engage

Engage Society for
Risk Awareness and Resilience

# Deliverable 2.4 – Identification of different communication channels and guidelines for the first responders and authorities to reach society

**Authors**: Nathan Stolero (TAU), Moran Bodas (TAU), Kobi Peleg (TAU), Bruria Adini (TAU)

**Contributors**: Francesca De Donato (ASL), Alexis Gizikis (EENA), Haakon Straume (EverBridge), Raed Arafat, George Manea, Roxana Ifrim-Donici (DSU), Leire Labaka, Sahar Elkady (TECNUN).

**Abstract**: ENGAGE aims at understanding how authorities and first responders use various communication channels to promote societal resilience. Deliverable 2.4 focuses on describing the communication channels used by authorities and first responders and the guidelines they follow using these channels. We conduct an empirical study, using qualitative measures (semi-structured interviews), focusing on two goals: 1) identifying and analysing what communication channels and guidelines authorities and first responders use to communicate with the society, and vice-versa, taking into account the cultural and gender diversity of the population; and, 2) how do they use these channels, starting from previous building resilience campaigns, to improve the risk awareness and societal resilience, taking into account all the phases of an emergency and a disaster: prevention, preparation, response, recovery, and learning.

## INFORMATION TABLE

| | |
|---|---|
| **Deliverable Number** | 2.4 |
| **Deliverable Title** | Communication, Social Media and Societal Resilience Among Citizens |
| **Project Acronym** | ENGAGE |
| **Dissemination Level**<br>PU: Public; CO: Confidential; CI: Classified | PU |
| **Grant** | 882850 |
| **Project Duration** | July 2020 – June 2023 |
| **Call** | SU-DRS01-2018-2019-2020 |
| **Topic** | Human factors, and social, societal, and organisational aspects for disaster-resilient societies |
| **Consortium Coordinator** | SINTEF |
| **Edition date** | 4 May. 2021 |
| **Version** | 00.01.00 |

## AUTHORSHIP & APPROVAL INFORMATION

| | |
|---|---|
| EDITOR<br>**Bruria Adini (TAU)** | DATE<br>23.4.2021 |
| CONTRIBUTORS<br>**Francesca De Donato (ASL), Alexis Gizikis (EENA), Haakon Straume (EverBridge), Raed Arafat, George Manea, Roxana Ifrim-Donici (DSU), Leire Labaka, Sahar Elkady (TECNUN)** | DATE<br>17.12.2020 - PCOS<br>20.4.2021 – Intermediate<br>27.4.2021 - External |
| REVIEWED BY<br>**Marita Hoel Fossen, TRC**<br>**Svein-Eric Bolland, TRC**<br>**Martina Ragosta, SINTEF** | DATE<br>17.12.2020 – PCOS<br>16.4.2021 – Intermediate<br>27.4.2021 - External |
| APPROVED BY<br>**Matthieu Branlat (SINTEF)** | DATE<br>4.5.2021 |

| **ETHICS BOARD REVIEW REQUIRED?** | **SECURITY BOARD REVIEW REQUIRED?** |
|---|---|
| YES (Reviewed by TAU Ethics Committee) | NO |

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

## DOCUMENT HISTORY

| Version | Date | Version description / Milestone description |
|---|---|---|
| 00.00.01 | 30 Nov. 2020 | PCOS Proposed |
| 00.00.02 | 17 Dec. 2020 | PCOS Approved |
| 00.00.03 | 7 Apr. 2021 | Intermediate Proposed |
| 00.00.04 | 16 Apr. 2021 | Intermediate Approved |
| 00.00.05 | 23 Apr. 2021 | External Proposed |
| 00.00.06 | 27 Apr. 2021 | External Approved |
| 00.01.00 | 4 May. 2021 | Final Version |

*The project uses a multi-stage internal review process with defined milestones. Milestone names include terms (in bold) as follows:

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

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

» **External**
- **proposed:** Document is approximately 100% complete – review checkpoint. Document authors submit for internal review.
- **revised:** Document authors produce new version in response to internal reviewer comments.
- **approved:** Internal project reviewers accept the document.

» **Released:** Executive Board accepts the document. Coordinator releases the deliverable to the Commission Services.

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

## Members of the ENGAGE Consortium

| | | |
|---|---|---|
| SINTEF | Stiftelsen SINTEF (SINTEF)<br>NO-7465 Trondheim<br>Norway<br>www.sintef.com | **Project Coordinator:**<br>Matthieu Branlat<br>Matthieu.Branlat@sintef.no |
| deepblue CONSULTING & RESEARCH | Deep Blue Srl (DBL)<br>IT-00198 Rome<br>Italy<br>www.dblue.it | **Contact:** Alberto Pasquini<br>alberto.pasquini@dblue.it |
| tecnun Universidad de Navarra | University of Navarra (TECNUN)<br>SP-31009 Pamplona<br>Spain<br>www.tecnun.unav.edu | **Contact:** Leire Labaka<br>llabaka@tecnun.es |
| TEL AVIV UNIVERSITY אוניברסיטת תל אביב | Tel Aviv University (TAU)<br>IL-6997801 Tel Aviv<br>Israel<br>www.english.tau.ac.il | **Contact:** Bruria Adini<br>adini@netvision.net.il |
| Røde Kors Trondheim | Trondheim Red Cross (TRC)<br>NO-7465 Trondheim<br>Norway<br>www.rodekors.no/en/ | **Contact:** Marita Hoel Fossen<br>marita.fossen@redcross.no |
| eena EUROPEAN EMERGENCY NUMBER ASSOCIATION | European Emergency Number Association (EENA)<br>BE- 1060 Brussels<br>Belgium<br>www.eena.org | **Contact:** Alexis Gizikis<br>ag@eena.org |
| | Ministry of Internal Affairs, Department for Emergency Situations (DSU)<br>RO- 010086 Bucharest<br>Romania<br>www.dsu.mai.gov.ro | **Contact:** Raed Arafat<br>arafatr@smurd.ro |
| everbridge® | Everbridge Norway (EVBG)<br>NO-0663 Oslo<br>Norway<br>www.everbridge.no | **Contact:** Håkon Straume<br>haakon.straume@everbridge.com |
| ENS ÉCOLE NORMALE SUPÉRIEURE | Ecole Nationale Supérioure (ENS)<br>FR-75005 Paris<br>France<br>www.ens.psl.eu | **Contact:** J. Peter Burgess<br>james.peter.burgess@ens.psl.eu |
| ERTZAINTZA | ERTZAINTZA - Departamento de Seguridad – Gobierno Vasco - (ERTZ)<br>ES- 01010 San Sebastian<br>Spain<br>www.ertzaintza.eus/wps/portal/ertzaintza | **Contact:** J. Jesús Alberto Alonso Velasco<br>06090@ertzaintza.eus |
| CITTADINANZATTIVA | Cittadinanzattiva (CA)<br>IT- 00183 Rome<br>Italy<br>www.cittadinanzattiva.it | **Contact:** Annalisa Mandorino<br>a.mandorino@cittadinanzattiva.it |

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

Azienda Sanitaria Locale Roma 1 - – Dipartimento di Epidemiologia (ASL)
IT- 00198 Rome
Italy
www.aslroma1.it

**Contact:** Francesca de'Donato
f.dedonato@deplazio.it

Katastrofmedicinskt Centrum (KMC)
SE-58330 Linköping
Sweden
www.lio.se/kmc

**Contact:** Carl-Oscar Jonson
carl-oscar.jonson@regionostergotland.se

NTNU Social Research Ltd. (NTNUSR)
NO- 7491 Trondheim
Norway
www.ntnu.edu

**Contact:** Stian Antonsen
stian.antonsen@ntnu.no

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

# Table of Contents



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

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

## List of Tables



## List of Figures



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

# Executive summary

**Background**: One of ENGAGE's goals is to identify solutions that contribute to building societal resilience. More specifically, it aims at examining the existing processes, practices, approaches, tools, and guidelines for authorities and first responders.

**Goal**: The main goal of task 2.4 is to describe all the communication channels and guidelines that first responders and authorities use to communicate with society to improve societal resilience, in addition to understanding their communication strategies. Therefore, the deliverable objectives are: (1) To identify what communication channels and emerging technologies are used by authorities and first responders to communicate with the public and vice-versa. (2) To analyse the communication guidelines authorities and first responders use to manage the communication process. (3) The identify how the communication process is managed by authorities and first responders. (4) To understand how authorities and first responders consider the cultural and gender diversity of the population and refer to digital literacy in the communication process with the public.

**Methodology**: The study of this deliverable is based on a qualitative approach. We analysed the communication channels and guidelines used by authorities and first responders, collected through snowball sampling. We also conducted 30 semi-structured interviews with professionals from authorities and first responders across seven countries.

**Findings**: The first research question addressed the communication channels and emerging technologies that authorities and first responders use to communicate with society and vice-versa. Findings showed that authorities and first responders use various communication channels to communicate with society and vice-versa, with a strong preference to traditional and social media. The study also showed that few organizations already started examining innovating and emerging technologies to improve the communication process. From the affordance's perspective (i.e., what do the channels enable and what they do not), most organisations used communication channels that allow both unidirectional and multidirectional communication with society. However, it was noticeable that most of the communication process was conducted in a top-down approach.

The second research question examined the existence of written communication guidelines among authorities and first responders. Here, the picture was more complex. On the one hand, among international authorities (e.g., WHO, CDC), various communication guidelines were found. Also, it was found that concerning specific communication questions, such as what channels to use and in which events, who is authorised to use them and under what circumstances – authorities and first responders had written guidelines. These guidelines were implemented, in most cases, as a component within more general policy papers (e.g., like different chapters or sections) and in a few cases, also as independent guidelines. Regarding crises and emergency risk communication, there were very few written guidelines.

The third research question examined how messages are developed, what information is disseminated in the top-bottom communication, what information is needed and received in the bottom-up communication, and how the effectiveness and success of messages are measured. The interviews supported the findings of the first part of the analysis. They also provided more details on how messages are developed by authorities and first responders, their preference for top-down communication over bottom-up communication and how they measure the effectiveness of their communication strategy.

The fourth research question examined the differences between the communication process and the varied phases of emergencies and disasters, before, during and after crises. Regarding the use of communication channels, we showed that most channels are used in all phases of crises, excluding the specialized channels (e.g., warning systems that are relevant only for the initial alert phase). A similar picture was found regarding the use of communication guidelines.

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

The last research question focused on diversity. It examined how authorities and first responders refer to different genders, cultures and citizens from less fortunate societies (e.g., low socioeconomic status, digital illiteracies and more). While diversity was perceived to be very important by the interviewees, very few organisations described specific written guidelines that related to diversity. They relied heavily on oral practices, mainly regarding cultural diversity and minorities, and on training. Especially regarding gender diversity, several interviewees regarded it as a form of discrimination.

**Conclusions**: The findings of the study lead to several conclusions aligned with the initial objectives. The first conclusion is two-fold. On the one side, it relates to the wide choice of channels and the possibility of authorities and first responders to learn from each other and adopt new channels. On the other side, it emphasizes the importance of learning how to use these various channels properly.

The second conclusion is that more specified and unique communication guidelines should be developed. We recommend that as part of deliverable 2.5, ENGAGE will develop a document or a template to support the process of developing communication guidelines.

Following the second conclusion, the third conclusion is related to the need of authorities and first responders to develop organised procedures for developing messages, choosing communication channels, top-down information strategies and the role of bottom-up communication.

The fourth conclusion relates to the need to consider diversity in the communication process. This should be integrated within the communication guidelines.

**Recommendations for future activities/work in ENGAGE:** The discussion section described in detail the necessary recommendations for future WPs and deliverables. For D2.5: develop a suitable material for authorities and first responders, based on deliverable 2.4. For example, templates for developing communication strategies and diversity guidelines. For D3.1 and D3.2: the recommendations in deliverable 2.4 are part of the basis for the choice of promising solutions. Understanding how authorities and first responders design their communication strategy can also contribute to D3.2, which aims at recommending a blue print for an innovating emerging technology of an AI-chatbot. For D4.1: the identified uses of communication channels and the communication strategies of authorities and first responders can serve the initial validation process of solutions. For D5.1: the use of the results of this study is shaping ENGAGE's communication and dissemination strategy. Last, for D5.4 and D5.5: the results contribute to the website and knowledge platform of ENGAGE.

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

# 1 INTRODUCTION

## 1.1 SCOPE OF THE DELIVERABLE

This deliverable focuses on the communication process between authorities and first responders, and society. Based on an online search and semi-structured interviews conducted with disaster authorities and first responders, the deliverable identifies and analyses the communication channels and emerging technologies used by authorities and first responders. The deliverable also analyses the guidelines they use to build the communication process with the public. The interviews were conducted in France, Israel, Italy, Norway, Romania, Spain, and Sweden. We also map and build on existing resilience-building campaigns to improve risk awareness and societal resilience, considering all the phases: prevention, preparation, response, recovery, and learning. Using these methods allows us to examine the communication process between authorities and first responders, and the public, taking into account the cultural and gender diversity of the population and the communication process with those in less favoured conditions.

The deliverable deepens our knowledge on how authorities and first responders use various channels to communicate with the public, and vice-versa, in all phases of emergencies and disasters. Following deliverable 1.3, which analysed the public's perspective, this deliverable elaborates on the side's emergency and disaster organisations.

The deliverable's intended readers are the ENGAGE Consortium (composed of 14 partners from 7 countries), the European Commission and project reviewers, and EU emergency authorities, first responders, and NGOs.

## 1.2 GOALS

The deliverable reports on the result of Task 2.4: "Identification of different communication channels and guidelines for the first responders and authorities to reach society". It completes tasks 2.1, 2.2, and 2.3, identifying the needs and expectations of authorities and first responders from the society, formal and informal solutions for improving societal resilience. The main goal of task 2.4 is to describe all the communication channels and guidelines that first responders and authorities use to communicate with society to improve societal resilience and understand their communication strategies.

The task aims at concluding on authorities and first responders' use of communication channels and communication strategies. As a mirror image of deliverable 1.3, focusing on society's communication needs, deliverable 2.4 examines how, in turn, authorities and first responders respond and interact with these needs. Therefore, this study's findings will serve as the basis for improving communication strategies with society, helping identify the divergence of communication channels and strategies and highlighting what aligns with the public's needs and expectations and what does not.

## 1.3 OBJECTIVES

One of ENGAGE's goals is to identify solutions that contribute to building societal resilience. More specifically, it aims at examining the existing processes, practices, approaches, tools, and guidelines for authorities and first responders. Under that, this deliverable's objective is to understand the use of communication channels and guidelines, by authorities and first responders, in building societal resilience. Furthermore, the goal is to understand the actions of authorities and first responders and provide suggestions to improve the communication process based on the findings of this deliverable and deliverable 1.3, which analysed the public's point of view. The objectives of the deliverable are:

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

(1) To identify what communication channels and emerging technologies are used by authorities and first responders to communicate with the public and vice-versa.

(2) To analyse the communication guidelines authorities and first responders use to manage the communication process.

(3) The identify how the communication process is managed by authorities and first responders.

(4) To understand how authorities and first responders consider the cultural and gender diversity of the population and refer to digital literacy in the communication process with the public.

## 1.4 FIT WITHIN ENGAGE

D2.4 contributes to understanding how authorities and first responders use various communication channels in all phases of emergencies and disasters. It is related to other deliverables in WP1 and WP2, which analyse the public and authorities and first responder's role in promoting societal resilience, as follows:

- **D1.3 Communication Social Media and Societal Resilience:** the analysis of the communication channels and guidelines of emergency authorities and first responders is conducted after analysing the public's needs and expectations, reviewed in D1.3. The two deliverables complete a full examination of an end-to-end communication process, from the organisations to the public and vice-versa.
- **D2.1 Identification of needs and expectations of authorities and first responders:** the use of communication channels by authorities and first responders reflects some of their needs and expectations regarding how to improve societal resilience.
- **D2.2 and D2.3 Identification of formal and informal solutions:** the communication channels analysed in this deliverable are part of both formal and informal solutions' broad perspectives.
- **D2.5 Revision and updated solutions:** the results of D2.4 will later be adapted and improved during the final validation process.

The deliverable also contributes to future WPs, 3, 4, and 5, as elaborated further in the report, in sections 2.1 and 2.2.

## 1.5 ACRONYMS AND ABBREVIATIONS

**Table 1.** List of terms.

| Term | Explanation |
|---|---|
| Risk Communication | Risk Communication refers to exchanging real-time information, advice and opinions between experts and people facing threats to their health, economic or social well-being. |
| Crisis and Emergency Risk Communication | Risk Communication that focuses on crises and emergencies. |
| Authorities | Official national or regional emergency authorities, operated by the country, state or region. |

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

| | |
|---|---|
| First Responders | Organisations with the ability to respond first in situations of emergencies and disasters. |
| Top-down communication | The communication process from the organisations (e.g., authorities and first responders) to the public. |
| Bottom-up communication | The communication process from the public to the organisations (e.g., authorities and first responders) |
| Unidirectional Flow of Communication | One-way flow of communication (top-down). |
| Multidirectional Flow of Communication | Two-way flow of communication (bottom-up and top-down) |
| Contextual Factors | Contextual factors are internal to society and hard to modify. They include personal, social, cultural, economic, and political factors. |
| Target factors | Target factors are less persistent than contextual factors and can be changed. |
| Diversity | Understanding the unique characteristics of different members and communities in society. |

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

# 2 SIGNIFICANCE

## 2.1 CONTRIBUTION TO THE FIELD OF STUDY

The study carried out in this deliverable identifies how authorities and first responders communicate with the public. It examines how they think about the process, whether they follow specific guidelines or work in an unstructured way, and tries to pinpoint the specific areas in which the organisations focus. All of these, along with identifying the public's communication needs and expectations that were done in deliverable 1.3, formulate the basis for an effective communication process that contributes to societal resilience.

The deliverable is part of identifying solutions for societal resilience, with a focus on communication solutions. Therefore, the deliverable's conclusions and recommendations contribute to setting the criteria for selecting promising solutions, exploring the innovative use of communication and social media technologies (WP3), and validating the solutions (WP4).

## 2.2 SPECIFIC CONTRIBUTION TO THE ENGAGE PROJECT

The deliverable describes the communication channels of authorities and first responders based on the task's goals, the guidelines they use, and how professionals in these organisations think about society's communication process and vice-versa. It focuses on the top-down part of the process and how the authorities and first responders perceive the bottom-up process (public organisations). We examine how authorities and first responders address the public, with particular consideration to questions of diversity – different genders, age groups, culture, digital illiteracies, and other variables. All crucial criteria for communication, identified by academic scientific literature and professional guidelines.

The deliverable, therefore, contributes directly to the second objective of project ENGAGE, regarding identifying solutions: "Identify existing formal and informal solutions for enhancing societal resilience transferable across contexts". Whereas in this case, we focus on contexts of communication situations.

In addition, deliverable 2.4 lays the groundwork for WP3, WP4, and WP 5, as follows:

- **D3.1 Selection of promising solutions:** deliverable 2.4 identifies the communication channels and strategies of authorities and first responders as communication solutions. Therefore, this deliverable sets some of the criteria for examining promising solutions.
- **D3.2 Innovative use of communication and social media technologies:** some of the communication channels described in this deliverable use innovating technologies (e.g., AI chatbots, social media-based solutions) are the base for the future development of deliverable 3.2.
- **D4.2 Initial validation of solutions:** following D3.1, deliverable 2.4 sets the criteria which can be used for validation of solutions.
- **D5.4 Website and knowledge platform & D5.5 Knowledge and innovation community:** the description of communication channels and guidelines used by authorities and first responders is included in ENGAGE knowledge platform.

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

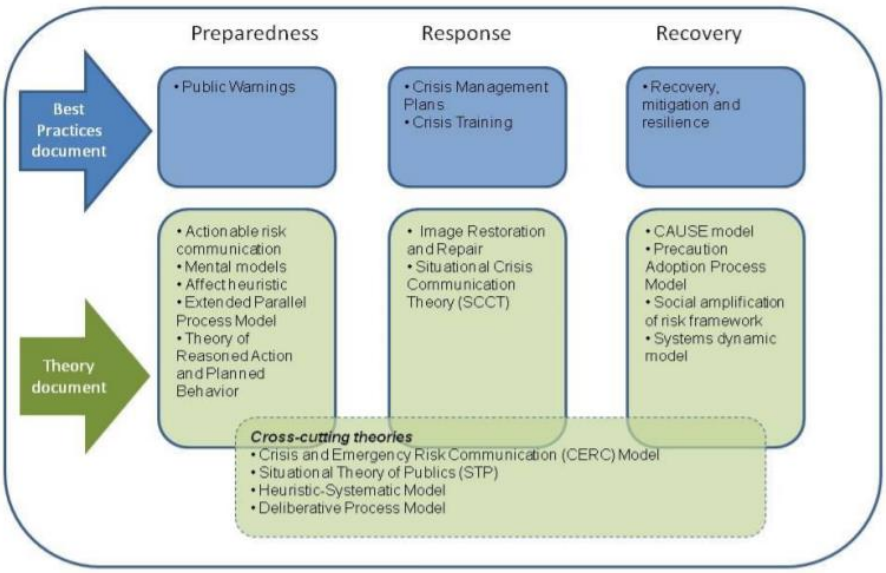
# 3 SCIENTIFIC BACKGROUND

## 3.1 EMERGENCY RISK COMMUNICATION

Emergency Risk Communication (ERC) or Crisis and Emergency Risk Communication (CERC) is the process of sharing information, top-down and bottom-up, strategically and effectively to help society understand the risks and make informed decisions. Effective ERC/CERC was found as a solid contributor for individual, community, and societal resilience and was reviewed extensively in deliverable 1.3.

According to Reynolds & Seeger (2005), CERC is essential in mitigating barriers of the society before, during, and after emergencies and disasters. Effective CERC addresses the various factors which can design the risk perceptions and awareness, including cognitive, emotional, integrative and other factors (CDC, n.d; Gesser-Edelsburg et al., 2015; Holmes, Henrich, Hancock & Lestou, 2009; Kar & Cochran Jr., 2019; Sandman, 2007). For the last decades, several theories served as the basis for effective CERC, developed as part of the empirical investigation of the field, in addition to several models (e.g., Alaszewski, 2005; Karger, 2005; Larsen, Hanigen, Reich, Qin, Cope, Morgan & Rappold, 2020; Ogie, Rho & Clarke, 2018; Rohemann, 1992; Wendling, Radisch & Jacobzone, 2013). Veil, Reynolds, Sellnow & Seeger (2008) highlight that despite, or maybe because of, the wide range of literature, there is no single theory or model that captures all considerations that affect CERC and serve as validation criteria. From psychological theories addressing effect, emotions, and information processing (e.g., Berry, 2004; French, Cameron & Benton, 2017; Paek, Hilyard, Freimuth & Barge, 2010; Renn & Levine, 1991) to sociological theories about stratification and inequality (e.g., Petridou, Danielsson & Olofsson, 2019) – all contribute to the general assessment of CERC. Even the division between the different phases of emergencies and disasters varies a bit. While some refer to preparedness, before the crisis, response, during the crisis, and recovery, after the crisis (Shappard, Janoske & Liu, 2012), some refer to a broader five-stage process, including prevention and preparation, representing the before stage, recovery, representing the during stage, and recovery and learning, representing the after stage (e.g., Olshansky, Hopkins & Johnson, 2012). Figure 1, taken from Shappard, Janoske & Liu (2012), defines the relationship between the three phases related to CERC-related theories and practices.

**Figure 1.** Theories and practices across risk phases. Taken from Shappard, Janoske & Liu (2012).




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

The figure shows that the best-identified practice in the initial (Preparedness) stage is public warnings. This practice is supported by theories such as actionable risk communication, mental models, and more. During the crisis (response), crisis management plans and crisis teaming are considered to be the most valuable practices, supported by theories of image restoration and repair and situational crisis communication theory (SCCT). Finally, after the crisis (recovery), recovery mitigation and resilience are the top priority, supported by theories such as the CAUSE model, precaution-adoption process models, and more.

As mentioned above, several theories and models serve for developing ERC/CERC strategies by authorities and first responders. One theory is the situational theory of publics (STP), allowing authorities and first responders to define the public or the public better they face in building the CERC strategy (Aldoory & Sha, 2007). Another theory, the Heuristic-Schematic Model (HSM), focuses on cognitive processes, defining the internal and persistent patterns through which the public interpreted the event (Forgas, 1992). Unlike the first top-down theories, the Deliberative Process Model (DPM) highlights the need for a bottom-up, mutual-development of messages with the public – in a deliberative way (Renn, 1999). Focusing not just on experts but also on the general public, which is the audience of such messages.

## 3.2 Risk characteristics

In effective CERC, several factors and variables should be addressed, both in designing the key messages and in what the communication strategy tries to affect. Those can be divided into contextual and target factors.

### 3.2.1 Contextual Factors

The role of contextual factors in resilience-building was extensively covered in WP1, mainly in deliverables 1.2 and 1.3, focusing on needs and expectations about societal resilience and communication. Contextual factors such as sex, age, religiosity, culture, and more are hard to change and, therefore, less addressed by resilience-building campaigns. However, these factors are crucial in designing the campaigns themselves. Meaning that the communication strategy will not aim to change someone's age, sex, or culture but rather consider the message's design process.

Figure 3, taken from deliverable 1.3, shows the relationship between crisis and emergency risk communication, communication needs and contextual factors, and target factors, which are also relevant here. While deliverable 1.3 focused more on the red circle, deliverable 2.4 focuses on the right green circle of CERC.

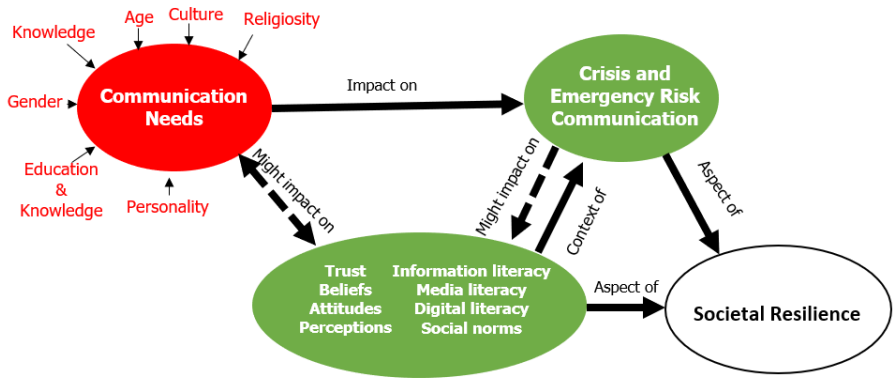



**Figure 2.** The relationship between communication needs, crisis and emergencies risk communication, contextual factors (in red), and target factors (in green). Taken from deliverable 1.3.

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

The figure highlights the role of contextual and target factors. Previous studies showed, for example, that younger people tend to have a reduced risk awareness and a higher tendency to take risks (e.g., Machin & Sankey, 2008; Ronan, Creilin & Johnston, 2010; Wackowski & Delnevo, 2016; Yildiz, Teeuw, Dickinson & Roberts, 2021). Religiosity levels are connected, according to studies, with solid religious figures that mediate the risk communication messages and can facilitate them – or prevent the extreme religious groups from complying with the risk messages (e.g., Adiyoso & Kanegae, 2017; Frei-Landau, 2020; Lyons, Winters & Zeebari, 2020). Other studies also show that women have higher risk perceptions than men and that men tend to take more risks and be less prepared than women, highlighting the need for different strategies for diverse genders (e.g., Harris & Jenkins, 2006).

Another important contextual factor, addressed in deliverable 2.4, is socioeconomic status, representing less privileged societies. While mostly correlated with other factors and variables, such as education and digital literacy, socioeconomic status can play an independent role in risk communication (Amornsiripanitch, Ameri & Goldberg, 2020; Vaughan, 1995). Communicating with less privileged societies, for example, can face higher barriers, such as the desire to fulfil more basic needs (e.g., physiological, feed, shelter) before thinking about higher risks, which are perceived to be more distant from the individuals (e.g., Kwilinski, Vyshnevskyi, Dzwigol, 2020; Glik, 2007).

### 3.2.2 Target Factors

Deliverables 1.2 and 1.3 have also widely discussed the role of target factors, among them trust, beliefs, information, media and digital literacy, social norms (that can also be a contextual factor), and others. In the evaluation process of risk communication strategies and campaigns, several target variables are addressed.

A central concern of risk communication is the effect of communication on attitudes and behaviours (Dohmen, Falk & Huffman, 2012; Gesser-Edelsburg et al., 2015; Glik, 2007; Renn & Levine, 1991). In other words, it focuses on the question of cause and effect. Such studies highlight the goals of CERC as clarifying the perceived risk, understanding its severity, measuring behavioural change, and achieving compliance with the recommended behaviours by authorities and first responders. In most cases, risk communication for these topics focused on communicating with the general public. In a few cases, the focus, or part of the strategy, was put on emergency and disaster professionals, such as health workers, police, fire brigades, environmental experts, and more (e.g., DeMello, Egan & Drew, 2020; Marana et al., 2019).

In addition to the above strategies, trust, uncertainty, and optimistic bias are considered other three important risk communication components that should be addressed. However, while they are considered to be critical categories of crisis and emergency risk communication, their presence in the communication strategies analysed in the literature is limited (e.g., Gesser-Edelsburg et al., 2015; Houston, Spialek, Cox, Greenwood & First, 2015; Son, Sasangohar, Neville, Peres & Moon, 2020; Wang, Hao & Platt, 2021).

## 3.3 Assessing the use of communication channels to communicate with the public

In a conceptual model for evaluating ERC/CERC, Seeger et al. (2018) suggested several essential variables assess in using various communication channels to communicate risks. Figure 3 illustrates those variables.

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

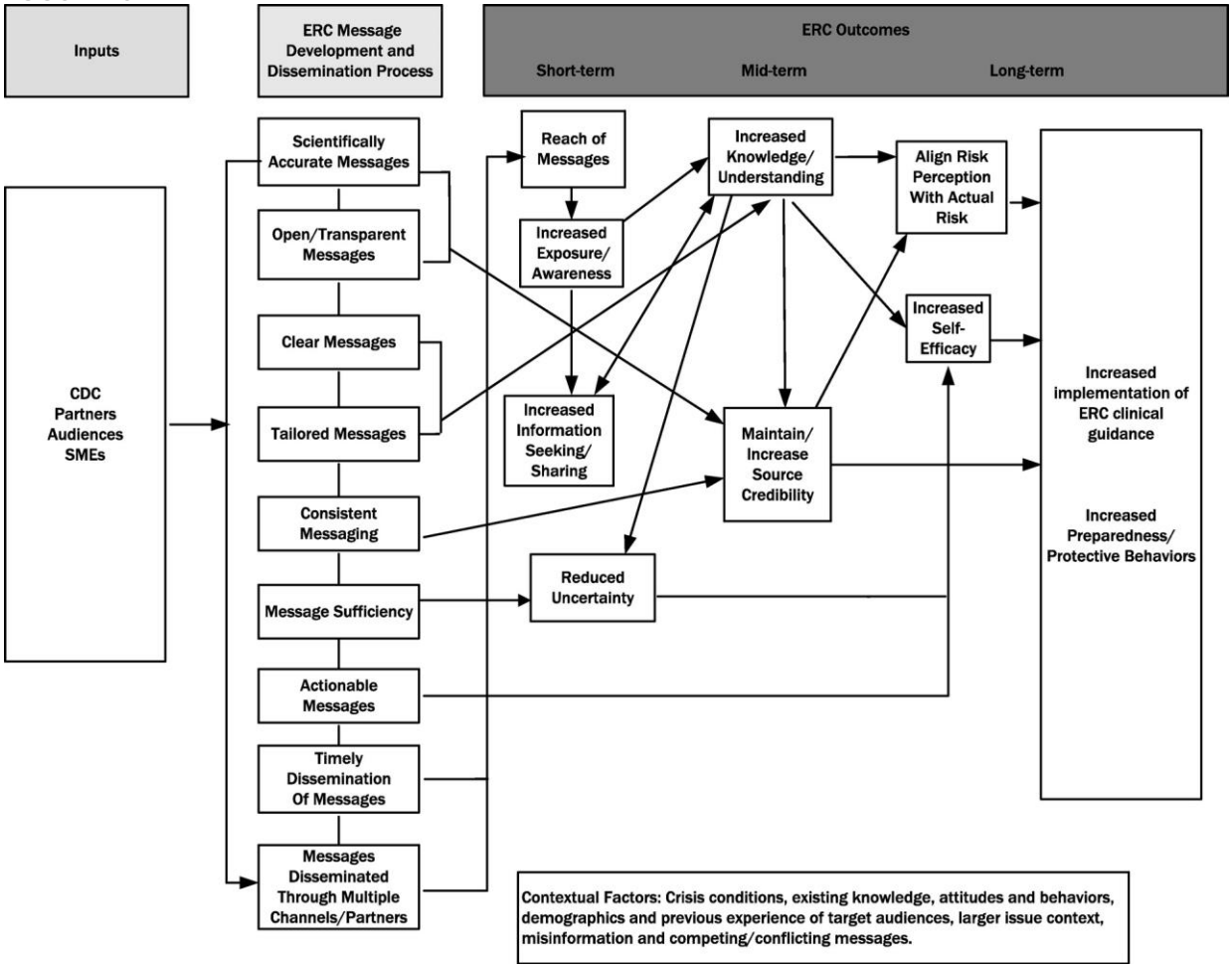



**Figure 3.** The emergency risk communication (ERC) conceptual model. Taken from Seeger et al. (2018).

The model, drawn from emergency response experiences at CDC, and based on the feedback of the public in other, also non-health related, emergencies and disasters, incorporates constructs that are relevant for assessing CERC messages:

- *Scientifically accurate messages*: providing inaccurate information can hard the public. Therefore, CERC messages should rely only on scientific, preferable evidence-based information (Reynolds, 2011; Wray, Becker, Henderson, 2008).
- *Open/transparent messages*: providing all possible information in the most accessible way. Being open and/or transparent can lead to a decrease in public trust (Peters, Covello & McCallum, 1997; Ruggiero & Vos, 2015).
- *Clear messages*: vague messages can be understood in multiple, some undesired ways by different publics. Therefore, messages should be as straightforward as possible (Fish et al., 2017).
- *Tailored messages*: different and diverse publics have various needs. Therefore, messages should be tailored-made to the specific segmented groups and not in a "one size fits all" design (Ruggiero & Vos, 2015).
- *Consistent messaging*: Although the situation can be confusing during emergencies and disasters, it is crucial to keep the messages for the public as consistent as possible. Inconsistencies can decrease the messages' credibility and even harm the understanding by the public (Wray, Becker, Henderson, 2008).

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

- *Message sufficiency*: if information lacks details, it may raise questions. Some of these questions could lead the public to look for answers in undesired information sources. Therefore, the messages should provide sufficient information and explain why some information is still unavailable (Griffin, Neuwirth, Dunwoody & Giese, 2009).
- *Actionable messages*: one of the goals of CERC is to make the public make informed decisions. Therefore, the information should include recommendations regarding what to do or not (McComas, 2006).
- *Timely dissemination of messages*: in deliverable 1.3, one of the critical aspects of unidirectional communication flow referred to the speed of information. The timing is distributing the messages is essential – as fast as possible, and at the appropriate time, so the public will not dismiss it as not relevant (Reynolds, 2011).
- *Messages disseminated through multiple channels/partners*: last, since the public is not consuming its information from a single communication channel, it is crucial to disseminate the messages through multiple channels. Allowing the information to be spread and reach its audience in more than one way and providing the opportunity to take advantage of each medium's different affordances (Ruggiero & Vos, 2015).

According to the model, the ERC/CERC outcomes can be measured in three ways. The first is the short-term (e.g., the reach of messages, increased exposure/awareness, increased information seeking/sharing, and reduced uncertainty). The second is the mid-term (e.g., increased knowledge/understanding and maintaining/increasing source's credibility). The third is the long-term (e.g., align risk perception with actual risks and increased self-efficacy). All, in turn, lead to increased implementation of ERC/CERC guidelines and increased preparedness/protective behaviours that contribute to building societal resilience (Seeger, Pechta, Price, Lubell, Rose, Sapru, Chanski & Smith, 2018).

The different components of CERC, such as message clarity, might affect the target variables, such as trust in formal authorities, for example, as well as on the crisis and emergency risk communication. The target variables and CERC are aspects of societal resilience. In addition, it is worthwhile to mention that even this model lacks some crucial elements, identified in the literature, such as community leaders, that can work with authorities and first responders on the impact on society.

## 3.4 Resilience building campaigns

Resilience-building campaigns, led by emergency and disaster authorities and first responders, employ a wide range of strategies to achieve their goals. In a systematic review of the literature, focusing on Emerging Infectious Diseases (EID) communication, Gesser-Edelsburg et al. (2015) identified the main factors, addressed by authorities and first responders, in the three phases of pandemics. The review found that most campaigns focused on risk perceptions and effects on behaviour and framed the media's risk. Far behind were public concerns, trust, optimistic bias, uncertainty, and evaluating the risk communication process. These results suggested that campaigns were more concerned with how the public perceived the risk, in general, than with its particular characteristics, and even less – with the evaluation of the communication process and whether it was effective or not. Moreover, one of the study's conclusions was that communication with the public tends to be more unidirectional, one-way communication flow focusing on distributing information, rather than a multidirectional, two-way flow of communication, allowing feedback and dialogue. Later studies and reviews also supported these findings, focusing on other emergencies and disasters, such as earthquakes (e.g., Herovic, Sellnow & Anthony, 2020), severe weather conditions (e.g., Kjellgren, 2013; Lejano, Melcar & Wilson, 2016), and more (e.g., Bradley, McFarland & Clarke, 2014).

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

The unidirectional versus the multidirectional flow of communication was also widely discussed in deliverable 1.3, focusing on the public's communication needs and expectations. The deliverable showed that while early studies described more unidirectional campaigns, the public's role and feedback are considered more in the last years. Also, the findings of the survey from deliverable 1.2, which was also analysed in deliverable 1.3, showed that unidirectional communication flow needs are still crucial and that the public perceives fast, credible and organised information as more critical than the multidirectional flow of communication (i.e., feedback, the ability to comment, the post information to the organisations).

The importance of the multidirectional flow of communication in resilience-building campaigns was also highlighted in the last decade in Europe, the US, and other parts of the world. Part of this strategy is structured in the *Whole Community* approach (Khanlou & Wray, 2014; Myers, 2021), which promotes the engaging the empowering of citizens, and not just organisations, elected official, and public servants, to participate in the communication process in all phases of emergencies and disasters, including accessing, exchanging, creating and interoperating information.

Houston, Spialek, Sorenson & Koch (2016) claimed that crisis and emergency risk communication campaigns still lack validation in assessing the whole community approach. Therefore, an alternative approach, the Citizen Disaster communication measurement (CDCA), was offered by Spialek & Houston (2018), addressing the need for robust citizen-focused crisis and emergency risk communication. This is a bottom-up approach, focusing on pre-event, event, and post-event, completing the traditional top-down CERC models (Spialek & Houston, 2019). The CDCA is illustrated in figure 4.

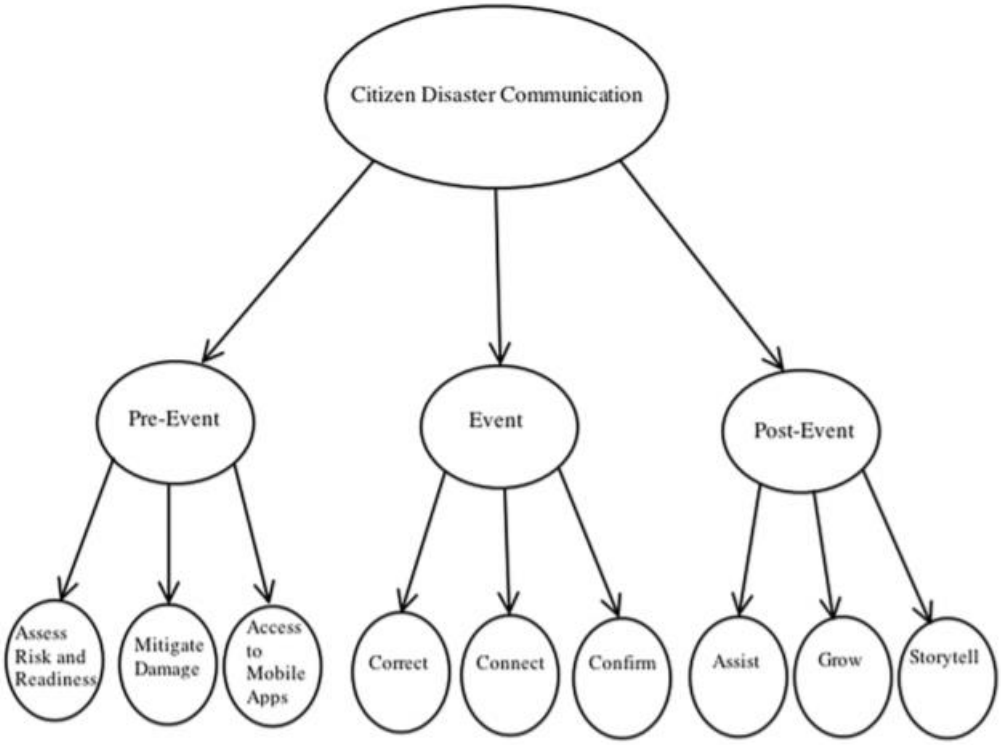



**Figure 4.** CDCA model. Taken from Spialek & Houston, 2018.

The CDCA model, illustrated in figure 4, shines a light on how effective communication strategies can promote individual, community, and societal resilience. It builds in all three phases of emergencies and disasters. Spialek, Czlapinsky & Houston (2016) found that promoting social media communication and personal conversations among community members after extreme weather disasters is associated with better community resilience. They also found that to a certain extent; it is associated with better community resilience, more than traditional contextual factors such as age, sex, and education). Similar findings were also found in more recent studies (Houston, Spialek,

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

Stevens & First, 2017; Deuge, Kent & Mond, 2020). Therefore, Spialek & Houston (2019) recommends a more multidirectional flow of communication.

## 3.5 USING DIFFERENT COMMUNICATION CHANNELS IN RESILIENCE-BUILDING CAMPAIGNS

The scientific literature regarding the use of various communication channels before, during, and after disasters is rich. There is a vast literature of the use of traditional mass media channels, from flyers and mail posts (Paci-Green, Varchetta, McFarlane & Iyer, 2020; Quinn, Thomas & McAllister, 2005) and newspapers (Piotrowski, 1998) to television (Rahmi, Joho & Shirai, 2019; Reuter & Spielhofer, 2017; Shaikh, 2017) and radio (Reuter & Spielhofer, 2017), mobile phones, including text messages (Bean, Liu, Madden & Sutton, 2016; Goniewicz & Burkle, 2019), location-based services (Bengtsson, Lu, Thorston & Garfield, 2011) and emergency apps (Reuter, Ludwig & Kaufhold, 2016; Reuter & Spielhofer, 2017; Wang, Li, Zhao, Feng & Luo, 2020), social media (Reuter, Ludwig & Kaufhold, 2016; Spielhofer et al., 2017), innovative technologies such as AI (Ahuja & Reddy & Marques, 2020; Markakis et al., 2017; Pandey, Gautam, Pal & Bandhey, 2020) and separate emergency networks (Chorust, Rainer, Sturm, Roth & Ziehesberger, 2011; Cohen, 2010; Meum & Munkvold, 2013).

Previous studies highlighted several similarities in authorities' and first responders' uses in all three phases of disasters. One of the dominant uses is the dissemination of information to the public in a top-down approach. Several studies found that most organisations use at least one of their communication channels to disseminate information Medford-Davis & Kapur, 2014). On the other hand, receiving information from the public (e.g., asking the public to send pictures and information about events) was less dominant (Haeffele & Storr, 2020; Musacchio, Falsaperla, Bernhardsdóttir, 2016; Thaler & Seebauer, 2019). These findings are coherent in analysing authorities' and first responders' communication channels in quiet times (e.g., before and after crises) and during disasters. Alerts and warnings were standard methods by authorities and first responders (Omori, Kuligowski, Gwynne & Butler, 2017).

However, there are a few differences between how authorities and first responders use communication channels in the three phases of disasters. One difference is in creating organised media events. Such events, for example, can be hosting a professional that can answer the questions of the public in social media, publishing an ad in the newspaper, or initiating a news article or newscast. These initiations are more dominant during disasters than before or after (Bhuvana & Aram, 2019; Lindsay, 2011). In general, more focus is given in the literature on the differences between the uses of communication channels during disasters to not during disasters, before and after (e.g., Saulnier & Ribacke, 2017).

Authorities and first responders, however, as noted by Lovari & Bowen (2019), encounter significant barriers when trying to create effective communication with the public. Two of the causes of these barriers are lack of policies and guidelines and low trustworthiness of crowdsourced data (Hilts, Kushma & Plotnik, 2014). Lovari & Bowen (2019) interviewed emergency professionals in the US and reported that while some of them reported about policies which guided their communication work, usually it was unwritten policy, mostly related to technical "dos and don'ts", such as not including private information of users in social media posts.

Written guidelines are found, usually, in more central authorities, usually international. For example, the World Health Organisation (WHO) has several guidelines for communicating risks, such as outbreaks and guides for planning communication[1]. Similar guidelines also appear on the websites of the CDC, ECDC, and more[2]. However, as Omori, Kuligowski, Gwynne & Butler (2017) claim,

[1] One example can be found here: https://www.who.int/csr/resources/publications/WHO_CDS_2005_28/en/ [accessed on April 7th, 2021].
[2] One example can be found here: https://emergency.cdc.gov/cerc/ [accessed on April 7th, 2021].

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

guidelines are usually focused more on how authorities and first responders should act to prepare the public for a disaster, help during it, and help the society to recover when it ends – and less on how to communicate it.

Lastly, another essential question raised in the scientific literature is the aims and goals of building resilience campaigns, and more specifically, how do they correspond with the way authorities and first responders use various communication channels. In the UN office for disaster risk reduction's (UNDRR) campaign for building resilience, three goals were set: raising awareness, allocating budget for disaster risk activities, and building more safely (World Economic Forum, 2008). In the Pan-American Health Organisation's (PAHO) building resilience campaign, "stronger together", aiming to cope with the impact of natural hazard events, the goals were set to helping people cope with the difficulties caused by a natural disaster, the support the mental health of the population, all through offering information and strategies to assist communities. This was done using several ads, jingles, graphic material, and videos distributed in various communication channels[3].

The comparison between these two campaigns and others analysed in the scientific literature (Aldrich, 2012; Lamond & Proverbs, 2009) highlights critical perceived goals of building resilience campaigns and communication strategies of authorities and first responders – raising awareness. Gray, Hanna & Reifels (2020) found that most campaigns and communication strategies set this goal to be the most critical and dominant measure for success. However, as Andreasen (2006) and Kotler & Lee (2008) stress out, awareness might be an initial point for a change, but other, more severe steps, should be conducted to improve societal resilience. Such as providing helpful information, moral support figures to identify with, and more. Therefore, several scholars call for a change of strategy in the methods used by authorities and first responders, which need to broaden their set of goals more than awareness (Gordon, 2019; Kubacki, Siemieniako & Brennan, 2020; Wood, 2019).

## 3.6 Communicating diversity in building a resilience campaign

Another critical focus of building a resilience campaign, examined in this deliverable, is diversity. DeeDee & Bennett (2019) and Bonnie, Simon, Thornton & Grant (2020) stress that women and racial/ethnic minorities are underrepresented in emergency management campaigns, both in practice and research. According to Phillips & Morrow (2008), it leads to significant constraints on such campaigns' effectiveness. Underrepresentation of women and racial/ethnic minorities also contributes, according to Enarson (2000), to community vulnerability. In addition, Bonnie, Simon, Thornton & Grant (2020) raise the concern that such underrepresentation is also unethical in many ethical codes in the US, such as the American Society for Public Administration (ASPA).

As a possible answer for such underrepresentation, Young & Jones (2019) offer a support framework for effective management and communication, focusing on diversity and inclusion. Adapted from Satir et al. (1991), Kübler-Ross (1993), and Rogers (2010), Young and Jones (2019) developed the phases of the diversity and inclusion transformation process, as presented in Figure 5.

[3] The campaign can be found here: https://www.paho.org/en/campaigns/stronger-together-building-individual-and-social-resilience-cope-impacts-natural-hazard [accessed on April 7th, 2021].

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

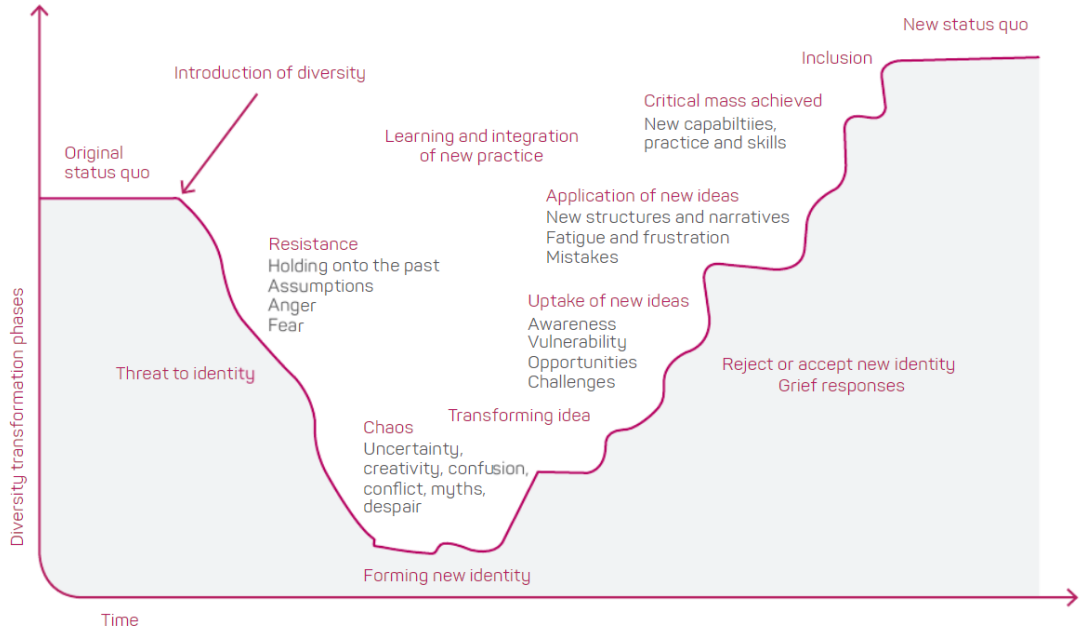



***Figure 5.*** *Support framework for effective management and communication. Taken from Young & Jones, 2019.*

The figure shows the different stages of moving from one *status-quo*, with underrepresentation of diversity, to a new *status-quo*, with better, or even complete, inclusion. This model's strength is in highlighting the different barriers, constraints, and failures of different steps, offering solutions that can prevent the communication process from going backwards. The model applies to the state and organizational level and how they accept and treat diversity.

## 3.7 Summary of the literature – towards improving the communication process of building resilience campaigns

The scientific literature highlights the relationship between effective emergency risk communication and the way authorities and first responders use their communication channels in all three phases of emergencies and disasters. We highlighted the contextual factors identified in the literature, such as age, religiosity, and culture. We suggested the addressable target factors that authorities and first responders' communication strategies should include trust, beliefs, information, media and digital literacy, social norms (that can also be a contextual factor), and others.

In reviewing the criteria for assessing the use of communication channels by authorities and first responders to communicate with the public and vice-versa, we identified several criteria related to the messages themselves. We introduced the CDC's CERC model and their short-, medium- and long-term outcomes, illustrating how meeting the goals of effective message design can affect the target variables that improve societal resilience.

We also reviewed some known strategies, types of information, and authorities' attitudes and first responders towards using unidirectional and multidirectional communication processes. We suggested assessment models for effective communication, comparing traditional CERC models and the CDCA, combining top-down and bottom-up communication processes. It was highlighted in the literature that more significant validation measures for communication effectiveness still lack.

Lastly, we reviewed the question of diversity. It was shown that building resilience campaigns still lack firm reliance on diversity, with women and racial/ethnic minorities, along with other populations, still underrepresented. The importance of diversity was stressed out, and by that, the need for the examination was not what was changed.

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

# 4 METHODS

## 4.1 METHODOLOGICAL APPROACH AND STUDY PROCEDURE

The study in the centre of this deliverable is based on a top-down qualitative approach. Contrary to bottom-up grounded theory, which is more common in qualitative investigations, this study's goal was to examine the existence of specific policies and examine how authorities and first organisations communicate with society, rather than building new theories from a premature field. To achieve this goal, we used qualitative semi-structured interviews and systematic analysis of campaigns and guidelines.

## 4.2 STUDY QUESTIONS

The study explores how authorities and first responders use various communication channels to communicate with society in different phases of emergencies and disasters. Based on this, the research questions of the study are:

***RQ1: What communication channels and emerging technologies do authorities and first responders use to communicate with society and vice-versa?***

***RQ2: What guidelines do authorities and first responders use to communicate with society and vice-versa?***

***RQ3: What are the different steps in the communication process between authorities and first responders, the public and vice-versa?***

***RQ4: What are the differences between the communication processes in all phases of emergencies and disasters?***

***RQ5: What is the role of sociodemographic differences, such as gender, culture, and age, and digital literacy, in the communication process of authorities and first responders with society and vice versa?***

## 4.3 CAMPAIGNS AND GUIDELINES ANALYSIS

In the first step, in order to answer the research question, we collected and analysed previous resilience-building campaigns from the last years from varies countries, including the partners, but also other countries around the world. We mapped the communication channels and emerging technologies used in these campaigns and how they were used. The number of official communication guidelines of authorities and first responders was meagre.

### 4.3.1 SAMPLING

The sampling process of campaigns was based on snowball sampling. We approached resilience-building professionals from ENGAGE consortium, the Ki-CoP members, and other resilience professionals, asking them for examples of such campaigns. The informants shared the request also with other professionals, allowing the collection of more examples. Other campaigns were collected from the scientific literature.

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

### 4.3.2 Analysis

The campaigns and guidelines were analysed according to the criteria set by the research questions:

- The list of communication channels used in the campaign.
- Which messages were distributed in each channel or each group of channels?
- Information sharing – what types of information were shared top-down and what bottom-up?
- Diversity - What groups are identified in the campaigns (e.g., women, minorities, sub-cultures, and youth)?
- Differences – between the uses of communication channels, communicating with different groups, channels used more to the unidirectional flow of communication versus channels used more to the multidirectional flow of communication and more.

## 4.4 Semi-Structured Interviews

To complete the analysis, and since the number of guideline documents was relatively low, we also conducted semi-structured interviews with professionals in emergency and disasters and resilience-building areas. The interviews for deliverables 2.1, 2.3, and 2.4 were conducted together. Here we report on the findings regarding deliverable 2.4.

### 4.4.1 Participants

We conducted 30 interviews with professionals from seven countries of the consortium: France, Israel, Italy, Norway, Romania, Spain, and Sweden. Six interviews were with professionals from authorities (two in Israel, two in Norway, one in Spain and one in Italy), while the other was with professionals of first responders. Only two interviewees were female, while the others were male. The list of interviewees, with no identifiable details, appears in table 1.

**Table 2.** List of interviewees.

| Country | Authority/First Responder | Type of Organisation | Role | Gender |
|---|---|---|---|---|
| France | First Responder | Health Services & Fire Department | Former Team Leader | Male |
| France | First Responder | Health Services | Firefighter | Male |
| France | First Responder | Fire Department | Team Leader | Male |
| Israel | Authority | Regional | Former Emergency Officer | Male |
| Israel | Authority | Local | Emergency Manager | Male |
| Israel | First Responder | Health Services | Community Manager | Male |
| Israel | First Responder | Police | Head of Police Station | Male |
| Israel | First Responder | Fire Department | Senior Firefighter | Male |
| Italy | Authority | Regional | First Responders and Intervention Manager | Male |
| Italy | First Responder | Fire Department | Professional Operator | Male |
| Italy | First Responder | Central Authority | First Responder | Male |
| Italy | First Responder | Police | Policeman | Male |
| Norway | Authority | Coordination Agency for Societal Safety | Section Manager | Female |
| Norway | Authority | Municipality | Emergency Preparedness | Male |
| Norway | First Responder | Health Services | Manager | Male |
| Norway | First Responder | Fire Department | Manager | Male |

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

| | | | | |
|---|---|---|---|---|
| Norway | First Responder | Police | Department Manager | Male |
| Romania | First Responder | Health Services | Physician | Male |
| Romania | First Responder | Fire Department | Paramedic | Male |
| Romania | First Responder | Rescue Aviation | Emergency Pilot | Male |
| Romania | First Responder | Fire Department | Firefighter (Communication) | Female |
| Romania | First Responder | Fire Department | Firefighter | Male |
| Spain | Authority | Regional | General Director | Male |
| Spain | First Responder | Law Enforcement | Technician | Male |
| Spain | First Responder | Red Cross | Unit Director | Male |
| Spain | First Responder | Fire Department | Firefighter | Male |
| Sweden | First Responder | Health Services | Chief of Staff | Male |
| Sweden | First Responder | Health Services | Anaesthetist in Ambulance | Male |
| Sweden | First Responder | Health Services | Health Worker | Male |
| Sweden | First Responder | Fire Department | Former Commander | Male |

The interviews in each country were conducted with members of national/regional governments, local authorities/government, firefighters, the police, and health services:

- Two interviews in France with a former team leader in the health services and the fire department and a current firefighter in the fire department.
- Five interviews in Israel with professionals from one of the biggest municipalities in Israel, a regional manager of emergency (authorities), and senior representatives from the police, fire brigade, and EMS (first responders).
- Four interviews in Italy with a first responder in a central authority, a Professional Operator and switchboard operator in the fire department and a first responder in a regional authority.
- Five interviews in Norway with managers from a health service and the fire department, a section manager of the Coordination Agency for societal safety/security and civil protection, a department manager in the police and an emergency preparedness projector in a municipality.
- Five interviews in Romania with professionals and first responders within the national integrated emergency system, including firefighter officers (both from operational and communication departments), EMS (paramedic and emergency physician), and emergency pilot on SMURD helicopters (Mobile Emergency Service for Resuscitation and extrication).
- Four interviews in Spain with a general director in regional authority, an emergency responder in the law enforcement, a unit director in the Red Cross and a firefighter in the fire department.
- Four interviews in Sweden with the chief of staff and two other professionals in a health service organisation and a former chief fire in the fire department.

Each country's interviews were conducted by a local member of the consortium and summarised in English. The summarised document, which was mutual to deliverables 2.1, 2.3, and 2.4, is included in the appendices. The complete list of interviewees, including a description of their position, is also attached in the appendices.

### 4.4.2 THE INTERVIEW GUIDE

The interview guide, attached in the appendices, included 14 questions. As part of deliverable 2.4, we focused in the interviews on questions regarding how messages are developed, what type of information authorities and first responders share with the public, what information is shared with authorities and first responders, what information is perceived as more relevant to share, how do

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

they perceive a campaign of sharing information as "successful" and how do they refer to questions of diversity. Also, we asked the interviewees for any other relevant written guidelines.

### 4.4.3 CONDUCTING THE INTERVIEWS

Since the interviews took place under COVID-19 regulations, they were conducted according to regulations in each country, with a combination of video interviews and face-to-face meetings. The interviews took between one to two hours. They were conducted in the interviewees' mother language and then summarised in English according to the summary document.

### 4.4.4 ANALYSIS

The interviews were analysed in a top-down approach. We used the predefined categories and sorted the findings according to the predefined topics listed in chapter 4.4.2.

## 4.5 ETHICAL CONSIDERATIONS

Semi-structured interviews entail several ethical risks, especially in sensitive topics, such as emergencies and disasters. First, the interviewees are not always aware of the data they disclose due to the nature of a friendly conversation. Second, sensitive issues can cause inconvenience to the interviewees, making the interviewer responsible for their health and well-being. Following the data protection measures of ENGAGE, set in deliverable 6.1, we excluded all types of information to identify the interviewees. All interviewees signed an informed consent form and a data privacy document.

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

# 5 RESULTS

## 5.1 DESCRIPTION OF WRITTEN COMMUNICATION GUIDELINES

The data gathering and semi-structured interviews revealed that authorities and first responders rarely use written guidelines in all three phases of emergencies and disasters. Even when written guidelines were used, they were outdated in several cases, and in others, it was not sure when and if decision-makers still use them in the investigated organisations. It should be noted that there is a need to differentiate between guidelines written by international or large-scale organisations, such as the World Health Organisation (WHO) or the Centre of Diseases Control (CDC) that published written guidelines as recommendations for other countries and smaller local organisations, acting within one country. These were more popular but yet, not always used.

### 5.1.1 AUTHORITIES

There are several examples of written guidelines by authorities. The UN and its related agencies, WHO and CDC, have several authorities and first responders' guidelines on communication strategies. WHO had a comprehensive set of guidelines for building a communication plan for an outbreak, on how to communicate an outbreak, planning risk communication campaigns, and more. These guidelines were updated regularly, with several case studies for specific outbreaks (e.g., the Ebola outbreak and COVID-19). CDC published regular and updated communication guidelines concerning various health topics, regarding the crisis and emergency risk communication (CERC), providing guidance for preparing the public before disasters, communicating with them during the disaster, and supporting society after the disaster.

Several written guidelines focused on the communication channels themselves. For example, "Smart tips for category one responders using social media in emergency management", aiming at authorities and first responders, published by the UK government at the core of emergency response. The guidelines, published in 2012, summarise the typical uses and features of social media, providing tips on generating messages (e.g., defining messages, obtaining the audience, achieving online engagement). Similar guidelines were also published by the CDC, which, NPIA (former national policing improvement agency) and several more UK government organisations.

Project OPSIC (Operationalising Psychosocial Support in Crisis), supported by the EU, published a set of guidelines, some of which focus on communication. It gives several recommendations for all phases of emergencies and disasters. For preparedness, how to set up information and resource centres, respond, enable a dialogue between the public and authorities and first responders, and for recovery, check the psychological implications of the crisis.

MSB (Myndigheten för samhällsskydd och beredskap), the Swedish civil contingencies agency, shares guidelines about handling a crisis, among them instructions regarding communication. For examples, guidelines on how to communicate emergencies and disasters, before, during and after, through social media. The need to give more than just information (e.g., raise morale, engage the public) and the need for openness with the public.

### 5.1.2 FIRST RESPONDERS

Written communication guidelines by first responders were rare, maybe because of the less institutionalised nature of such organisations.

Three dominant examples come from Spain, Norway and Romania. In Spain, "Protocolo Iberio", developed by the Spanish Society of Disaster Medicine and Emergencies ("Sociedad Española de

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

Medicina de Urgencias y Emergencias"), providing guidelines for dealing with armed threats. The protocol refers to communicating with victims from a psychological perspective and communicating with the affected community during an attack.

In Norway and Romania, several EMS first responders had guidelines related to the communication process with callers to the call centres. Those guidelines defined a list of questions to ask and what the answers should cover to provide the necessary aid.

## 5.2 Communication Channels

The review of guidelines, campaigns and interviews with professionals from authorities and first responders also generated an extensive list of communication channels and the way they are used. Table 2 presents the list of communication channels identified in the study, divided into categories. The entire table, in the appendices, is divided into categories, sources, a description of the source, by whom it is used, when it is used and examples. The short table below presents only a list of categories and sources.

| Category | Source |
|---|---|
| **Traditional Channels** | Brochures<br>Booklets<br>Reminders (magnets, keychains)<br>Written Instructions<br>Information call-centres<br>Emergency call-centres<br>Advising/Consultation hotlines |
| **Mass Media** | Ads (Television, Radio, Newspaper or other Internet websites)<br>News Programs or articles (Television, Radio or Internet TV)<br>Other Television/Radio/Internet shows<br>Content Marketing (Newspapers or Internet websites) |
| **Interpersonal Communication** | "Preparedness Guard"<br>Education Plans – in Schools<br>Education Plans – in Community<br>Community leader<br>Community Meetings<br>Volunteer Groups<br>Community Patrol |
| **Mobile Phones (Apps)** | Information Apps<br>Warning Apps<br>Reporting Apps<br>Emergency Contact Apps<br>Educational Apps<br>Volunteer Management Apps<br>City-Connect App |
| **Mobile Phones (Messaging & Text)** | Facebook Messenger<br>WhatsApp<br>Telegram<br>Viber<br>Other Messaging Apps<br>Alert Systems - Warnings through Cell Broadcast Messages (CBM) |
| **Social Media** | Facebook – Pages<br>Facebook – Groups<br>Twitter<br>Instagram<br>TikTok<br>YouTube<br>LinkedIn |
| | Information Websites |

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

| | |
|---|---|
| **Websites** | Engaging Websites<br>Donation Websites |
| **Innovative and emerging technologies** | AI-Chatbot Coronavirus symptoms analyser<br>AI-Chatbot Coronavirus information<br>AI-Chatbot General health "triage"<br>AI Facebook Messenger chatbots<br>Viber chatbots |
| **Separate/Independent Networks** | Crisis Information Management<br>iDAWG systems<br>Public safety networks |
| **Other channels** | Emergency street lamps<br>Sirens<br>Press Conferences<br>Webinars<br>TEDx talks |

**Table 3.** A list of communication channels used by authorities and first responders (the full table appears in the appendices).

The table does not emphasize the quantitative measures of these channels (i.e., how many are using) but provides a comprehensive review of all possible channels. While deliverable 2.4 presents various communication channels, the complete list of specific solutions (e.g., specific apps, particular websites, and examples of educational programs) appears as part of deliverables 2.2 and 2.3 of formal and informal solutions.

### 5.2.1 Traditional Media

The analysis of previous resilience campaigns, guidelines, and interviews showed that authorities and first responders still rely on many traditional media channels. For example, written instructions, brochures, and booklets that contain important information relevant to the preparedness phase of emergencies and disasters. Several organisations, especially first responders, distributed small "reminders", such as magnets or keychains, containing important information (e.g., the number of the emergency call centre, what to do in case of a fire). Figure 6 presents examples for such uses.


**Figure 6.** A magnet with instructions for home water and sanitation kit (local municipality in Israel) and a brochure about saving water from cittadinanzattiva (Italy).

### 5.2.2 Mass media

According to the analysis, mass media still plays a vital role in the communication process of authorities and first responders. Almost all campaigns and organisations used these channels. Using Television, they heavily relied on advertisements. Including information about emergencies and disasters in all phases – before, during, and after. Professionals from authorities and first responders were also interviewees in news shows and other televised or radio shows, providing information and

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

answering questions, whether as a preparing step for future disasters, during the emergency, or in the recovery phase. A similar picture appears with newspapers when ad and news articles are used.

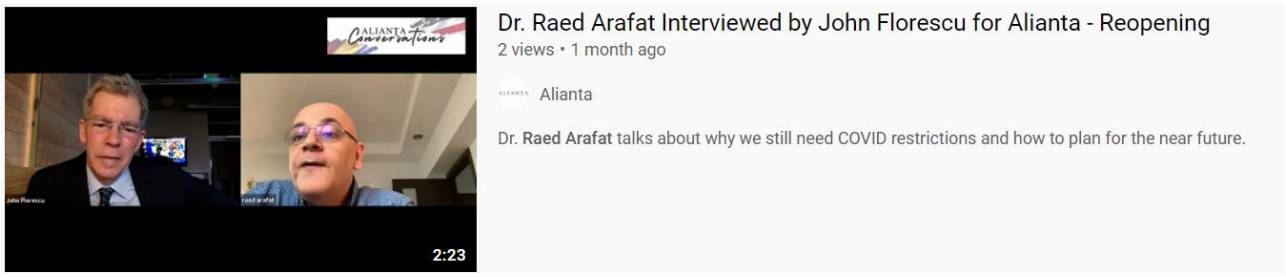



***Figure 7.*** *An interview of Dr. Raed Arafat, DSU (Romania).*

### 5.2.3 INTERPERSONAL COMMUNICATION

One of the most dominant, if not the most dominant interpersonal channels used by authorities and first responders was the phone, for example through information and emergency call centres that provide information, help, and guidance to the public. While emergency authorities activate more information lines, first responders focus more on emergency lines. Those call centres allow authorities and first responders to direct contact with society and serve as an essential channel for receiving direct and unmediated information and allowing tailored-made messages.

Apart from the call centres, authorities and first responders also use face-to-face interpersonal communication channels, such as "community leaders", a representative of the organisation in the community, which is in charge of being in direct contact with the community members. For example, In Israel, the police appointed a "community policeman". A dedicated police officer in every neighbourhood or a group of neighbourhoods is in charge of communication with the community members.

Several authorities and first responders also developed educational kits or training program for schools or other community institutions. For example, in Israel, the home-front command conducts lectures in school about emergencies and preparedness, raising risk awareness and giving tools to use during crises.

Last, interpersonal communication with community volunteers was another vital communication channel with society. For example, the "Red Cross" maintains a database of citizens with particular expertise, which can be used during emergencies. In a time of emergency, the relevant volunteers are "activated".

Volunteer groups were arranged, in other forms, also in other countries and organisations. In Israel, Norway and France, there was some sort of reliance on volunteer groups inside the community to bridge the communication gap between the organisations and community members. Those volunteers are considered the representatives of the organisation in the community and communicate directly with community members. Also, In Israel, several municipalities arranged "community patrols", a group of community members who conducted a patrol at nights and communicated with other members in the community on behalf of the municipality (or the organisation that arranged these groups). Examples are illustrated in Figure 8.

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


**Figure 8.** On the top: the community police officer and home-front command school lectures (Israel). On the bottom: Norges Røde Kors volunteer database (Norway) and Tawa community police (France).

### 5.2.4 Mobile Phones

Mobile phones are among the most popular channels used by authorities and first responders to communicate with society and vice-versa. Due to their complex technological affordances, both as a mean to allow phone calls, run mobile apps (including mobile apps of social media) and receive text messages, mobile phones might overlap with other categories. Therefore, the description of mobile phones, including smartphones, as a communication channel refers to the physical existence of the medium and its affordances.

Authorities and first responders use mobile phones as communication channels in various ways. First and foremost, mobile phones are used by emergency authorities as part of alert systems. According to the legal provisions, systems that allow sending Cell Broadcast Messages (CBM) to warn and alert citizens in case of emergency. Channels that are used in major disasters.

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

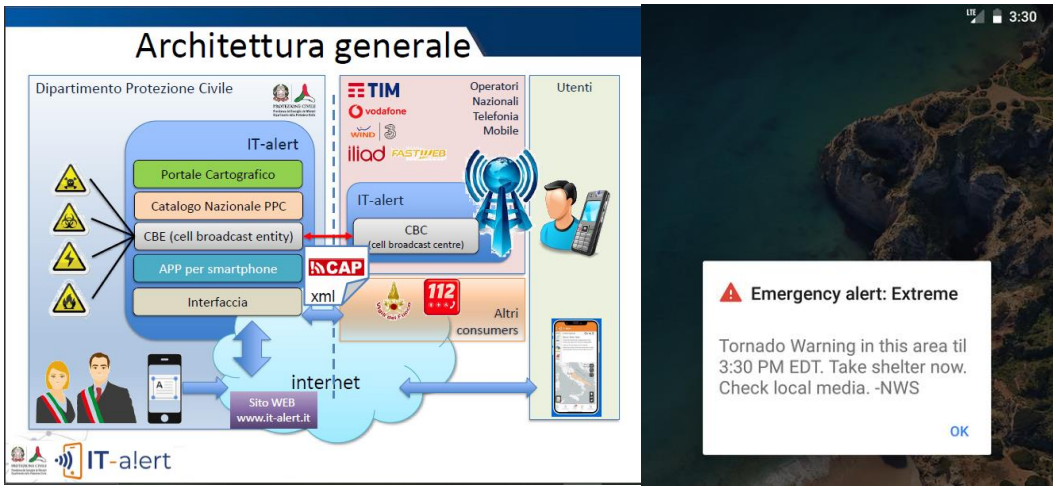



**Figure 9.** The architecture of an alert system (Italy) and a general example of an alert text.

Mobile apps for smartphones were another dominant channel of authorities and first responders. Mobile apps, as figure 10 shows, included one or more of the following features: disseminating information, alerting the users and allowing them to report about events or send texts/pictures/videos. Mobile apps also include emergency contact apps, educational apps and even volunteer management apps for volunteers of first responders. One interesting example is an app, used by municipalities in Israel, called "city-connect", allowing constant communication between the municipality and the local community before, during and after emergencies and disasters.

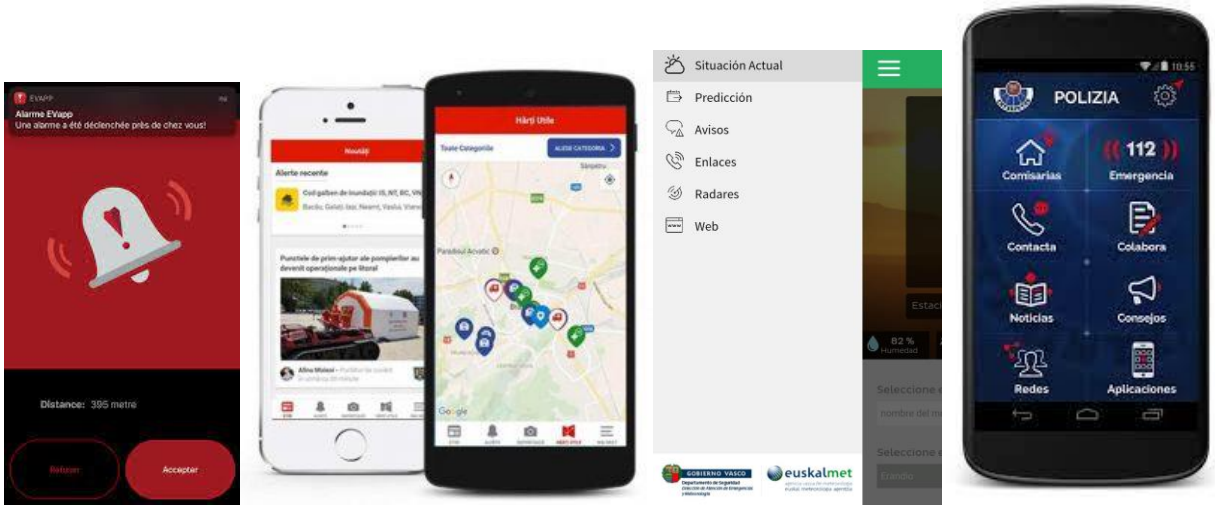



**Figure 10.** EVapp for managing medical volunteers (Italy), DSU mobile app (Romania), EUSKALMET and ERTZAINTZA (Basque county).

The use of mobile apps as a communication channel by authorities and first responders includes also messaging apps. Many authorities and first responders use WhatsApp or Telegram groups to communicate with society and vice-versa, or just disseminating information. Other messaging apps, such as Viber or Facebook messenger, are also in use.

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

### 5.2.5 SOCIAL MEDIA

Authorities and first responders make a vast huge of social media. Facebook pages, Twitter, and YouTube are used by many authorities and first responders across countries. They are used to disseminate information, communicate with the public and, in several cases, also hosting events (e.g., hosting experts on the Facebook page).

On the other hand, TikTok, despite being a popular social network for youth, is used rarely. One example is the national police of Spain (Policia Nacional) which holds an active TikTok account that serves for disseminating information about risks entertainingly, taking into account the nature of this social network.

In between, Instagram and LinkedIn are also used by authorities and first responders. The first is to communicate visual content to a younger population, and the second is a professional communication channel. Contrary to Facebook pages, which represents a more unidirectional flow of communication, authorities and first responders tended to use more minor Facebook groups, emphasising the multidirectional flow of communication, not putting the organisation in the centre, allowing open conversation among community members, as illustrated in figure 11.

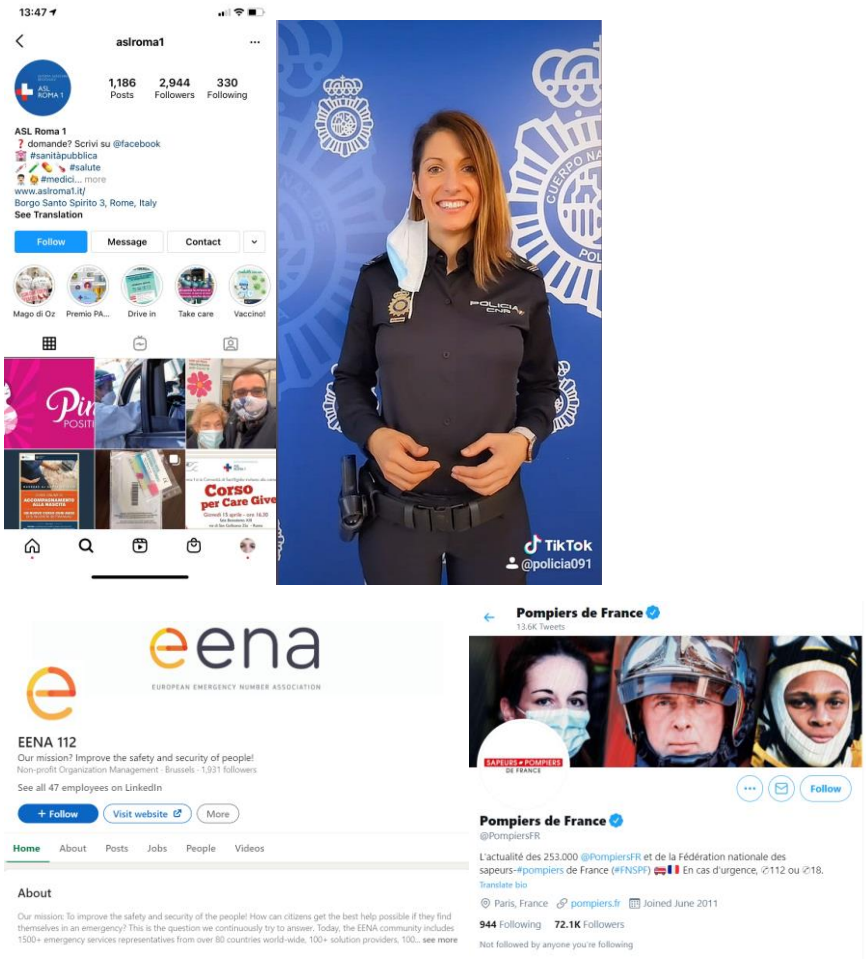



**Figure 11.** On top: ASL Roma Instagram account (Italy) and Policia Nacional TikTok (Spain). On the bottom: EENA LinkedIn account (EU) and Pompiers de France Twitter account (France).

### 5.2.6 WEBSITES

Websites are another channel of communication between authorities and first responders, and society. The review and interviews revealed several types of websites when, in most cases, these

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

types are combined in one website. Websites could be informative, providing information relevant to crises, during an emergency, and recovering from it. Such websites included information regarding risk awareness campaigns, safety information and other relevant data. Other websites emphasise engaging society, providing information that can facilitate interaction between citizens, authorities and first responders. Last, especially first responders, also maintain websites devoted to donation for crises related causes. Examples are illustrated in figure 12.

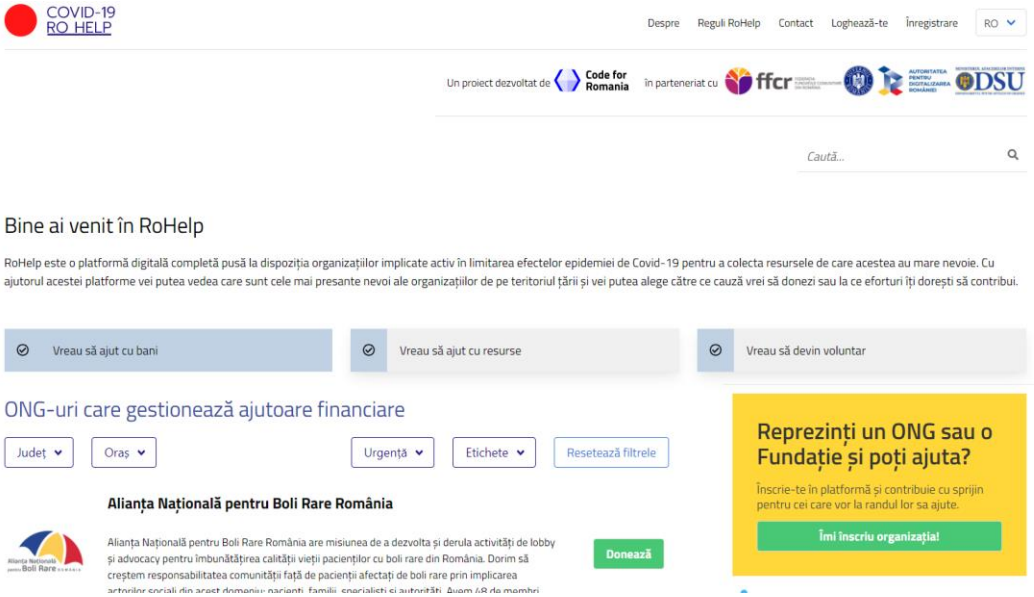



**Figure 12.** RoHelp is a fully featured digital platform that lends itself to be used by all organisations involved in halting the spread of Covid-19. The primary purpose of the platform is to help organisations collect the resources they need.

### 5.2.7 INNOVATIVE AND EMERGING TECHNOLOGIES

Apart from new and social media channels, few authorities and first responders use innovative and emerging technologies. Some of them in a yet premature way. One dominant example is the use of chatbots. As shown in figure 12, the use of Artificial Intelligence (AI) chatbots have significantly developed during the COVID-19 pandemic. Several authorities started using chatbots that helped in the diagnostics of coronavirus symptoms, provided information regarding the virus and even made some "triage", telling the user whether he should go immediately to a medical test.

One exciting example is DESI (acronym that in Italian stands for Intelligent Dashboard for Health Emergencies) chatbot, developed in Italy and operated from the beginning of the first lockdown in March 2020 up to June 5th, 2020. DESI responded 24 hours a day for 90 days to more than 20,000 requests for support from Italians. From questions, doubts and various issues on the Coronavirus emergency.

Some of the chatbots, as figure 13 shows, use an independent platform. Others use advanced technologies of Facebook Messenger and Viber that allows third parties to create independent chatbots.

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

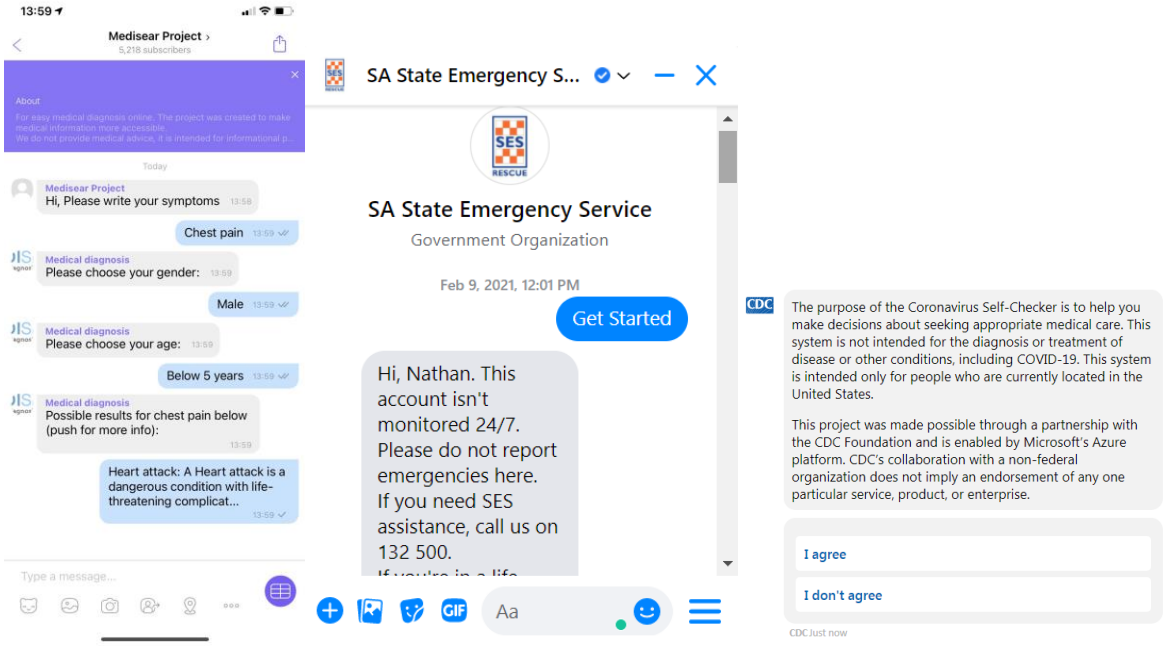



**Figure 13.** Medisear health symptoms chatbot (USA), SA state emergency service Facebook chatbot (Australia), and CDC Coronavirus symptoms check (USA).

### 5.2.8 SEPARATE/INDEPENDENT NETWORKS

In addition to the various communication channels from authorities and first responders to society and communities and vice-versa, several other separate or independent communication networks were also found. Those networks serve internal communications between first responders and community volunteers and between different organisations that take care of the same crisis.

One example is iDAWG (Intelligent Deployable Augmented Wireless Gateway). A technology that facilitates machine to machine communication. It can capture and share the transmission of multiple first responders (e.g., police, fire brigade, EMS), so professionals from all organisations can communicate between them seemingly. Another example is the Norwegian Safety Network (Nødnett), used for internal and interdisciplinary communication of police, health services and fire brigades.


**Figure 14.** iDAWG conceptual diagram (taken from Marsden, Tregilia & Lee McKnight, 2012).

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

Another type of independent networks is Crisis Information Management (CIM) systems, software that allows the management of all occurrences during a crisis. They allow sending messages and warnings to the public during the event. These types of software can be independent of regular communication infrastructures, allowing them to operate even when some communication systems are down, as illustrated in figure 15.

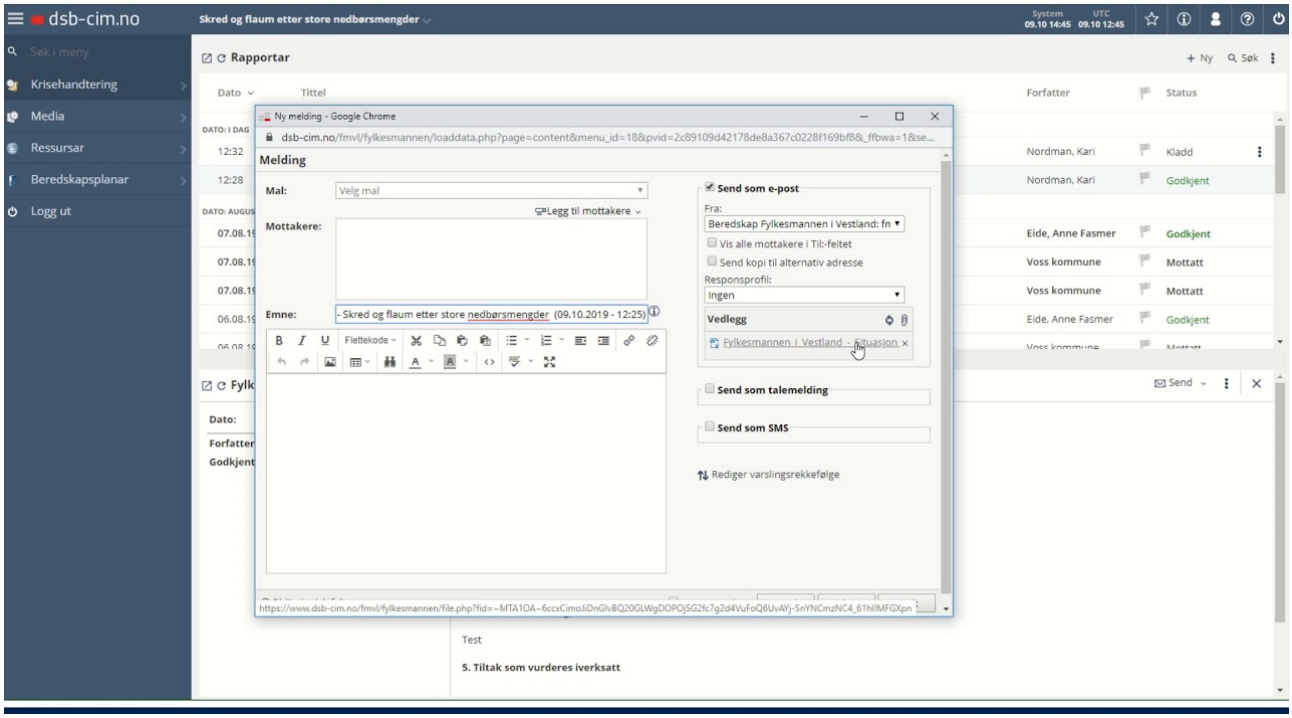



**Figure 15.** Crisis Information Management (CIM) of DSB-CIM.no (Norway).

### 5.2.9 OTHER CHANNELS

Several communication channels, which are used by authorities and first responders, are not classified under specific categories. For example, authorities and first responders sometimes arrange "media events" related to several channels. The most popular are press conferences, allowing either interpersonal communication or broadcasted via mass media. Those events could also be in the form of a TEDx talk, as shown in figure 16. Several organisations, especially during COVID-19, also organised webinars. Emergency organisations also produced video guides and photos as guidelines for emergencies.


**Figure 16.** A Caption of a video guide about behaviour in a case of flood and a TEDx talk by Dr. Raed Arafat, DSU (Romania).

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

Another typical example is the use of sirens to notify of emergencies, such as falling missiles. In addition, intelligent emergency street lamps can change the colour due to an emerging disaster (e.g., rising water, strong wings), which is an example of other communication channels. The change of colour is a communication tool to alert the citizens in that area and be controlled from a distance, as shown in figure 17.

**Figure 17.** Emergency street LED lights (UK).

## 5.3 Designing messages

The interviews with the professionals from emergency and disaster authorities and first responders examined the process of designing messages for the public in all three phases of the emergencies and disasters. We examined whether (1) there are any communication guidelines/written policies and (2) who participates in developing the messages and how it is done.

### 5.3.1 Written guidelines/policies

The interviewees referred to two types of guidelines/policies. The first is related to the communication process as a whole (e.g., how to communicate with the public? What channels to use? What questions to ask?). Here, around half of the interviewees referred to written guidelines/policies that they use, and the rest claimed that such guidelines do not exist, at least not officially. Several interviewees mentioned that while these guidelines might exist – they do not know where to find them and what do they include.

In some countries, communication guidelines were decided on a minister's order, on the institution's level (e.g., Romania) or in a contingency or emergency plan (e.g., Romania and Sweden). In most cases, written guidelines regarding how to communicate the emergency existed in emergency

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

authorities, whether national or regional. Only several interviewees, especially from firefighters, and in Israel, MDA (EMS) referred to communication guidelines grounded in the book of commands.

According to the interviewees, the communication guidelines defined the criteria for how to communicate with the public. For example, "the Norwegian Index for emergency call service" specifies a list of questions used by operators during emergency calls. Other interviewees mentioned guidelines related to technical guidelines, such as when to operate a siren and which systems to use for what purposes.

On the other hand, at least not from the conducted interviews, there was no use of written guidelines regarding communicating the risk and strategically developing messages. Several interviewees, especially in Romania and Italy, referred to public domain guidelines (e.g., by WHO, CDC, ECDC and others) that serve as sources for information. However, the interviewees did not report on original official written guidelines.

In one country, Romania, an interviewee from the firefighters told about indirectly written guidelines that are emerged in learning modules of professional courses in firefighters. The interviewee explained that a professional committee prepared a written module about communicating emergencies in the mass media. The students need to learn this module about challenges, risk communication, what kind of information to give and more. In the interviewee's eyes, these can be considered written guidelines because they teach what they think should be done.

### 5.3.2 WHO IS RESPONSIBLE, AND WHO PARTICIPATES IN THE PROCESS?

Another topic discussed in the interviews was developing messages to the public in all three phases of crises. The question did not ask about general guidelines, rather how each organisation develops its messages. All authorities and first responders who participated in the interviews developed messages for the public, from information on preparing for risks and what to do during disasters to the events' results.

In almost all the interviews, one typical role was mentioned: a spokesperson (sometimes PR, press officer, media relations manager, etc.). In almost all cases, media professionals from within the organisation participated in the process of developing messages. In a few cases, they were mentioned as the only team members, but in most of the interviews, the interviewees also mentioned other professions who participated in the process. In several cases, they mentioned different teams for different subjects. For example, emergency professionals from the municipalities or regional governments, who were in charge of emergencies and disaster from various areas, explained that for each topic, the spokesperson and the relevant professionals participate in developing the messages (e.g., environmental professionals for environmental emergencies, security professionals for security emergencies). In a few cases, the interviewees mentioned "a board" of managers from the organisation that developed the messages together. In a few cases, external professional teams (e.g., media experts on monitoring social media) also participate in the process. The size of the teams varied significantly between the countries and organisations. Small (1-3) teams in small organisations to an entire media department, with ten different professionals (e.g., PR, mass media professional, social media manager, etc.).

Most interviewees claimed that there is no organised process for developing messages. Most of them described ad-hoc meetings, email correspondence or hired-per-project media professionals. Most of the process is taking place in the preparedness stage of the crises. Interviewees across countries and types of organisations referred to it as the "most significant part". Before the crisis occurs, as they said, there is much time to prepare, plan the messages and think about how to communicate them. In this case, the professional teams meet with the media teams, the goals are set, and the necessary information to meet these goals is decided.

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

During crises, the interviewees raised two points. The first, mutual to most of them, is that barely any rules apply to the communication process. The event is being communicated to the public as it progresses. Topics to be communicated cannot be prepared and decided in advance, and ad-hoc decisions must be taken. Therefore, even a few organised processes that are used in the preparedness phase are not consistent. The Second was that during each crisis, new communication methods are developed and explored. This was mentioned both as an advantage (e.g., finding new ways) and as a disadvantage (e.g., not working in an organised way). In France, both interviewees from the firefighters mentioned another part of the communication process – monitoring social media for false news and submitting society with accurate information regarding false news spread on social media.

Another question in which the interviewees were split was regarding the direct or indirect communication with the public. In Italy, Romania, and one first responder in Sweden, several interviewees claimed no direct communication with the public before and during crises. The communication process is conducted through the national authorities and journalists, who communicate the messages to the public. In other organisations, the communication process was conducted directly with the public and through professional media outlets. Before the crisis, in Romania, interviewees mentioned that there are prevention campaigns and awareness sessions regarding possible risks/disasters and adequate behaviour of the population. These campaigns and sessions are also organised at the field level in schools, private sector societies, being conducted by the first responders. However, during the crisis, it applies the principle of single voice during the communication process and it is managed at the level of authorities.

Lastly, almost all interviewees did not refer to the prevention stage (after-crisis) as a separate stage regarding the communication process and developing messages. The most important and organised phases were before crises and real-time emergencies, developing messages in a less organised way. However, after crises, they were not perceived as a unique phase but similar to the preparedness stage.

Several interviewees addressed one problem of message development - incoherent information. In Romania, one of the interviewees from an emergency authority explained that since each organisation develops its messages, they lack coordination between the organisations that can improve the effectiveness of the messages. One interviewee from a first responder from Sweden added that the communication process is far from ideal and needs improvements.

**Developing Messages – Key Findings**

- **Written Communication guidelines are limited to a number of issues, such as what channels to use, what purposes and what questions to ask in order to get sufficient information. However, there is little use of written emergency risk communication guidelines.**
- **Dependent of the size of the organisation, not only communication experts participate in developing messages. Environmental experts, health workers, police officer and others also took part in developing messages. However, only a few interviewees reported on an organised process of developing the messages for the public.**

## 5.4 TOP-DOWN INFORMATION SHARING

Another topic that was widely discussed in the interviews related to information sharing. The interviewees were asked what type of information they share in all three phases of emergencies and

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

disasters, the differences between the stages, and how they decide what information to share. In this part of the interview, the focus was on the top-down process.

### 5.4.1 WHAT INFORMATION IS SHARED, AND WHEN?

Most interviewees agreed that the types of information, which are the most important in the preparedness phase of emergencies and events are related to risk awareness and education. Regarding risk awareness, the interviewees stated that before crises, it is essential that the public understand the situation, be aware of the risks, and contact when needed. Regarding education, several interviewees, especially in Spain, talked about training campaigns on how to behave and respond in a situation of emergency. Those campaigns were mentioned especially concerning school, due to the possibility to create practical training sessions. Those campaigns were more similar to awareness campaigns concerning the general population, providing information without active training sessions.

Another theme that reoccurred in the interviews relates to instructions and guidelines. The interviewees, especially in Israel and Sweden, believed that it is essential to expose society to guidelines and instructions in the preparedness stage - not only concerning what they should do, but also what they must do. For example, instructions on what to do after exposure to coronavirus patient (e.g., an obligation, and "just" a recommendation) or what not to do after a security event (e.g., avoid coming to the area, not to crowd). In contrast to awareness and information, which focus on explaining the recommended behaviour to the public, instructions and guidelines review information related to law and order.

As mentioned before, during disasters, similar emphasis was put, but with different urgency, timing and context. In Israel, for example, the interviewees discussed several call centres issues during COVID-19. In regular times, the call centres can provide information about what to do during a pandemic. During COVID-19, the information was more focused. They gave information about when and how to quarantine people, diagnose symptoms, and provide a phone triage. The available videos produced to the public before COVID-19 were changed during the pandemic to more focused videos for real-time events. In general, phone numbers and information sources should be widely publicised for the public regarding health situations. Regarding weather conditions, it was mentioned that details about weather and preventing damage should be shared with society in the preparedness phase.

Similar information was also presented by interviewees from other countries regarding various types of crises. In each country, information regarding prevalent crises was widely and regularly shared. For example, in Norway, authorities and first responders constantly shared information about prevention and self-preparedness on house fires during the Christmas season due to many such events. In Israel, a similar process was conducted regarding security events.

During disasters, in the response phase, the general information, guidelines and instructions were adapted to fit the current situation, with almost no focus on education. In Israel, for example, general health videos were focused on what to do in the specific situation (e.g., what is the coronavirus, what to do when you have symptoms, what is precisely the vaccine), details and statistics about the crises (e.g., how many coronavirus patients are there in your area?), where to evacuate, and more. In Italy, Israel, Romania and Sweden, the interviewees emphasised distributing specific guidelines and directions from civil protections regarding what happened, what to do now and what to expect next. In France, the interviewees highlighted live monitoring of the event, adapting the online information to the progress of the crises.

The recovery phase, after crises, was perceived by most interviewees with the least uniqueness. More than half of the interviewees perceived it as more similar to the preparedness phases (preparing for the successive crises), and several interviewees did not perceive it as a phase by itself but differentiated between binary events of crisis/no crisis.

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

In several cases, the recovery, after, phase was differentiated from the others. For example, in Israel, three interviewees explained that the information shared in the after phase should use examples from the current crises that just ended, with conclusions on what to do next time. However, this is similar to several examples of information distributed in the preparedness phase, using prevalent crises in the area (e.g., the example of Christmas fires).

The most critical unique information distributed in the recovery phase was related to what it takes to recuperate and help society help one another. The interviewees emphasised this stage on giving information regarding help-centres, what rights people who were harmed in the crises have, how they can execute them, and how they can address the authorities. Here, there was also a big difference between first responders, who shared little or no information about it, to authorities, who emphasised more.

In addition, there were several unique examples for countries' specific situations. For example, interviewees from Italy referred to post-earthquake events where people lose their homes and need to live in a tent, highlighting the importance of information on living on a tent in the recovery process. In Israel, despite not experiencing a severe earthquake in more than a decade, one interviewee explained that it is essential to make people understand that in a situation of an earthquake, it will take time before they can return to their home; in the recovery phase, the information should be focused on helping them survive the period in which they have to live in a temporary residences.

### 5.4.2 The differences between before, during and after phases

In general, among most authorities and first responders whose professionals participated in the interviews, there was no clear division between shared information before, during and after emergencies and disasters. The only difference was the urgency, timing, and in certain situations, the context. For example, information about the risks of several crises (e.g., earthquakes, extreme weather condition) was shared before, during and after disasters. The difference was that in the preparedness stage, the information was shared in a more general context, with less urgency, and in the response stage, they used specific data from the emergency (e.g., specific temperatures, data about the damage) while the question of timing was more important.

Among the three phases, before, during, and after crises, preparedness was perceived to be the most important. Almost all interviewees across countries and organisations agreed that preparing society for emergencies and disasters could help them manage the crises more effectively. As one interviewee from Israel said: "Emergencies and disasters will happen. This is 100% sure. The question is how prepared society will be." The before phase was also perceived as the most likely to think appropriately and plan the necessary information.

On the other hand, during, phase, the response was perceived to be the one with the most significant noticeable impact. During emergencies and disasters, the information is perceived to be more relevant because the situation is now "live." If it is before a crisis occurs, society can learn and be aware that the information is actively saving lives during emergencies and disasters.

All interviewees agreed that the least important information is recovery after. However, they still perceived it with a high priority, but it was the lowest compared to the first two. As mentioned before, in most cases, the recovery phase was perceived in a very similar way to preparedness.

### 5.4.3 Aims and goals of top-down information sharing

Several aims and goals were discussed regarding top-down information sharing. Under the general aims of building individual, communal and societal resilience, the interviewees mentioned some other goals. One of them was gaining the trust of society. Another was achieving collaboration, which is crucial for resilience. As two interviewees from Italy and Israel mentioned, to help them help the

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

public. In Sweden, achieving compliance was another important goal, making society responsive to the decisions and guidelines. In Norway, another focus was made on encouraging people to share their experience and understanding regarding crises, to provide feedback that is crucial for the continuance distribution of top-down information. Last, in France, they mentioned the goals of improving the safety of society.

**Top-Down Information – Key Findings**

- **Perceived important top-down types of information to share: risk awareness, education, instructions and guidelines.**
- **The difference between top-down information sharing before, during and after crises is the urgency, timing and context of the information.**
- **Regarding communication, the recovery phase, post- crisis, is perceived to be very similar to the preparedness pre-phase, before the crisis (excluding information regarding the recuperate process).**
- **Preparedness is perceived as the most important phase; Response, during crises, is perceived to be the most urgent and with shown effects.**

## 5.5 Bottom-up information sharing

On the other side of the information, sharing stands the bottom-up process. Information that comes from society to authorities and first responders. Here, we discussed several issues with the interviewees. First and foremost, how much importance do they relate to bottom-up information sharing? Based on their answers, we also discussed what types of information are relevant in every phase of the crisis, the differences between the different phases, and how they can be helpful and improve crisis management.

### 5.5.1 Is bottom-up information sharing important?

The interviewees were conflicted in their answers regarding whether bottom-up information from society is essential in crisis and emergency risk communication. The interviewees identified two main types of bottom-up information sharing. The first was information related to the emergency, which is relevant to the society or individual at risk. For example, when someone is at immediate risk from a fire, he or she should be able to provide accurate information for the emergency services. In this case, all interviewees agreed that bottom-up explicit information sharing is critical.

On the other hand, another type of information was related to how to deal with specific emergencies. In this case, there were differences between the countries. Most interviewees from Israel, Italy, and France, attributed less importance to this process of communication. In Israel, the interviewees highlighted that the process of sharing information is a top-down process. One interviewee from an EMS explained that the ideal situation is that the public will not need to report anything and will be able to help itself. Another one said that distributing information is the responsibility of authorities and not of society. In Italy, one interviewee focused on educating the public on reporting events to meet predefined specific criteria. In France, they referred to the association of amateur radio as a bottom-up information sharing process.

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

Most interviewees in other countries stated the bottom-up information sharing is essential and contributes to their success in risk management. They said that the information is crucial as feedback for current measures, to know where they should be and who needs help.

### 5.5.2 WHAT INFORMATION IS SHARED IN ALL THREE PHASES OF EMERGENCIES AND DISASTERS?

The interviewees referred to several types of information shared by society in all three phases of emergencies and disasters and specific phases.

Several types of bottom-up information sharing were perceived with greater importance than others. The interviewees claimed that it is essential to know where the people are at risk and understand what was hit and whether there are causalities. They added that sometimes the information is not very clear and that callers are in panic, emphasizing the need to train society on how to report on a crisis. They elaborated the need for a quick update with precise data, which is not always available.

One interviewee from Romania gave an example of an ideal and straightforward bottom-up information sharing. He explained a fire situation in which many residents in the community identified a cloud of smoke changing direction due to a change of wind. They then reported it to the emergency call centre, which processed the information and knew what to do and where to go. The interviewee explained that these results from an intervention program they initiated in Romania, explaining how to report on a crisis and what people should pay attention to.

Another necessary type of information relates to descriptions from people at the scene, compared to people in the scene before, but not reporting from another place. They emphasised that it is essential to understand the current, most relevant situation, what is working and what is not working (e.g., IT services, electricity), and what resources are available for the public (e.g., working water, fire extinguisher, medical equipment).

Providing information by the public was also relevant for other measures. For example, the interviewees from Norway and several from Sweden and France claimed that getting information from society is relevant for knowing what to do and understanding what society understands. For example, how do they perceive the risk, how well they are familiar with what they should or should not do, and what strategies were conducted top-down (e.g., providing information, sending help) is working and helping and what does not reach the society. They explain that this feedback helps them in the reorganisation of the situation, if and when needed.

Also, mentioned mainly by the Spanish interviewees and one interviewee from Spain, user-generated content, in the form of photos, video, audio and social media content, was perceived as helpful during emergencies and disasters. They gave several examples regarding such content posted on social media channels and sent through mobile apps, such as live pictures from disaster events, that could help them understand the number of forces needed on the field. In addition, they gave an example of providing feedback for a question on social media as a type of bottom-up information sharing. For example, they published a post saying: "The house of Netherlands is at risk. Do you know where are they?" People answer to this, providing information, for example. "I know where they are. I will get in touch with them."

Last, the interviewees, mainly from Romania and Norway, elaborated another type of bottom-up information sharing – between local rescue teams and the national emergency teams or between them and other organisations working on the event. In Romania, for example, they emphasised a regularly working process during emergencies and disasters, of information exchange between rescue teams, different organisations, other institutions and even the media. In Norway, one interviewee elaborated on a separate emergency network, allowing first responders and volunteers to communicate during emergencies and disasters. Here he explained, the information from the volunteers and what happens, what they can do for themselves, and what they need help with is crucial.

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

### 5.5.3 BOTTOM-UP INFORMATION SHARING: DIFFERENCES BETWEEN PREPAREDNESS, RESPONSE AND RECOVERY

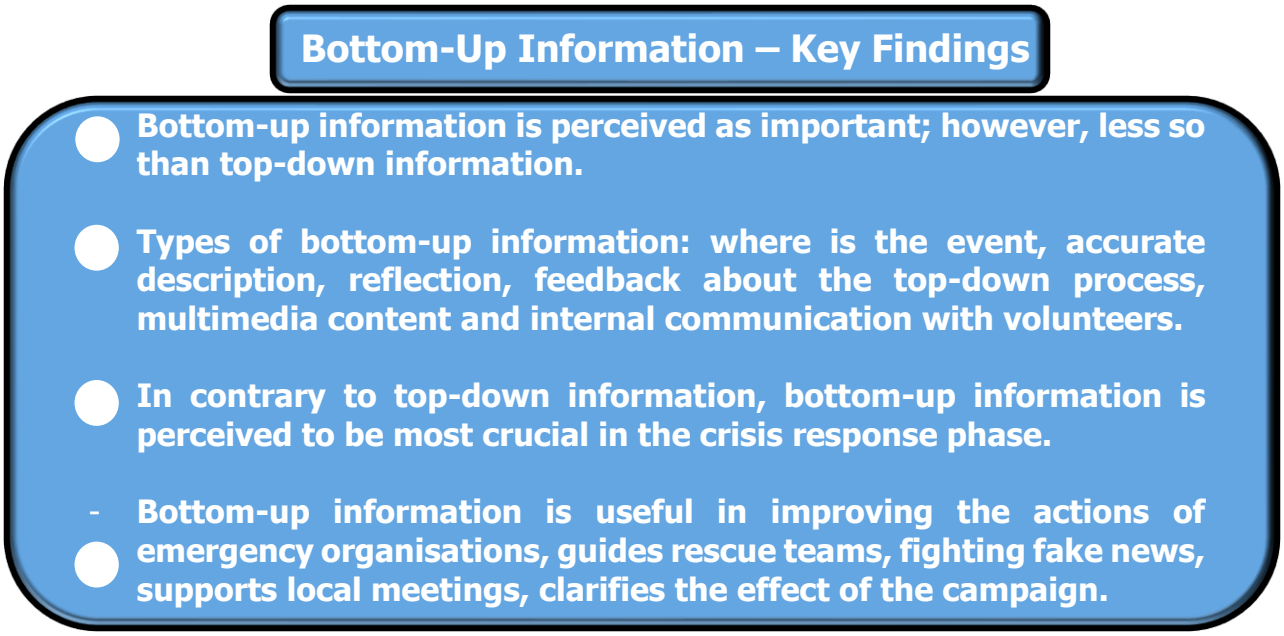
Compared to the top-down information sharing process here, most interviewees believed that the response phase is the most important during emergencies and disasters, with before and after right after. It was explained by most of them since during emergencies and disasters, the information shared by society is the most relevant to what is needed right now, while before and after represents less urgent situations.

Before emergencies and disasters, the interviewees said that bottom-up information sharing is related mainly to understanding public needs and what they understand. During emergencies and disasters, the interviewees explained that bottom-up information sharing is related to identifying situations in which the public cannot help itself and understand when society is not following (or does following) the instructions and guidelines.

Here, again, the recovery phase, after emergencies and disasters, was perceived as the least important of the three. Again, they did not perceive it as unnecessary or with low importance but only compared to the before and during phases. The information shared after emergencies and crises are related to the public's situation in recovering from the crisis and where help is still needed.

### 5.5.4 HOW THE INFORMATION CAN HELP ACHIEVE THE TARGETS AND HELP RISK MANAGEMENT

As answers from how the bottom-up information can be helpful, the interviewees gave several answers. First, they explained that the information helps in improving their actions and making them act faster and better. They also added that it guides first responders and emergency teams to facilitate the recovery process. They also highlighted the importance of fighting fake news and false information in Romania and France, identified in the bottom-up information process. In Sweden, they did not refer specifically to fake news and false information but stated that bottom-up information sharing could help society get help from local authorities to distribute more accurate and helpful information. In Spain, they explained that the bottom-up information is serving them in local meetings in which they analyse the information, debrief the professional workers and get a better impression on what they should do. According to one interviewee from Spain and another from Norway, it also helps understand the public's feedback to the top-down communication process and how authorities and first responders are perceived by society.




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

## 5.6 THE PROCESS OF INFORMATION SHARING – TOP-DOWN AND BOTTOM-UP

The last topic regarding information sharing related to top-down and bottom-up communication and examined how the information is shared in both directions. Here we discussed the communication channels, which were elaborated in an earlier section of the report, how they are used for different goals, and whether there are different entities in charge of different communication channels.

### 5.6.1 WHAT COMMUNICATION CHANNELS ARE USED TOP-DOWN AND WHAT BOTTOM-UP?

In an earlier section of the report, we documented the various communication channels used by authorities and first responders. In the interviews, we identified several communication channels used more as top-down and others that served more bottom-up needs.

For most interviewees, traditional media, direct contacts with journalists, websites, newsletters and webinars, served top-down information dissemination intentions. To this list, we can also add early warning systems and texts messages using mobile phones to inform about emergencies and disasters.

Social media and mobile apps represented both top-down and bottom-up information sharing processes and purposes. While the interviewees talked a lot about social media as an essential tool for communicating with the public, most of them referred to the top-down information process, disseminating information. Significantly fewer interviewees emphasized using these channels for bottom-up information sharing processes, with Spain and France giving it the most significant importance in the interviews.

On the other side, call-centres, for information and emergencies, were the most significant mentioned communication channel for bottom-up information.

### 5.6.2 DIFFERENT COMMUNICATION CHANNELS FOR DIFFERENT PURPOSES

In most cases, the interviewees referred to most communication channels as "all-purpose" channels. Social media, for example, was perceived as a tool for disseminating information, asking questions, debating the public, entertaining it and more. Mobile phones, whether through apps and text message, were also perceived as multi-purpose communication channels.

However, there were a few channels designated for specific purposes. For example, early warning systems were perceived as communication channels that can only give early warnings and relevant information. Another difference was made regarding the context of information. For example, in Israel and Spain, the interviewees mentioned TikTok to disseminate "childish" and entertaining content, wherein it will be less appropriate in other channels. Some interviewees perceived newsletters and WhatsApp groups as communication channels that allow individuals to decide on the amount and type of information they wish to get. One interviewee mentioned the schools as an educative communication channel in Italy, but only during quiet times and not during, or after, emergencies and disasters. In Romania, they said that combining top-down and bottom-up information at the same time is relevant only to communication channels that can facilitate direct and live communication with the public (e.g., social media – yes, call centres – yes, but not emails).

### 5.6.3 WHO IS IN CHARGE OF EACH COMMUNICATION CHANNEL?

Last, under this topic, almost all interviewees explained that all professionals are working on all communication channels or that all communication channels are responsible for one or two departments. It was either (1) all under the responsibility of spokesperson, PR, media staff; (2) divided between mass media (e.g., press officer, media ads) and social media; or (3) divided

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

between media (either divided between traditional and social) and call centres and emergency tools which were separated.

**Information Sharing (Process) – Key Findings**

- **For most interviewees, traditional media, direct contacts with journalists, websites, newsletters and webinars, served top-down information dissemination intentions.**
- **Social media and mobile apps represented both top-down and bottom-up information sharing processes and purposes.**
- **Call-centres, for information and emergencies, were the most significant mentioned communication channel for bottom-up information.**
- **In most cases, the interviewees referred to most communication channels as an "all purpose" channels. Exceptions were: early warning systems, TikTok (only for youth), newsletters and messaging apps groups.**
- **In most organisations, the media department is in charge of most communication channels, with call-centres and emergency tools excluded.**

## 5.7 ACHIEVING TARGETS

As part of managing their communication strategy and developing messages, authorities and first responders have different aims and goals, from general aims such as increasing societal resilience to more focused goals, such as measuring an increase in the public's awareness of specific risks. In several cases, the objectives for achieving these aims and goals go through quantitative metrics, such as a declared number of exposures to specific content, developed as part of a campaign.

Another topic discussed in the interviews related to how the information provided as part of the campaign or the communication process achieves its target. Several issues were discussed, such as what are the targets of the communication process? How do authorities and first responders measure effectiveness and "success"? What type of top-down and bottom-up messages is effective? What type is not? Moreover, what are the most successful communication channels?

### 5.7.1 WHAT ARE THE TARGETS, AND HOW IS SUCCESS MEASURED?

Most interviewees agreed that the targets of the messages relate to attitudes, awareness and behaviour, and not to exposure. They mentioned that when we can see that society acted as expected, it is a sign of success. One interviewee from Romania mentioned an example: when citizens are not blocking the escape routes during emergencies, they tended to do it more in the past – it means that the message was successful.

Another interviewee from Romania added another dimension of "success" – from the side of the organisations – if the rescue intervention is faster and more successful, it means that the message was compelling, meaning that society internalised the messages. Another interviewee from a first

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

responder organisation in France explained that the success of messages is "measured" by the amount of relevant information that flows from society. Meaning, that if the bottom-up information from society is more relevant, accurate and the circulation of information among citizens is more correct – it is considered an indication of the effectiveness of the communication process.

However, across countries and organisations, almost all interviewees agreed that the effectiveness and success of messages are complex and almost impossible to measure. Most interviewees claimed that they do not actively measure the success using surveys, interviews or even digital metrics from social media. Three interviewees from Israel, Romania and France, mentioned digital metrics (e.g., number of views of Facebook posts and visitors from Google Analytics) as tools for measurement. One interviewee from Romania mentioned surveys that measure the impact of institutional activity on the ground. Nevertheless, besides that, the interviewees mentioned that no actions are made to measure the success or effect of the messages, therefore, highlighting a sense of working by "gut feelings".

Lastly, besides the three interviewees from Israel, Sweden and Romania, no other organisations mentioned digital metrics and a tracking tool used to measure the exposure to social media or other online content.

### 5.7.2 Effective versus not effective top-down messages

Regarding what makes messages effective, the interviewees pointed out on serval components. The most critical components, according to most interviewees, are the simplicity and clarity of the message. Interviewees stressed that message should be simple. They gave several examples from the COVID-19 pandemic: wear masks, wash hands, stay at home. These messages were an example of simple messages. Regarding clarity, the interviewees claimed that the messages should state clearly, how the pubic is expected to act. On the other hand, when messages are not simple, not clear, or include too much information, it was perceived not just as not practical, but also with possible adverse effects, such as being hostile to the situation, doing the opposite on purpose and losing trust in the authorities and first responders.

The last point, however, reflected a tension in the answers of the interviewees. A few interviewees from different countries claimed that messages should include important information. Not only wash hands or keep distance, but also how to do it, why it is essential, and how it affects the crisis. While several interviewees could find this approach too complex and not precise, the few interviewees who mentioned it believed that more information helps achieve compliance.

In addition, interviewees believed that adequate information is constant information. To send a message that there is nothing to hide and that the organisations are with their hand on the pulse. According to around half of the interviewees, constant, trusty, online information can achieve its target effectively.

Lastly, one interviewee from Israel presented a different approach for effective versus not effective top-down messages. The same interviewee from the EMS first responder organisation, which discussed using digital metrics broadly, also discussed using them to decide what information is practical and what is not. He claimed that when a topic receives many views, it is considered a topic that more information about it should be distributed.

### 5.7.3 Effective versus not effective bottom-up content

Similar answers were given regarding bottom-up information, while the interviewees believed that the information from society should be simple and straightforward – allowing authorities and first responders to complete the rest of the information professionally. The interviewees discussed the importance of explaining to society how to provide adequate information to help the organisations

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

help the society. For example, give a clear visual description of the situation, give a reasonable amount of the affected population, and contact the first responders only when there is new and relevant information, allowing more urgent calls that call for "time estimation" to be treated.

For example, as mentioned in an interview with a first responder professional from Romania: In the case of an injured or lost person in the mountain area, first responders do not necessarily need geographical coordinates in the first phase, but more general information on landmarks to identify the place. Such as how the victim was dressed, where he went and on what route. Another interviewee, however, claimed that First responders need as much information as possible in the first phase. Not only related to geographical coordinates, but even more detailed and focused on information on landmarks to identify the place, how the victim was dressed, where he went and on what route.

### 5.7.4 THE MOST SUCCESSFUL COMMUNICATION CHANNELS

The last issue regarding effective messages discussed successful communication channels, in general, and for top-down and bottom-up communication in particular. Here, the interviewees were split greatly, with different answers among professionals from all the countries.

In Israel and France, the interviewees claimed that mobile-phone related communication channels, such as WhatsApp and Telegram groups, are the most effective for top-down and bottom-up communication. One of the reasons was their independence of the electricity infrastructure. In Italy and Norway, phone call centres were considered the most effective, along with face-to-face communication and education programs in school, allowing top-down information and tailored-made bottom-up communication. In Romania and Sweden, five interviewees preferred traditional mass media, including television, radio channels and public warning systems, since they are the most accessible and, therefore, most effective in their eyes. Newspapers, on the other hand, were perceived to be the least effective. Another interviewee in Romania, as in Italy, perceived the face-to-face communication to be the most effective, while another two, one from Romania and one from Sweden, added that communication channels, especially about new technologies, are constantly changing and evolving, requiring adaptations from the institutions – which is the most effective strategy for using communication channels, according to him. Lastly, one interviewee from Norway added that there is not "an effective communication channel", but it depends on the target group and the goal of the information. For example, text messages effectively provide immediate short warnings, but not for the complete information.

**Achieving Targets – Key Findings**

- **Most interviewees agreed that the targets of the messages relate to attitudes, awareness and behaviour, and not to exposure. Another target was to make the rescue missions quicker in their response.**
- **Authorities and first responders found the evaluation process of the effectiveness of the messages to be complex.**
- **Very few organisations tried to assess the effectiveness of their communication strategy, mostly in indirect ways (e.g., measuring attitudes and risk awareness).**
- **While they are familiar with them, digital metrics was used rarely to assess the effectiveness of messages.**

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

## 5.8 DIVERSITY

The last topic in the interview referred to questions of diversity. We asked the interviewees what the overall thinking is in developing messages about diversity if there are written guidelines when thinking about diversity occurs, and regarding diverse genders, cultures, and less privileged populations.

In general, most interviewees perceived the question of diversity as necessary. They believed it is essential to address members of the society in their language, adapt the messages to their culture of abilities and by this, to achieve compliance. Many interviewees believed the diversity is not relevant regarding emergencies and disasters, stating that especially during crises, first responders and authorities will provide the most experienced and professional rescuers.

When asked how does thinking about diversity affects practice, interviewees were, again, split. Very few interviewees, especially in Norway, referred to guidelines but could not point out their written source. These guidelines referred mainly to the cultural variety in Norway and to question of different age groups.

In most cases, the reference to guidelines was unofficial or through training. Unofficial, meaning that the emergency organisations followed a well-known process, which is not written. For example, an interviewee from a regional emergency authority in Israel explained that they have a known process for communicating with the Arab villages, including which religious members to involve in the process, what to say and what not to say and how to do it. However, as emphasised, these were based on experience instead of on official written guidelines that can be transferred and preserved.

In most countries, the interviewees that perceived diversity as necessary referred to cultural training that first responders and professionals who deal with communication go through. In Israel and Romania, several interviewees referred to the multicultural nature of the country, resulting in the fact that in every team, of every organisation or authorities, all genders and minorities are represented. In all phases of emergencies and disasters, they serve as cultural/gender communicators to their local community/group/culture. In Romania, there are some particular regions with a multicultural nature. Only in these regions, according to one of the interviewees, they have mixed teams (i.e., representing either cultural/minority inclusion). This does not apply at the national level, however there is a flexibility and open approach to welcome them.

In the few cases in which diversity was fully taken into consideration in practice, it happened, according to the interviewees, in choosing the most appropriate communication channels, choosing the language of the message and taking into account cultural considerations (e.g., what not to say, how to say, using pictures instead of texts).

Last, when diversity is taken into consideration, it is usually before the crises occur. During crises, according to the interviewees, they have little time to think about diversity.

### 5.8.1 GENDER

Since there was little focus on diversity, there were also very few examples for each category. Especially regarding gender, around half of the interviewees claimed that there is "no discrimination between men and women" in the communication process.

In Norway, several gender-related issues were discussed. For example, not having two male professionals treating a female in the field. In addition, in call centres, interactions between male operators and female victims were limited. When they identified the most patients are women in health-related topics, they created campaigns directed to women.

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

### 5.8.2 CULTURE

Regarding culture, very few interviewees referred to the need to adapt the message to particular categories or using cultural leaders, such as Imams for the Muslim. In Norway, the focus was on the cultural training of first responders and operators to understand different cultures, be more patient, and ask more questions when a person from a minority group might find it too embarrassing or impolite to ask. One interviewee from a national emergency authority pointed out a collaboration with regional organisations that have more cultural knowledge about specific groups.

### 5.8.3 LESS PRIVILEGED POPULATIONS

Last, less privileged populations are those from less-educated communities, with low socioeconomic status and lower literacies. However, besides the little reference to the elderly, the interviewees did not report particular communication guidelines. Regarding the elderly, few interviewees, one from Norway and one from Romania, mentioned the importance of face-to-face communication channels and traditional mass media to communicate with them over more complex new and social media channels.

**Diversity – Key Findings**

- **Cultural, national and gender diversity is perceived as very important; However, emphasis is put only on cultural diversity, with little or no written guidelines.**

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

# 6 DISCUSSION

The study conducted as part of deliverable 2.4 examined the communication channels authorities and first responders use, the communication guidelines they follow by using these channels, and how they manage the communication process with society and vice-versa. We also examined the differences between the communication process, use of communication guidelines and managing the process and different phases of emergencies and disasters, before, during and after crises. Finally, we examined how much considerations authorities and first responders give to diversity, considering gender, culture and less privileged societies, with digital illiteracies and low socioeconomic status, for example. The analysis was based on reviewing the various communication channels, communication guidelines and 30 semi-structured interviews with professionals from authorities and first responders across seven countries.

The first research question addressed the communication channels and emerging technologies that authorities and first responders use to communicate with society and vice-versa. In this deliverable, we described the communication channels. As part of deliverable 2.2 and 2.3, the solutions themselves, formal and informal, are widely discussed (e.g., specific apps used by authorities and first responders and the difference between systems).

Findings showed that as the scientific literature suggests (e.g., Paci-Green, Varchetta, McFarlane & Iyer, 2020; Piotrowski, 1998; Rahmi, Joho & Shirai, 2019; Reuter & Spielhofer, 2017; Shaikh, 2017), authorities and first responders use a wide variety of communication channels to communicate with society and vice-versa. The review also showed that few organizations already started examining innovating and emerging technologies to improve the communication process. While not all emergency organisations used all types of channels, the generated list can be effective in suggesting new ideas.

**From the affordance's perspective (i.e., what do the channels allow and what they do not), most organisations used communication channels that allow both unidirectional and multidirectional communication with society and vice-versa. However, how they used these channels is another matter. It was noticeable that most communication was conducted in a top-down approach. Social media was primarily used to disseminate information, and mobile phones served as tools for receiving warnings and information, and less on reporting.**

The second research question examined the existence of written communication guidelines among authorities and first responders. Here, the picture was more complex. On the one hand, among international authorities (e.g., WHO, CDC), various communication guidelines were found. In addition, about specific communication questions, such as what channels to use and what events, who is authorised to use them and under what circumstances – authorities and first responders had written guidelines for these issues. Those guidelines were implemented, in most cases, among general guidelines (e.g., like different chapters or sections) and in a few cases, also as independent guidelines.

Regarding crises and emergency risk communication, there were very few written guidelines. The international organisations primarily generated those guidelines, and not by local organisations. Several organisations, such as in Norway and Romania, have written guidelines concerning, for example, what questions to ask in a call centre in order to receive complete information from the callers. In Romania, one interviewee explained on how they are improving the set of questions based on past disasters, and even develop procedures on how to engage with callers, what questions to ask, get as much information as possible from

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

the field/ground. However, issues such as developing messages, who should take part in it, according to what process and other related questions were not part of written guidelines, but practical, transferable processes.

This tension corresponds with findings from the literature. On the one hand, the scientific review showed evidence-based recommendations, for example, regarding what steps are most effective in which phase of the crises (e.g., Aldoory & Sha, 2007; Gesser-Edelsburg et al., 2015; Shappard, Janoske & Liu, 2012). In addition, several models developed in the literature, such as ERC conceptual model (Seeger et al., 2018) and CDCA (Spialek & Houston, 2018), lay the groundwork for communication guidelines.

**The communication-related recommendations were adopted by authorities and first responders and integrated in the work process. However, they were not grounded in communication guidelines. This, while general other guidelines in non-communication issues did exist.**

The third research question delved more into authorities' communication and first responders and society, and vice-versa. We examined, mainly by the semi-structured interviews, how messages develop, what information is disseminated in the top-bottom communication, what information is needed and being received in the bottom-up communication and how do effectiveness and success of messages are measured.

The interviews revealed several key findings. Like early claims made by Omori, Kuligowski & Butler (2017), interviewees elaborated on oral communication guidelines that were customary in the organization, and several of them also pointed out the lack or written, transferrable guidelines. They pointed out that while communication and media professionals led the process of message development, at least in more influential organisations, other experts also participated. They explained the risk awareness, education, instructions, and guidelines were the most important types of information to share regarding emergencies and disasters. Similar to the image reviewed in the literature (Medford-Davis & Kapur, 2014). They added that bottom-up information is essential when it supports the top-down process (e.g., provides the necessary information), as found earlier by several scholars (Haeffele & Storr, 2020; Musacchio, Falsaperla, Bernhardsdóttir, 2016; Thaler & Seebauer, 2019). In addition, each interviewee had his or her preferred communication channels to disseminate and receive information.

The last topic in the interviews was how do authorities and first responders measure the effectiveness and success of the risk messages and how they handle diversity. Regarding the first question of effectiveness, traditional media, direct contact with journalists, websites newsletters, and webinars were perceived to be the most effective for top-down communication. In contrast, social media and mobile apps supported the interviewees' perspective on the bottom-up communication process. Most interviewees referred to the communication channels as "multipurpose" channels and not as complimentary channels that each serve specific goals, as pointed out in the literature (Kalogeras, 2014; Pratten, 2011).

The fourth and fifth research questions comparatively addressed the previous questions. The fourth research questions examined the differences between the communication process and all phases of emergencies and disasters, before, during and after crises.

Regarding the use of communication channels, we showed that most channels are used in all phases of crises, excluding the specialized channels (e.g., warning systems that are relevant only for emergencies). Several channels were used only before or during crises due to urgency, timing or context. A similar picture was found regarding the use of communication guidelines.

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

In the interviews, the interviewees highlighted several similarities and differences between the phases. In general, the interviewees distinguished between two binary situations, before and after crises (quiet times) and during crises. From their point of view, there was very little difference between before and after crises from the communicational perspective.

Before crises, interviewees mentioned that it is easier for them to think about developing messages and that it happens "on the go" during crises. In addition, the difference between top-down and bottom-up information sharing in quiet times versus crises is related to urgency, timing and context. Preparedness was perceived as the most critical communication phase regarding top-down information, while bottom-up information was perceived to be more crucial during disasters.

The last research question focused on diversity. It examined how authorities and first responders refer to different genders, cultures and citizens from less fortunate societies (e.g., low socioeconomic status, digital illiteracies and more).

**While diversity was perceived to be very important by the interviewees, very few organisations described specific written guidelines related to diversity. They relied heavily on verbal practices, mostly regarding cultural diversity and minorities, and on training. Especially regarding gender diversity, several interviewees looked at it as some sort of discrimination.**

## 6.1 USE OF COMMUNICATION CHANNELS, WRITTEN GUIDELINES AND SOCIETAL RESILIENCE

The scientific literature draws the vast options of communication channels for authorities and first responders to communicate with society and vice-versa. Each channel carries a set of affordances for improving the communication process between the different sides. If handled correctly, the communication process can contribute significantly to societal resilience.

The literature regarding the crisis and emergency risk communication highlights the theories and related practices relevant for all phases of crises (Shappard, Janoske & Liu, 2012). The wide use of communication channels by authorities and first responders gives them a vast number of opportunities to address the risks using the relevant practices.

The review of communication channels, their analysis and the semi-structured interviews revealed that a lot is done in the communication process between emergency organisations and society. However, as elaborated in the literature, most of what is being done are not documented in any guidelines, which allow systematic actions that can also be transferable from one place to another. Such guidelines also allow the organisations to act in an evidence-based approach (Omori, Kuligowski, Gwynne & Buttler, 2017).

Another significant contribution of the written communication guidelines to authorities and first responders is matching their actions into measurable criteria. The theories and models in the literature set different strategies and outcomes in the short, medium and long-term (Seeger et al., 2018).

**Guidelines are important in setting goals and measures for the communication process. They can contribute towards understanding of how specific communication actions contributed to a situation, and increased risk awareness of provided tools, for society to cope with future emergencies. They create more organization, improve the communication process and help in building societal resilience.**

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

The literature also connects between specific types of events (e.g., extreme weather conditions) to using specific communication solutions (e.g., personal connections, social media). With a division to what Spialek & Houston (2018) define as pre-event, event and post-event, that highlight that proper use of communication channels is associated with community and societal resilience, sometimes more than traditional contributors of resilience. The analysis and interviews revealed that authorities and first responders make this connection between events and communication channels, but this work should be strengthened and elaborated more.

**Authorities and first responders should consider the various communication channels, not just as means for technological development or for addressing more citizens in a more diverse way. Communication channels, as the literature suggests, are like "remedies" to different illnesses, and should be used accordingly.**

## 6.2 GAPS BETWEEN COMMUNICATION CHANNELS AND NEEDS DURING THE PHASES OF RESILIENCE CAMPAIGNS

Deliverable 1.3, focusing on the public's communication needs and expectations, pointed out several gaps in the communication process between authorities and first responders and the public and vice-versa. The survey and qualitative content analysis conducted as part of deliverable 1.3 highlighted many needs expressed by the public rather than information – from integrative needs focusing on a sense of belongingness and connection to the community, through affective needs of feeling better, and even to escapist needs, wanting to "clear the head" from the reality of the emergency.

The findings in the semi-structured interviews conducted in deliverable 2.4 highlighted two key findings that expose a gap in the communication process. The first is the almost sole focus on disseminating information. Authorities and first responders put risk awareness, education and other information, reflecting the cognitive needs of the public, at the core of their communication process. Even if the findings in deliverable 1.3 showed that authorities and first responders sometimes create content related to affect, integration and escapism, the interviews state the clear hierarchy between the different needs. On top of that, the response phase, during emergencies, was perceived as an acute phase that prevented any type of communication, rather than emergency information, which is necessary, according to authorities and first responders, to survive the crises.

**However, as shown in deliverable 1.3, even during emergencies, the public still looks for ways to feel better, to maintain the integration inside the community and to escape from the ongoing reality. All factors, if not addressed, can prevent or harm the process of building resilience. Therefore, it is important, even during emergencies, to manage the full cycle of needs and not just cognitive-related.**

A second key finding relates to the perception of bottom-up information. The hierarchy in the eyes of authorities and first responders' professional regarding top-down and bottom-up information was clear. They believed that top-down information is more critical, and in cases of emergencies and disasters, should get a significant place with bottom-up communication only supplementing the top-down process and providing information that can contribute to it. While even the findings of

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

deliverable 1.3 supported that top-down processes are perceived to be more critical to society, it also showed that bottom-up communication fulfils a vital role in societal resilience.

**Bottom-up communication, representing multidirectional flow, cannot be limited to goals set by authorities and first responders. It should be an open process that can be adapted more to the needs and expectations of the society. For example, interviewees mentioned the need to educate society on how to give information in emergency calls, focusing on all the important details, as a bottom-up process. However, other, not less important, bottom-up processes, reflect, for example, feedback from society that also changes how call-centres work.**

Addressing these needs and gaps are essential. As discussed, both in WP1 and in other deliverables of WP2, crisis and emergency risk communication are an essential aspect of societal resilience. It is impacted by contextual factors that are hard to change and the context of target factors. In addition, crisis and emergency communication might impact target factors, such as trust, beliefs, attitudes – with the proper use of the various communication channels.

## 6.3 Diversity: Gender and Culture

One of the crucial goals of this deliverable is how authorities and first responders consider diversity. Here, as mentioned above, the findings were contradictory. In general, diversity was perceived to be necessary. However, diversity, in the eyes of the interviewees, was heavily connected with culture, while gender diversity, for example, was perceived as discrimination, although it is considered an essential aspect in the literature (Bonnie, Simon, Thornton & Grant, 2020; DeeDee & Bennett, 2019).

The scientific literature highlights the importance of referring to diversity in all aspects. Warning that underrepresentation of minorities leads to significant constraints on resilience campaigns (Phillips & Morrow, 2008) and is also considered unethical (Bonnie, Simon, Thornton & Grant, 2020). We presented a framework by Young & Jones for effective communication management, focusing on diversity and inclusion. This framework aims to help organisations change a current status-quo to a new and improved one, accepting new identities.

The model, representing changes in the institutional processes in the state and organizational levels, might set the desired process, but as elaborated in the interviews – it is still hard to implement. Emergency systems were developed and developed and evolved to a new status quo, based on emergencies that highlight vulnerabilities, limits, and mistakes. In other words, the results of crises move the systems forwards, and not the theory.

**This is implied in the communication channels and processes. As the interviewees emphasized, especially in multicultural countries, they felt that the training is enough for communicating with diverse culture, while gender diversity was perceived as discrimination. Less privileged populations are usually not heard and the feedback is not presented, preventing the evolvement of such systems.**

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

## 6.4 MAIN FINDINGS AND SUGGESTED STRATEGIES TO INVESTIGATE AND VALIDATE

**Table 4.** List of main findings and suggested strategies to investigate and validate.

| Findings | Suggested strategies to investigate and validate |
|---|---|
| Authorities and first responders use a variety of communication channels, but specific written communication guidelines are deficient. | Using the variety channels as part of a general systematic approach. Creating integrative communication guidelines that take into consideration the interaction between channels and how they supplement each other. Communication guidelines should refer also to issues such as how to design the messages. |
| In large organisations various professionals (environment, fire, health) participate in the process of developing the messages in resilience campaigns. In small organisations, only communication experts, and in some cases, external advisors, do it. | Organisations, of any size, should train professionals to participate in the messages design process. The input of professionals is crucial in risk communication. Organisations should create organized processes for message development, including decided which professionals are relevant for each campaign, what are the different necessary steps and what are the desired outcomes. |
| The perceived important top-down types of information to share according to emergency organisations' professionals are: risk awareness, education, instructions and guidelines. | Deliverable 1.3 highlighted other non-information related needs, such as affective, integrative and escapist. Organisations should address these needs in their resilience campaigns to a greater extent. Validation measures should also take it into consideration. |

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

The perceived differences between top-down types of information to share before, during and after crises are the urgency, timing and context of the information. In addition, the interviewees perceived the phases before and after crises as almost similar, regarding communication processes. They referred to them as "quiet" times.

Authorities and first responders' professionals are highly affected by the sense of emergency. However, there are significant identifiable differences between the phases before and after crises. There should be more focus on the different communication strategies before and after crises, and not just in "emergency" and "no emergency" situations. The communication strategy of organisations should also be evaluated by this.

The interviewees perceived preparedness as the most important stage of top-down information sharing. Response was the most urgent case. Therefore, less planning was involved in this stage.

Despite the fact that during an emergency the situation is considered very urgent, the contribution of a planned communication strategy is crucial. Therefore, it is recommended to create an organised procedure for message development even during crises.

Bottom-up information was perceived to be important, if it serves the top-down process. Bottom-up information was perceived as useful in improving the actions of emergency organisations, guiding rescue teams, fighting fake news, supporting local meetings, and clarifying the effect of the campaign. The focus was on the side of authorities and first responders.

Bottom-up multidirectional communication flow is important to societal resilience. Authorities and first responders should encourage bottom-up communication.

In most cases, the interviewees referred to most communication channels as "all-purpose" channels. Meaning, that they serve as channels for different messages for different purposes.

Each communication channels has its own uniqueness, users and contribution in the communication process. Messages should design with thinking on the relevant channels and relevant channels should be adapted with the appropriate messages.

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

Most interviewees agreed that the targets of the messages relate to attitudes, awareness and behaviour, and not to exposure. Another target was to make the rescue missions faster. Authorities and first responders found the evaluation process of the effectiveness of the messages to be complex. Very few organisations tried to assess the effectiveness of their communication strategy, mostly in indirect ways (e.g., measuring attitudes and risk awareness).

Targets should be developed along with measures for effectiveness. For example, if one goal of the communication strategy is to change attitudes, organisations should have the information regarding the attitudes before and after, in order to measure the effectiveness of the strategy. Measurements and evaluation criteria should be part of the validation process.

While they are familiar with them, digital metrics was used rarely to assess the effectiveness of messages.

Authorities and first responders who are not familiar with them, should learn and implement digital metrics, such as exposure tracking, popularity count and interactions reporter. Some of these tools are provided along with services by site hosting companies and social networks.

Cultural, national and gender diversity is perceived as very important; However, emphasis is put only on cultural diversity, with little or no written guidelines.

Future WP's should consider working on recommendations on implementing diversity in the lifecycle of communication management and strategies of authorities and first responders.

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

# 7 STRENGTHS & LIMITATIONS

## 7.1 STUDY LIMITATIONS

The study has several limitations. First, from the methodological perspective, the sampling strategy of the study was a snowball. Therefore, the generalisation of the findings is limited. The same applies to the choice of interviewees, which does not necessarily, represent the population of authorities and first responders' professionals.

Second, the semi-structured interviews were conducted in seven countries, representing the participants of the consortium. While this choice has the logic of the consortium as a research group, it has a limitation regarding a possible cultural bias. Each country is unique in its characteristics, and those reflect heavily on the results.

Third, from a methodological perspective, interviews were conducted in seven languages and were not transcribed and fully translated to English. They were summarised directly in English and analysed from the summaries. Working directly from the summaries might also affect the results.

Fourth, the study was conducted during the COVID-19 pandemic. It was noticeable that many of the interviewees' responses were affected by the pandemic as an ongoing crisis. Therefore, it might be arguable that some of the findings represent not emergencies and disasters in general but COVID-19.

## 7.2 STUDY STRENGTHS

On the other hand, the study carried in deliverable 2.4 has two main strength. First, the international comparison gives a broader perspective than other studies found in the literature. The research consortium consists of several countries representing multicultural societies and different approaches regarding emergency management and crises and emergency risk communication. This broader, international perspective broadens our understanding of the communication process of authorities and first responders and its relationship to societal resilience.

Second, the study carried interviews and analysed the communication strategies of different types of organisations. Not just authorities versus first responders, but also different types of authorities (national, regional, local) and first responders (EMS, fire department, environmental). This also enlightened widened the perspective of the study and its results.

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

# 8 CONCLUSIONS

The study had four objectives. The first objective was to identify what communication channels and emerging technologies are used by authorities and first responders to communicate with the public and vice-versa. The study findings showed that authorities and first responders use various communication channels, from brochures and critical chains, through warning systems and community patrol, to social media accounts and even innovative AI-chatbots. The conclusion here is double. On the one side, it relates to the wide choice of channels and the possibility of authorities and first responders to learn from each other and adopt new channels. On the other side, it points out on the importance of learning how to use these various channels properly.

The second objective was to analyse the communication guidelines authorities and first responders use to manage the communication process. Here, the findings were conflicted. Authorities and first responders had written general guidelines, and some of them even referred to communication. However, even when they dealt with communication, they tended to focus on the technical side of using them and to list the necessary information for taking care of an event. Very little was written about how to communicate with society, emphasising message design and bottom-up communication. Therefore, the conclusion is that more specified, unique communication guidelines should be developed, using the recommendations from the discussion. It can also be a future task of deliverable 2.5 to add a document to develop communication guidelines.

The third objective was to understand how authorities and first responders manage the communication process. The interviews emphasised the communication preferences of professionals in authorities and first responders and highlighted that they lack organized procedures and do not always incorporate bottom-up communication processes in most cases. Therefore, following the last conclusion, another conclusion is related to the need of authorities and first responders to develop organised procedures for developing messages, choosing communication channels, top-down information strategies and the role of bottom-up communication.

The fourth objective was to understand how authorities and first responders consider the cultural and gender diversity of the population and refer to digital literacy in the communication process with the public. Here, it was dominant that still little is done despite diversity being perceived as necessary, especially regarding gender and less privileged populations. Therefore, the conclusion relates to the need to implement more guidelines regarding diversity in the communication process of authorities and first responders.

The discussion section described in details the necessary recommendations for future WP's and deliverables, among them, in short:

- For D2.5: develop a suitable material for authorities and first responders, based on deliverable 2.4. For example, templates for developing communication strategies and diversity guidelines.
- For D3.1 and D3.2: the recommendations in deliverable 2.4 are part of the base for the choice of promising solutions. Understanding how authorities and first responders design their communication strategy can also contribute to D3.2, which aims at recommending a blue print for an innovating emerging technology of an AI-chatbot.
- For D4.1: the identified uses of communication channels and the communication strategies of authorities and first responders can serve the initial validation process of solutions.
- For D5.1: use the results of this study is shaping ENGAGE's communication and dissemination strategy.
- Last, for D5.4 and D5.5: the results contribute to the website and knowledge platform of ENGAGE.

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

# 9 REFERENCES

Adiyoso, W., & Kanegae, H. (2017). Tsunami resilient preparedness indicators: The effects of integrating religious teaching and roles of religious leaders. In *Disaster Risk Reduction in Indonesia* (Vol. 1–Book, Section, pp. 561–587). Springer.

Ahuja, A. S., Reddy, V. P., & Marques, O. (2020). *Artificial intelligence and COVID-19: A multidisciplinary approach*.

Alaszewski, A. (2005). No title. *Risk Communication: Identifying the Importance of Social Context*, *Journal Article*.

Aldoory, L., & Sha, B.-L. (2007). The situational theory of publics: Practical applications, methodological challenges, and theoretical horizons. *The Future of Excellence in Public Relations and Communication Management: Challenges for the next Generation*, *Journal Article*, 339–355.

Aldrich, D. P. (2012). *Building resilience: Social capital in post-disaster recovery*. University of Chicago Press.

Amornsiripanitch, N., Ameri, S. M., & Goldberg, R. J. (2020). Impact of Age, Race, and Socioeconomic Status on Women's Perceptions and Preferences Regarding Communication of Estimated Breast Cancer Risk. *Academic Radiology*, *Journal Article*.

Andreasen, A. R. (2006). *Social marketing in the 21st century*. Sage.

Bean, H., Liu, B. F., Madden, S., Sutton, J., Wood, M. M., & Mileti, D. S. (2016). Disaster warnings in your pocket: How audiences interpret mobile alerts for an unfamiliar hazard. *Journal of Contingencies and Crisis Management*, *24*(3), 136–147.

Bengtsson, L., Lu, X., Thorson, A., Garfield, R., & Von Schreeb, J. (2011). Improved response to disasters and outbreaks by tracking population movements with mobile phone network data: A post-earthquake geospatial study in Haiti. *PLoS Med*, *8*(8), e1001083.

Bennett, D. (2019). Diversity in emergency management scholarship. *Journal of Emergency Management (Weston, Mass.)*, *17*(2), 148–154.

Berry, D. (2004). *Risk, communication and health psychology*. McGraw-Hill Education (UK).

Bhuvana, N., & Aram, I. A. (2019a). Facebook and Whatsapp as disaster management tools during the Chennai (India) floods of 2015. *International Journal of Disaster Risk Reduction*, *39*, 101135.

Bhuvana, N., & Aram, I. A. (2019b). Facebook and Whatsapp as disaster management tools during the Chennai (India) floods of 2015. *International Journal of Disaster Risk Reduction*, *39*, 101135.

Bradley, D. T., McFarland, M., & Clarke, M. (2014). The effectiveness of disaster risk communication: A systematic review of intervention studies. *PLoS Currents*, *6*.

CDC. (n.d.). *Crisis & Emergency Risk Communication (CERC)|CDC*. Centres for Disease Control and Prevention. Retrieved January 26, 2021, from https://emergency.cdc.gov/cerc/

Chroust, G., Rainer, K., Sturm, N., Roth, M., & Ziehesberger, P. (2011). Improving resilience of critical human systems in CBRN emergencies: Challenges for first responders. *Systems Research and Behavioral Science*, *28*(5), 476–490.

Cohen, N. (2010). *Emergency communications: Enhancing the safety network*. Nova Science Publishers, Incorporated.

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

de Deuge, J., Hoang, H., Kent, K., Mond, J., Bridgman, H., Skromanis, S., Smith, L., & Auckland, S. (2020). Impacts of community resilience on the implementation of a mental health promotion program in rural Australia. *International Journal of Environmental Research and Public Health*, *17*(6), 2031.

DeMello, A., Egan, R., & Drew, J. (2020). Resilience-building by community health organisations: A guiding model for practice. *Journal of The Royal Society of New Zealand*, *50*(4), 552–571.

Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2012). The intergenerational transmission of risk and trust attitudes. *The Review of Economic Studies*, *79*(2), 645–677.

Enarson, E. P. (2000). *Gender and natural disasters*. ILO Geneva.

Fish, J. A., Peters, M. D., Ramsey, I., Sharplin, G., Corsini, N., & Eckert, M. (2017). Effectiveness of public health messaging and communication channels during smoke events: A rapid systematic review. *Journal of Environmental Management*, *193*, 247–256.

Frei-Landau, R. (2020). "When the going gets tough, the tough get—Creative": Israeli Jewish religious leaders find religiously innovative ways to preserve community members' sense of belonging and resilience during the COVID-19 pandemic. *Psychological Trauma: Theory, Research, Practice, and Policy*, *12*(S1), S258.

French, D. P., Cameron, E., Benton, J. S., Deaton, C., & Harvie, M. (2017). Can communicating personalised disease risk promote healthy behaviour change? A systematic review of systematic reviews. *Annals of Behavioral Medicine*, *51*(5), 718–729.

French, J., & Gordon, R. (2019). *Strategic social marketing: For behaviour and social change*. Sage.

Gesser-Edelsburg, A., Stolero, N., Mordini, E., Billingsley, M., James, J. J., & Green, M. S. (2015). Emerging infectious disease (EID) communication during the 2009 H1N1 influenza outbreak: Literature review (2009-2013) of the methodology used for EID communication analysis. *Disaster Medicine and Public Health Preparedness*, *9*(2), 199–206.

Glik, D. C. (2007). Risk communication for public health emergencies. *Annu.Rev.Public Health*, *28*(Journal Article), 33–54.

Goniewicz, K., & Burkle, F. M. (2019). Challenges in implementing Sendai framework for disaster risk reduction in Poland. *International Journal of Environmental Research and Public Health*, *16*(14), 2574.

Gray, B., Hanna, F., & Reifels, L. (2020). The integration of mental health and psychosocial support and disaster risk reduction: A mapping and review. *International Journal of Environmental Research and Public Health*, *17*(6), 1900.

Griffin, R. J., Neuwirth, K., Dunwoody, S., & Giese, J. (2004). Information sufficiency and risk communication. *Media Psychology*, *6*(1), 23–61.

Harris, C. R., & Jenkins, M. (2006). *Gender differences in risk assessment: Why do women take fewer risks than men? Journal Article*.

Herovic, E., Sellnow, T. L., & Sellnow, D. D. (2020). Challenges and opportunities for pre-crisis emergency risk communication: Lessons learned from the earthquake community. *Journal of Risk Research*, *23*(3), 349–364.

Hiltz, S. R., Kushma, J. A., & Plotnick, L. (2014). *Use of Social Media by US Public Sector Emergency Managers: Barriers and Wish Lists.* ISCRAM.

Houston, J. B., First, J., Spialek, M. L., Sorenson, M. E., & Koch, M. (2016). Public disaster communication and child and family disaster mental health: A review of theoretical frameworks and empirical evidence. *Current Psychiatry Reports*, *18*(6), 54.

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

Houston, J. B., Spialek, M. L., Cox, J., Greenwood, M. M., & First, J. (2015). The centrality of communication and media in fostering community resilience: A framework for assessment and intervention. *American Behavioral Scientist*, *59*(2), 270–283.

Houston, J. B., Spialek, M. L., First, J., Stevens, J., & First, N. L. (2017). Individual perceptions of community resilience following the 2011 Joplin tornado. *Journal of Contingencies and Crisis Management*, *25*(4), 354–363.

J. Holmes, B., Henrich, N., Hancock, S., & Lestou, V. (2009). Communicating with the public during health crises: Experts' experiences and opinions. *Journal of Risk Research*, *12*(6), 793–807.

Janoske, M., Liu, B., & Sheppard, B. (2012). *Understanding risk communication best practices: A guide for emergency managers and communicators*. START, National Consortium for the Study of Terrorism and Responses to ….

Kar, B., & Cochran, D. M. (2019). *Risk communication and community resilience*. Routledge.

Karger, C. P. (2005). Mobile phones and health: A literature overview. *Zeitschrift Für Medizinische Physik*, *15*(2), 73–85.

Khanlou, N., & Wray, R. (2014). A whole community approach toward child and youth resilience promotion: A review of resilience literature. *International Journal of Mental Health and Addiction*, *12*(1), 64–79.

Kjellgren, S. (2013). Exploring local risk managers' use of flood hazard maps for risk communication purposes in Baden-Württemberg. *Natural Hazards and Earth System Sciences*, *13*(7), 1857–1872.

Kubacki, K., Siemieniako, D., & Brennan, L. (2020). Building positive resilience through vulnerability analysis. *Journal of Social Marketing*.

Kwilinski, A., Vyshnevskyi, O., & Dzwigol, H. (2020). Digitalization of the EU Economies and People at Risk of Poverty or Social Exclusion. *Journal of Risk and Financial Management*, *13*(7), 142.

Lamond, J. E., & Proverbs, D. G. (2009). Resilience to flooding: Lessons from international comparison. *Proceedings of the Institution of Civil Engineers-Urban Design and Planning*, *162*(2), 63–70.

Larsen, A., Hanigan, I., Reich, B. J., Qin, Y., Cope, M., Morgan, G., & Rappold, A. G. (2021). A deep learning approach to identify smoke plumes in satellite imagery in near-real time for health risk communication. *Journal of Exposure Science & Environmental Epidemiology*, *31*(1), 170–176.

Lee, N. R., & Kotler, P. (2011). *Social marketing: Influencing behaviors for good*. Sage Publications.

Lejano, R. P., Rahman, M. S., & Kabir, L. (2020). Risk Communication for Empowerment: Interventions in a Rohingya Refugee Settlement. *Risk Analysis*, *40*(11), 2360–2372.

Lindsay, B. R. (2011a). *Social media and disasters: Current uses, future options, and policy considerations*.

Lindsay, B. R. (2011b). *Social media and disasters: Current uses, future options, and policy considerations*.

Liu, W., Li, L., Rong, Y., Qian, D., Chen, J., Zhou, Z., Luo, Y., Jiang, D., Cheng, L., & Zhao, S. (2020). Hypoxic mesenchymal stem cell-derived exosomes promote bone fracture healing by the transfer of miR-126. *Acta Biomaterialia*, *103*, 196–212.

Lovari, A., & Bowen, S. A. (2020). Social media in disaster communication: A case study of strategies, barriers, and ethical implications. *Journal of Public Affairs*, *20*(1), e1967.

Lyons, P., Winters, M., Zeebari, Z., Schmidt-Hellerau, K., Sengeh, P., Jalloh, M. B., Jalloh, M. F., & Nordenstedt, H. (2020). Quantifying the Impact of Engaging Religious Leaders to Promote

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

Safe Burial Practices During the 2014-2016 Ebola Outbreak in Sierra Leone. *Available at SSRN 3578749*, *Journal Article*.

Machin, M. A., & Sankey, K. S. (2008). Relationships between young drivers' personality characteristics, risk perceptions, and driving behaviour. *Accident Analysis & Prevention*, *40*(2), 541–547.

Marana, P., Eden, C., Eriksson, H., Grimes, C., Hernantes, J., Howick, S., Labaka, L., Latinos, V., Lindner, R., & Majchrzak, T. A. (2019). Towards a resilience management guideline—Cities as a starting point for societal resilience. *Sustainable Cities and Society*, *48*, 101531.

Markakis, E. K., Lykourgiotis, A., Politis, I., Dagiuklas, A., Rebahi, Y., & Pallis, E. (2017). EMYNOS: Next generation emergency communication. *IEEE Communications Magazine*, *55*(1), 139–145.

McComas, K. A. (2006). Defining moments in risk communication research: 1996–2005. *Journal of Health Communication*, *11*(1), 75–91.

Medford-Davis, L. N., & Kapur, G. B. (2014). Preparing for effective communications during disasters: Lessons from a World Health Organisation quality improvement project. *International Journal of Emergency Medicine*, *7*(1), 1–7.

Meum, T., & Munkvold, B. E. (2013). *Information infrastructure for crisis response coordination: A study of local emergency management in norwegian municipalities.* ISCRAM.

Musacchio, G., Falsaperla, S., Bernhardsdóttir, A., Ferreira, M., Sousa, M., Carvalho, A., & Zonno, G. (2016). Education: Can a bottom-up strategy help for earthquake disaster prevention? *Bulletin of Earthquake Engineering*, *14*(7), 2069–2086.

Myers, N. (2021). Information Sharing and Community Resilience: Toward a Whole Community Approach to Surveillance and Combatting the "Infodemic." *World Medical & Health Policy*.

Nacoste, R. B. (1992). Toward a psychological ecology of affirmative action. *Social Justice Research*, *5*(3), 269–289.

Ogie, R., Rho, J. C., Clarke, R. J., & Moore, A. (2018). *Disaster Risk Communication in Culturally and Linguistically Diverse Communities: The Role of Technology*. *2*(19), 1256.

Olshansky, R. B., Hopkins, L. D., & Johnson, L. A. (2012). Disaster and recovery: Processes compressed in time. *Natural Hazards Review*, *13*(3), 173–178.

Omori, H., Kuligowski, E. D., Gwynne, S. M., & Butler, K. M. (2017). Human response to emergency communication: A review of guidance on alerts and warning messages for emergencies in buildings. *Fire Technology*, *53*(4), 1641–1668.

Paci-Green, R., Varchetta, A., McFarlane, K., Iyer, P., & Goyeneche, M. (2020). Comprehensive school safety policy: A global baseline survey. *International Journal of Disaster Risk Reduction*, *44*, 101399.

Paek, H.-J., Hilyard, K., Freimuth, V., Barge, J. K., & Mindlin, M. (2010). Theory-based approaches to understanding public emergency preparedness: Implications for effective health and risk communication. *Journal of Health Communication*, *15*(4), 428–444.

Pandey, R., Gautam, V., Pal, R., Bandhey, H., Dhingra, L. S., Sharma, H., Jain, C., Bhagat, K., Patel, L., & Agarwal, M. (2020). A machine learning application for raising wash awareness in the times of covid-19 pandemic. *ArXiv Preprint ArXiv:2003.07074*.

Peters, R. G., Covello, V. T., & McCallum, D. B. (1997). The determinants of trust and credibility in environmental risk communication: An empirical study. *Risk Analysis*, *17*(1), 43–54.

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

Petridou, E., Danielsson, E., Olofsson, A., Lundgren, M., & Große, C. (2019). If crisis or war comes: A study of risk communication of eight European Union member states. *Journal of International Crisis and Risk Communication Research*, *2*(2), 207–232.

Phillips, D., & Morrow, J. (2008). Reflective practice in postgraduate midwifery education. *British Journal of Midwifery*, *16*(7), 463–467.

Piotrowski, C., & Armstrong, T. R. (1998). Mass media preferences in disaster: A study of Hurricane Danny. *Social Behavior and Personality: An International Journal*, *26*(4), 341–345.

Quinn, S. C., Thomas, T., & McAllister, C. (2005). Postal workers' perspectives on communication during the anthrax attack. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, *3*(3), 207–215.

Rahmi, R., Joho, H., & Shirai, T. (2019). An analysis of natural disaster-related information-seeking behavior using temporal stages. *Journal of the Association for Information Science and Technology*, *70*(7), 715–728.

Renn, O. (1999). A model for an analytic– deliberative process in risk management. *Environmental Science & Technology*, *33*(18), 3049–3055.

Renn, O., & Levine, D. (1991). Credibility and trust in risk communication. In *Communicating risks to the public* (Vol. 1–Book, Section, pp. 175–217). Springer.

Reuter, C., Ludwig, T., Kaufhold, M.-A., & Spielhofer, T. (2016). Emergency services' attitudes towards social media: A quantitative and qualitative survey across Europe. *International Journal of Human-Computer Studies*, *95*, 96–111.

Reuter, C., & Spielhofer, T. (2017). Towards social resilience: A quantitative and qualitative survey on citizens' perception of social media in emergencies in Europe. *Technological Forecasting and Social Change*, *121*, 168–180.

Reynolds, B. J. (2011). When the facts are just not enough: Credibly communicating about risk is riskier when emotions run high and time is short. *Toxicology and Applied Pharmacology*, *254*(2), 206–214.

Reynolds, B., & W. SEEGER, M. (2005). Crisis and emergency risk communication as an integrative model. *Journal of Health Communication*, *10*(1), 43–55.

Rohrmann, B. (1992). The evaluation of risk communication effectiveness. *Acta Psychologica*, *81*(2), 169–192.

Ronan, K. R., Crellin, K., & Johnston, D. (2010). Correlates of hazards education for youth: A replication study. *Natural Hazards*, *53*(3), 503–526.

Ruggiero, A., & Vos, M. (2015). Communication challenges in CBRN terrorism crises: Expert perceptions. *Journal of Contingencies and Crisis Management*, *23*(3), 138–148.

Sandman, P. (2007). What kind of risk communication does pandemic preparedness require. *Minneapolis, MN: CIDRAP Business Source*, *Journal Article*.

Saulnier, D. D., Ribacke, K. B., & von Schreeb, J. (2017). No calm after the storm: A systematic review of human health following flood and storm disasters. *Prehospital and Disaster Medicine*, *32*(5), 568–579.

Seeger, M. W., Pechta, L. E., Price, S. M., Lubell, K. M., Rose, D. A., Sapru, S., Chansky, M. C., & Smith, B. J. (2018). A conceptual model for evaluating emergency risk communication in public health. *Health Security*, *16*(3), 193–203.

Shaikh, S. J. (2017). Television Versus the Internet for Information Seeking: Lessons From Global Survey Research. *International Journal of Communication (19328036)*, *11*.

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

Son, C., Sasangohar, F., Neville, T., Peres, S. C., & Moon, J. (2020). Investigating resilience in emergency management: An integrative review of literature. *Applied Ergonomics*, *87*, 103114.

Spialek, M. L., & Houston, J. B. (2018). The development and initial validation of the citizen disaster communication assessment. *Communication Research*, *45*(6), 934–955.

Spialek, M. L., & Houston, J. B. (2019). The influence of citizen disaster communication on perceptions of neighborhood belonging and community resilience. *Journal of Applied Communication Research*, *47*(1), 1–23.

Stabile, B., Simon, K., Thornton, T. E., & Grant, A. (2020). Diversity and Inclusion in Emergency Management and First Response: Accounting for Race and Gender in Codes of Ethics in the United States. *Public Integrity*, 1–20.

Storr, V. H., Haeffele, S., Lofthouse, J. K., & Grube, L. E. (2021). Essential or not? Knowledge problems and COVID-19 stay-at-home orders. *Southern Economic Journal*.

Thaler, T., & Seebauer, S. (2019a). Bottom-up citizen initiatives in natural hazard management: Why they appear and what they can do? *Environmental Science & Policy*, *94*, 101–111.

Thaler, T., & Seebauer, S. (2019b). Bottom-up citizen initiatives in natural hazard management: Why they appear and what they can do? *Environmental Science & Policy*, *94*, 101–111.

Vaughan, E. (1995). The significance of socioeconomic and ethnic diversity for the risk communication process. *Risk Analysis*, *15*(2), 169–180.

Veil, S., Reynolds, B., Sellnow, T. L., & Seeger, M. W. (2008). CERC as a theoretical framework for research and practice. *Health Promotion Practice*, *9*(4_suppl), 26S-34S.

Wackowski, O. A., & Delnevo, C. D. (2016). Young adults' risk perceptions of various tobacco products relative to cigarettes: Results from the National Young Adult Health Survey. *Health Education & Behavior*, *43*(3), 328–336.

Wang, Y., Hao, H., & Platt, L. S. (2021). Examining risk and crisis communications of government agencies and stakeholders during early-stages of COVID-19 on Twitter. *Computers in Human Behavior*, *114*, 106568.

Wendling, C., Radisch, J., & Jacobzone, S. (2013). *The use of social media in risk and crisis communication*. *Journal Article*.

Wood, M. (2019). Resilience research and social marketing: The route to sustainable behaviour change. *Journal of Social Marketing*.

Wray, R. J., Becker, S. M., Henderson, N., Glik, D., Jupka, K., Middleton, S., Henderson, C., Drury, A., & Mitchell, E. W. (2008). Communicating with the public about emerging health threats: Lessons from the pre-event message development project. *American Journal of Public Health*, *98*(12), 2214–2222.

Yildiz, A., Teeuw, R., Dickinson, J., & Roberts, J. (2021). Children's perceptions of flood risk and preparedness: A study after the May 2018 flooding in Golcuk, Turkey. *Progress in Disaster Science*, *9*(Journal Article), 100143.

Young, C., & Jones, R. N. (2019). Effective diversity in emergency management organisations: The long road. *Australian Journal of Emergency Management, The*, *34*(2), 38–45.

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

# 10 APPENDICES

## 10.1 APPENDIX A: THE INTERVIEW GUIDE

Experience

1. **What kind of crisis did you experience during your professional career?**
   - **Objective**: gather the context of the interviewee. Start by making the interviewee focus on the topic and make him/her explain the lived experiences. There is no need for specific details of the experience.
   - As a result, it is desired to get the context of the interviewee and be able to classify the described experiences: natural/man-made disaster events, extreme weather events, social events, critical service events, pandemics.

2. **How did the society help to withstand the crisis and recover from it?**
   - **Objective**: gather examples of society's reaction. The answers will enable us to better understand the context of the experience and the way the disaster was faced. Also, it will centre the content of the interview as it gets focused, concerning the experience, only in the society's participation and relation with first responders and authorities.
   - As a result, it is desired to get a set of good/bad practices concerning societies' behaviour, participation, and collaboration during and after a crisis.

Needs/Expectations

3. **When do you need the involvement of the society: in all the three phases?**
   - **Objective**: be able to understand, under the context of the interviewee, when it is better to prioritise the involvement of society. Relating and considering the previously given answers the aim will be not only to know when the involvement is needed but also why. At this point, the aim is not only to know about past experiences but also to start getting information about the needs of first responders/authorities.
   - As a result, it is desired to get a set of reasons that argue the involvement and contribution of society in the three different phases of the crisis (before, during, after).

4. **What do you need and expect from society when dealing with a crisis? (before the crisis, during the crisis, after the crisis)**
   - **Objective:** directly related to question 3, the aim is to gather specific needs of first responders/authorities from society. The questions start to be more precise at this point. We have started with a very generic question, then got focused on examples about societies' participation and collaboration, followed by the need for societies' participation depending on the phase of a crisis. Now we ask for first responders/authorities' needs. Not what has been done, but what is needed from society so that first responders/authorities face better a crisis. Having into account the 9 dimensions of societal resilience we are using. Based on the profile of the interviewee we can focus on some (3-4) of the following dimensions: ○ to improve the **communication** with the population, ○ to enhance **society's risk awareness**,

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

- to facilitate the **resources allocation** from or to the population, ○ to improve the **information and knowledge sharing** with the population, ○ to improve the **society's Preparedness** to deal with crises, ○ to promote **social networks and relationships** among the population, ○ to improve the **population trust** towards authorities and emergency organisations,
- to improve the **society's involvement** in dealing with crises, ○ to empower society in **governance and leadership** activities.

- As a result, it is desired to get a set of needs and classify them in the three different phases of the crisis (before, during, after) if possible.

Communication

5. **How do you (authorities and first responders) develop messages to the public (before, during, after the crisis)?**
   - **Objective**: To understand the process of developing messages for the public. Who is taking part in this process? How it is being done? Who are the advisors, if any? Are there any written policy/guidelines? **Note:** If there are written policies/guidelines, please kindly ask the interviewee whether it is possible to share them with us, and if the answer is yes, please ask them to send the guidelines to you.
   - As a result, it is desired to get a description of the process and a list of roles who takes part in it. And any additional written material regarding guidelines/policy.

6. **What information do you (first responders and authorities) share (before, during, after the crisis)?**
   - **Objective**: gather the type of information that is shared during the crises. Here the interviewee can go back to a context and a case. The aim is for the interviewee to identify examples of shared information (from first responders/authorities to society) taking into account the phase of the crisis the information was shared. In this sense specifying the aim of first responders/authorities when sharing the information will be interesting.
   - As a result, it is desired to get a set of examples and classify them in the three different phases of the crisis (before, during, after) if possible.

7. **How do you share information? How do you communicate with the public?**
   - **Objective**: The idea is to gather the type of channels used to share information in both directions, from first responders/authorities to society and vice versa, which channels are used, whether different channels are used for different goals (e.g. different messages in each channel)/publics. As part of the discussion of communication channels, it is also important to understand which roles in the organisation are in charge of sharing the information (PR? New Media specialist? No media-related role?)
   - As a result, it is desired to get the list of channels to share information and verify if the channel was the most appropriate.

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

8. **What information, shared by society, is relevant to first responders and authorities? How can it be useful?**
   - Objective: The aim is to gather the type of information society share during crises. Consider the three phases of a crisis, is there any difference? And argue if it is useful or even applied for first responders/authorities to better face the crisis.
   - As a result, it is desired to get a set of examples, address their impact on the crisis management and classify them in the three different phases of the crisis (before, during, after) if possible.

9. **How does the shared information, both by you (authorities and first responders) and the society, can succeed in achieving its target? Why? How do you measure success?**
   - **Objective**: To understand how the organisation measures success and understand why certain types of information are successful and others are not. Also, according to the goals of the society. It is important to understand what are exactly the components for "successful" information, as the interviewee perceives it. Moreover, it is important to understand how do they measure success? Do they have a tool for measuring digital metrics? Is it only about the popularity of the message? Other things?
   - As a result, it is desired to get a list of components for success, measurements for success, and most successful channels.

10. **How do you handle diversity (e.g. gender, culture, nationality) in designing messages for the public and using various communication channels (before, during, after the crisis)?**
    - **Objective**: to understand whether and how the organisation handles diversity in designing the messages to the public. To understand whether the organisation thinks about diversity, and if so, where does it take place – in designing the message? In thinking about what communication channels to use? The focus here is on gender, culture, and nationality
    - As a result, it is desired to get a set of examples of different messages and uses of communication channels, in the contexts of gender, culture, and nationality, and classify them in the three different phases of the crisis (before, during, after) if possible.

Involvement and Engagement

11. **What solutions do you use to involve society? Is the implementation successful (best practices)**?
    - **Objective**: following the questions concerning communication the aim here is to get a broader answer about formal and informal approaches, strategies, processes, tools, and guidelines to enhance the interaction between the first responders and authorities with society. The aim is to gather a set of solutions either formal or informal that were both successfully or unsuccessfully implemented during the three phases of the crisis and why.
    - As a result, it is desired to get the list of formal and informal approaches, strategies, processes, tools, and guidelines and examples of best practices as well as lessons learned and classify them in the three different phases of the crisis (before, during, after) if possible. The solutions should cover the dimensions identified. Again, we can just focus in some of them based on the profile:

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

○ to improve the **communication** with the population, ○ to enhance **society's risk awareness**,

○ to facilitate the **resources allocation** from or to the population, ○ to improve the **information and knowledge sharing** with the population, ○ to improve the **society's Preparedness** to deal with crises, ○ to promote **social networks and relationships** among the population, ○ to improve the **population trust** towards authorities and emergency organisations,

○ to improve the **society's involvement** in dealing with crises, ○ to empower society in **governance and leadership** activities.

12. **What would you do differently concerning society involvement/engagement?**

- **Objective**: follow question 8, considering the success and unsuccessful tools implementation, the idea is to gather suggestions concerning how to improve societies' involvement. The suggestions should be adjusted to what first responders/authorities can do or might be able to change (their influence area).
- As a result, it is desired to get the list of possible suggestions of how to improve the society's involvement and engagement for first responders/authorities that would improve societies' involvement.

13. **How do you raise societies' risk awareness? Is the time to do it determinant?**

- **Objective**: following societies' involvement, to finish the interview the aim is to ask about how to influence society's risk awareness. So, the aim would be to gather a set of solutions (formal/informal approaches, strategies, processes, guidelines) that are used by first responders/authorities to increase societies' risk awareness and make the difference based on the three phases of a crisis. So, for example, as risk awareness will not be the same after a crisis than before a crisis, the way to interfere with society might differ.
- As a result, it is desired to get the list of tools/methods to raise societies' risk awareness and classify them based on the three phases of a crisis (if possible).

14. **What would you do differently concerning raising risk awareness?**

- **Objective**: follow question 10 and based on the identified practices to raise societies' risk awareness, the idea is to gather suggestions concerning how first responders/authorities might raise risk awareness. The suggestions should be adjusted to what first responders/authorities can do or might be able to change (their influence area).
- As a result, it is desired to get the list of possible suggestions for first responders/authorities that would raise societies' risk awareness.

**To wrap up:**

**If you could request one thing from the society that would facilitate your work in dealing with a crisis, what would it be?**

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

- In this case, we are expecting that they come up with a single sentence such as "Trust towards authorities" or "inform us". This represents their essential need from their society to deal with a crisis in a better way.
- As a result, we will be able to prioritise what are the most important needs or requirements from society for their job in coping with crisis.

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

## 10.2 APPENDIX B: THE SUMMARY TABLE

**Interviewee Code:** Choose an item. Choose an item.
(Please use country code + the number of the interview. E.g., IL1 for the first interviewee in Israel)

# Summary of semi-structured interview

**Country:** Choose an item.
**Gender:** Choose an item.
**Date:** Click or tap to enter a date.
**Type of organisation (do not include identifiable information):** Click or tap here to enter text.
**Type of role (do not include identifiable information):** Click or tap here to enter text.

| Category (Q) | Topic | Answers from the interview |
|---|---|---|
| **Past crisis experience (Q1)** Please highlight the type of disasters they faced | Experience #1 -nature related -extreme weather -pandemics -social disruption -critical infrastructure | |
| | Experience #2 -nature related -extreme weather -pandemics -social disruption -critical infrastructure | |
| | Experience #3 -nature related -extreme weather -pandemics -social disruption -critical infrastructure | |
| **Society's role in past disasters (Q2)** | What was the society's role? | |
| | What did the society do correctly in this crisis? | |
| | What did the society do incorrectly in this crisis? | |
| **Society's involvement** | Do you want the society to be involved **before** the crisis and if so, why and what for? | |

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

| | | |
|---|---|---|
| **When and why? (Q3)** | Do you want the society to be involved **during** the crisis and if so, why and what for? | |
| | Do you want the society to be involved **after** the crisis and if so, why and what for? | |
| | Can you prioritise the society's involvement in these phases (before, during, after), how do you think they should be ranked and why? | |
| **Needs and expectations from the society**<br>**What do you need and expect? (Q4)**<br>• Cover just 3 or 4 dimensions; based on the profile of the interviewee.<br>• Highlight the phase of crisis handling process (before, during, after) | to improve the **communication** (bi-directional) with the population | |
| | to enhance **society's risk awareness** | |
| | to facilitate the **resources allocation** from or to the population | |
| | to improve the **information and knowledge sharing** with the population (to and from the citizens) | |
| | to improve the **society's Preparedness** to deal with crises | |
| | to promote **social networks and relationships** among the population | |
| | to improve the **population's trust** towards authorities and emergency organisations | |
| | to improve the **society's involvement** in dealing with crises | |
| | to empower society in **governance and leadership** activities | |
| **Developing Messages (Q5)** | **Who is responsible and who participates in the process? (Roles)** | |
| | **How is it done?** | |
| | **Who are the advisors (if any?)** | |
| | **Are there any written communication policies/guidelines? If yes – can you provide them?** | |

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

| | | |
|---|---|---|
| | **Other important information regarding developing messages:** | |
| **Information Sharing – What (top-down) (Q6)** | **What type of information is being shared in all phases of crises?** | |
| | **What differences do you perceive in types of information in varied phases of crises?** | |
| | **What is your aim in sharing information with the public? How do you decide what information to share?** | |
| | **Examples from three cases/contexts before, during, and after an adversity:** | |
| | **Other important information regarding information sharing (what):** | |
| **Information Sharing – How (top-down and bottom-up) (Q7)** | **What communication channels are used to communicate with the public (top-down and bottom-up)?** | |
| | **Can you describe different channels for different goals?** | |
| | **Which entities are in charge of the communication process with the public and what are their roles?** | |
| | **Other important information regarding information sharing (how):** | |
| **What information is relevant (bottom-up) (Q8)** | **What type of information do communities share in all phases of crises? What information do you expect to receive from the public and at what stages of the crisis?** | |
| | **Differences between the phases of crises:** | |
| | **How can it be useful and improve crises management?** | |
| | **Other important information regarding relevant information:** | |
| **How does the information** | **How do you measure effectiveness and success (e.g., tools? Popularity? Digital Metrics? Other data?)** | |

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

| | | |
|---|---|---|
| **achieve its target? (Q9)** | **What types of information are effective? What types are not? Why? – top-down** | |
| | **What types of information are effective? What types are not? Why? – bottom-up** | |
| | **Components of "successful" information (both top-down and bottom-up):** | |
| | **What are the most successful communication channels? The least? Why? (both top-down and bottom-up)** | |
| | **Other important information regarding achieving targets:** | |
| **Diversity (Q10)** | **Is there overall thinking about diversity in designing the message and communicating risks? If yes, are there any written policies/guidelines?** | |
| | **Where does the thinking about diversity occur (e.g., designing the messages, choosing the communication channels)?** | |
| | **Focus on gender:** | |
| | **Focus on culture:** | |
| | **Focus on nationality:** | |
| | **Handling diversity in the different phases of crises:** | |
| | **Other important information regarding diversity:** | |
| **Engagement (Q11)**<br>• For each solution, highlight the phase of crisis handling process | What kind of **formal** approaches/solutions do you use to involve the society in facing a crisis? | |
| | Were the solutions effective and why? Can you provide examples? | |
| | Best practices | |
| | Lessons learned | |
| | What kind of **informal** approaches/solutions do you use to involve the society in facing a crisis? | |

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

| | | |
|---|---|---|
| (before, during, after)<br>• Highlight which dimension the solution covers (resource allocation, social networks and relationships, Preparedness, society's involvement, population trust, governance and leadership) | Were the solutions effective and why? Can you provide examples? | |
| | Best practices | |
| | Lessons learned | |
| **Engagement reflection (Q12)** | Reflecting on the previous questions, what would you do differently? | |
| **Risk awareness (Q13)** | What kind of tools and approaches do you use to influence society's risk awareness **before** a crisis happens? | |
| | What kind of tools and approaches do you use to influence society's risk awareness **during** a crisis? | |
| | What kind of tools and approaches do you use to influence society's risk awareness **after** a crisis happens? | |
| | What are the main differences between the approaches you use in each of the crisis phases (before, during, after)? | |
| **Risk awareness reflection (Q14)** | Reflecting on the previous questions, if you can do something differently, what would you do? What kind of resources do you wish you could have etc.? | |

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

| | | |
|---|---|---|
| **Wrapping up** | If you could request one thing from the society that would facilitate your work in dealing with a crisis, what would it be? | |
| Other important information from the interview: (Add as many rows as needed. There is no need to classify the other information) | **1** | |
| | **2** | |
| | **3** | |
| | **4** | |
| | **5** | |
| | **6** | |
| | **7** | |
| | **8** | |

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

## 10.3 Appendix C: Table 2. A list of communication channels used by authorities and first responders (the full table).

| Category | Source | Description | Used by | Used during |
|---|---|---|---|---|
| **Traditional Channels** | Brochures | Printed information about risks. | Authorities & First Responders | Before, during and after crises |
| | Booklets | Printed booklets with information, numbers for emergencies and other relevant data. | Authorities & First Responders | Before and after crises |
| | Reminders (magnets, keychains) | Includes important information that can be put with the key or on the door of the house as reminders | Authorities & First Responders | Before crises |
| | Written Instructions | Written papers with instructions on what to do during emergencies | Authorities | Before and during crises |
| | Information call-centres | Call-centres dedicated to giving information | Authorities & First Responders | Before, during and after crises |
| | Emergency call-centres | Call-centres for cases of emergency | First Responders | During crises |
| | Advising/Consultation hotlines | Call-centres for advising | Authorities & First Responders | Before, during and after crises |
| **Mass Media** | Ads (Television, Radio, Newspaper or other Internet websites) | Paid ads with relevant information about risks | Authorities & First Responders | Before, during and after crises |
| | News Programs or articles (Television, Radio or Internet TV) | Professional interviewees from emergency organisations | Authorities & First Responders | Before, during and after crises |
| | Other Television/Radio/Internet shows | Professional interviewees from emergency organisations | Authorities & First Responders | Before, during and after crises |
| | Content Marketing (Newspapers or Internet websites) | Paid articles by organisations, sometimes in the form of an independent magazine | Authorities and First Responders | Before crises |
| **Interpersonal Communication** | "Preparedness Guard" | A regional list of persons with various competencies or resources that the organisation might contact for help if there's a crisis | First Responders | Before, during and after crises |
| | Education Plans – in Schools | Educating programs about risk awareness for students in schools | Authorities & First Responders | Before crises |
| | Education Plans – in Community | Educating programs about risk awareness for other members of the community | Authorities & First Responders | Before Crises |

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

| | | | | |
|---|---|---|---|---|
| | Community leader | Community members that get training in risk management and serve as leaders in crises | Authorities & First Responders | Before, during and after crises |
| | Community Meetings | Meetings between emergency professionals in the community and community members | Authorities & First Responders | Before and after crises |
| | Volunteer Groups | Organising groups of volunteers that can help during crises | First Responders | Before and during crises |
| | Community Patrol | A civil patrol of community members | Authorities & First Responders | Before and during crises |
| **Mobile Phones (Apps)** | Information Apps | Apps that provide information regarding risks, how to get protected and behave in crises | Authorities & First Responders | Before and during crises |
| | Warning Apps | Apps that allow receiving warnings in cases of disasters | Authorities | During crises |
| | Reporting Apps | Apps that allow citizens to report authorities and first responders about occurrence | Authorities & First Responders | During and after crises |
| | Emergency Contact Apps | Apps that allow citizens to contact emergency first responders | First Responders | During crises |
| | Educational Apps | Apps which aim to educate society | Authorities & First Responders | Before crises |
| | Volunteer Management Apps | Apps which are used for first responders to communicate with volunteers and not with the public | First Responders | Before, during and after crises |
| | City-Connect App | Used by municipalities to maintain the communication with community members and provide information about risks | Authorities | Before, during and after crises |
| **Mobile Phones (Messaging & Text)** | Facebook Messenger | Using Facebook messenger for receiving information and sending information | Authorities & First Responders | Before, during and after crises |
| | WhatsApp | WhatsApp groups, including community groups, for questions and getting information | Authorities & First Responders | Before, during and after crises |
| | Telegram | Telegram groups, including community groups, for questions and getting information | Authorities & First Responders | Before, during and after crises |
| | Viber | Viber communities, including community communities, for questions and getting information | Authorities & First Responders | Before, during and after crises |
| | Other Messaging Apps | Same as above, but with other, less popular, messaging apps | Authorities & First Responders | Before, during and after crises |

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

| | | | | |
|---|---|---|---|---|
| | Alert Systems - Warnings through Cell Broadcast Messages (CBM) | Systems which allow sending Cell Broadcast messages to warn and alert citizens in case of emergency, according to the legal provisions. Used in major disasters. | Authorities | During crises |
| **Social Media** | Facebook – Pages | Pages in Facebook for dissemination of information | Authorities & First Responders | Before, during and after crises |
| | Facebook – Groups | Groups that allow also interaction and feedback from the users. Mostly by municipalities | Authorities | Before, during and after crises |
| | Twitter | Used to disseminate information and interact with other users and organisations | Authorities & First Responders | Before, during and after crises |
| | Instagram | Disseminating visual content | Authorities & First Responders | Before, during and after crises |
| | TikTok | Disseminating visual content – entertainment | Authorities & First Responders | Before and during crises |
| | YouTube | Disseminating visual content – videos | Authorities & First Responders | Before, during and after crises |
| | LinkedIn | Maintaining professional interactions | Authorities & First Responders | Before crises |
| **Websites** | Information Websites | Providing information about risks | Authorities and First Responders | Before, during and after crises |
| | Engaging Websites | Engaging users in risk management | Authorities and First Responders | Before, during and after crises |
| | Donation Websites | Collecting donations for emergency organisations and their activities | First Responders | Before, during and after crises |
| **Innovative and emerging technologies** | AI-Chatbot Coronavirus symptoms analyser | Chatbot for reporting about possible symptoms of coronavirus and receiving health recommendations | Authorities | During crises |
| | AI-Chatbot Coronavirus information | Chatbot for receiving information about COVID-19 and the coronavirus | Authorities | During crises |
| | AI-Chatbot General health "triage" | Chatbot for health "triage" – non diagnostic (only emergency/not emergency) | Authorities & First Responders | During crises |
| | AI Facebook Messenger chatbots | Facebook messenger technology-based chatbots | Authorities | Before, during and after crises |
| | Viber chatbots | Viber technology-based chatbots | Authorities | Before and during crises |

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

| | | | | |
|---|---|---|---|---|
| **Separate/Independent Networks** | Crisis Information Management | A software which allows the management of all occurrences during a crisis. It allows sending messages and warnings to the public during the event. | Authorities and First Responders | During crises |
| | iDAWG systems | A technology which facilitates machine to machine communication. It can capture and share the transmission of multiple first responders | First Responders | During crises |
| | Public safety networks | used for internal and interdisciplinary communication of police, health services and fire brigades | Authorities & First Responders | During crises |
| **Other channels** | Emergency street lamps | Change of colour is a communication tool to alert the citizens in that area, and can be also controlled from distance | Authorities | During crises |
| | Sirens | Notifying on emergencies | Authorities | During crises |
| | Press Conferences | Media events for the public | Authorities & First Responders | Before, during and after crises |
| | Webinars | Professional events | Authorities & First Responders | Before crises |
| | TEDx talks | Professional talks in a TED style | Authorities & First Responders | Before crises |

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