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What do emergency services and authorities need from society to better handle disasters?

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ABSTRACT

Over the last 20 years, disaster events have been increasing with 3.25 billion people affected. The public are not only affected by these incidents but also, they are the first on the disaster scene. To fully utilize the public's potential and define their role in assisting in disaster management, we need to hear the voice of the main responsible for handling a disaster, the authorities, and emergency personnel. Therefore, this paper aims to identify and prioritize their needs through conducting a survey and interviews with members of authorities and emergency organizations in several European Union countries, namely; France, Israel, Italy, Norway, Romania, Spain, and Sweden. The highest-ranked needs identified are getting credible information as soon as possible from the disaster scene as well as following authorities' recommendations. Additionally, this study identifies some barriers associated with the engagement of society in disaster management. An example of such a barrier is that citizens could hurt themselves or others and hamper the intervention efforts through their interference. Despite the barriers, the emergency organizations are in favor of engaging the society in the response and recovery phases. The identified needs and barriers help to define procedures and policies that can improve the engagement of citizens and consequently, social resilience.

1. Introduction

Economic losses from disasters grew by 82% reaching 2.97 trillion USD in 2000–2019 from 1.63 trillion USD in 1980–1999 [1]. This paper building upon the definition of disasters developed by UNDRR [2] and adapted in the SENDAI framework [3] which defines a disaster as “a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceeds the ability of the affected community or society to cope using its own resources.” To deal with these increasingly complicated crises, emergency organizations are growing in responsibility and manpower [4]. However, emergency organizations are not the only stakeholders in disaster management; members of the community, civil organizations, politicians, media, and the government are also included [5]. Here we are interested in the crucial role of society in the face of disasters [6] since regular citizens are always the first to show up in a crisis [7]. The importance of society's role can be seen in many areas, such as collaboration and cooperation with emergency responders, helping and supporting other members of their society, donating resources, etc [8]. The current coronavirus situation is a good example of such a role, showing how collaboration from the public, following directions from authorities (e.g. mask adherence, social distancing), prevented the situation from worsening [9,10].

To fully leverage the role of society in facing a disaster, we need to know their capacities, abilities, and willingness to participate in

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disaster relief work. We also need to identify what emergency managers and personnel need from members of society in order to capitalize on their capabilities to better handle a crisis. This is the focus of the present article. To the extent of our knowledge, little empirical research has been done to capture the voice of emergency practitioners by gathering direct information about what they need and expect from society to better deal with crises [11,12]. Identifying these needs from the practitioners' point of view allows for a proactive engagement of the society in disaster management. It will also enhance the interaction between emergency responders and the public, which in turn will enhance community resilience [13,14]. Furthermore, this paper pursues to rank and prioritize the main activities the society could do so that they contribute to a better response and recovery from disasters. In turn, this makes it possible to define policies, guidelines, and tools to better harness community capacities in emergencies. Hence, our research question is "What do emergency managers and personnel in Europe need from society members to better handle a crisis?"

To answer our research question we followed an exploratory approach and used two methods to gather the necessary data. The first is an internet-based questionnaire, and the second method is semi-structured interviews. The questionnaire was distributed to authorities and emergency organization personnel in six European countries (France, Italy, Norway, Romania, Spain, and Sweden) and Israel. The countries represent different natures and characteristics which allowed us to have a broader view and enrich our findings. These countries are part of the ENGAGE¹ project, a European project funded by the Horizon 2020 program. The ENGAGE project builds upon the inherent capacities of society to face crises through enhancing the interaction between emergency organizations and members of society. The second method we used was semi-structured interviews. We carried out the semi-structured interviews in the same seven countries, asking more open-ended questions than in the case of the survey. The interviews allowed us to complement the findings of the survey and give context to how and why the participants have these specific needs. Therefore, through the survey and semi-structured interviews, we identified a list of needs and expectations emergency organizations and authorities have from society to better respond and recover from crises. We also examined the responders' risk awareness levels to place the responses in the proper context. Furthermore, existing barriers and challenges when involving civil society in managing crises were highlighted by the experts. Additionally, we provide a foundation for what emergency responders should do to earn society's trust.

The rest of this paper is organized as follows: First, we review prior work about the role of society in disaster management and community resilience research. In Section 3, we describe in detail the methodology used to collect and analyze the data. In Section 4, we introduce the results of the survey and the interviews. After that, we discuss our findings. Finally, in Section 6 we present our conclusions.

2. Literature review

The rising frequency of disasters [1] has drawn more attention to the notion of community resilience, which gives the society the capacity to prepare for risks, deal with the consequences, and recover from the effects. Community resilience has many definitions [15]. The one we use in this article is "the capability of a community to face a threat, survive and bounce back or, perhaps more accurately, bounce forward into normality newly defined by the disaster-related losses and changes. Community resilience is, in effect, a reflection of people's shared and unique capacities to manage and adaptively respond to the extraordinary demands on resources and the losses associated with disasters" [16]. The role of society lies at the heart of the definition. In this direction, several studies have emphasized the importance of the role of community in disaster situations, varying from conceptual disaster management models [17] to case studies [18]. Weil [19] shows how the community helped in the recovery after Hurricane Katrina. Adhikari et al. [20] suggest that the participation of community leaders in training, health promotion initiatives, the establishment of community teams, and volunteering would help reduce the severe side-effects of earthquakes and natural disasters.

Several other studies have shown that spontaneous volunteers may play a crucial role in dealing with disasters [11,21–25]. Spontaneous volunteers are a significant source of timely manpower and can save lives. They can help to carry out basic skills tasks so that emergency responders can focus on specified work to deal with crises [8]. Barskay et al. attempt to better understand how volunteers can help emergency services in dealing with crises [12]. Emergency services believe volunteers can help in a wide variety of tasks on the sites of disasters, such as clearing the site, collecting food, supplies, and money, providing shelter to the victims, or offering medical and psychological aid [8].

Nowadays, the traditional style of organized volunteering that involves a lifelong and demanding commitment is disappearing and more spontaneous, emergent, and episodic volunteering is prevailing [7,26]. Here, technology opens up promising opportunities for fostering citizen collaboration through digitally-enabled technologies [7]. A clear example of this is the use of social media and mobile-based technologies to improve bidirectional communication and information sharing between the citizens and emergency managers [24]. Furthermore, this newer way of volunteering has led to another emergent volunteering trend from private companies called skilled-based volunteering. The companies' skills, training, and experience to develop their activities in their sectors are transferred at a given point to help perform the same activities in disaster management [7,27,28]. This was the case, for example, of a DHL global logistics company in 2004 in the Indian Ocean tsunami. Employees used company vehicles to transport and deliver supplies to disaster-affected areas and even to transport tourists to safe areas [28].

Despite the high potential for volunteering in disaster management, involving civilians in dealing with disasters represents a dilemma. There are several situations in which the presence of volunteers hinders the response activities of emergency organizations, therefore delaying and hampering disaster management [8,11,12,29,30]. Hence, emergency services and organizations need to anticipate, prepare, and have the flexibility to interact with and benefit from emergent volunteers, as bystanders will appear on the

¹ <https://www.project-engage.eu/>.

scene and engage in the emergency whether their help is requested or not.

Society's engagement can be categorized into one of two types: reactive or proactive [31]. The reactive kind appears in the response phase, while proactive involvement emerges in the preparation and planning phases of disaster management [32,33]. The current role of emergent volunteers fits under the category of reactive engagement. However, there is a shift in disaster management strategies from reactive to proactive attitudes [34]. This shift in perspective, accompanied by the lack of research that reflects the point of view of emergency responders and authorities [35], highlights the importance of this article. To properly utilize society's capacities in responding to a crisis, this article aims to understand and identify what emergency managers and personnel need and expect from members of society in order to respond to disasters. This will promote proactive disaster management and make use of the capacities of citizens.

3. Methodology

To identify the authorities' and emergency organizations' needs and expectations from the community we adopted a mixed-methods approach [36]. We gathered quantitative data through a questionnaire combined with qualitative data from interviews. This combination of methods serves two purposes: triangulation and complementarity. We used the interviews to support our findings from the questionnaire (triangulation) and to complement and contextualize the research findings (complementarity). The methodology is shown in Fig. 1.

3.1. Survey

The first method we used to collect the data was an internet-based questionnaire. The questionnaire was designed in English and then translated into all the languages of the seven countries where it was disseminated. It consists of three main components: respondents' risk awareness, needs and expectations, and demographics. These three components include 19 questions which we describe below.

Component 1 (risk awareness): In this component, we evaluate the risk awareness level of the participants through a Likert scale (ranging from 1 "not at all" to 5 "extremely aware"). The scale includes five items representing the five types of risks based on UNESCO's categorization of disasters [2]:

- extreme weather-related events (cyclones, snow, flooding, droughts, and wildfires),
- nature-related events (earthquakes, landslides, tsunamis, volcanoes, and storms),
- social disruptions (massive human displacements, cyber-attacks, terrorist attacks, protests, and riots),
- critical services dependencies (transportation networks, water, and energy),
- and pandemics (contagious diseases).

The main aim of this component is to corroborate the reliability level of the responses gathered from the experts, comparing their risk perception with the actual risks their countries face.

Component 2 (needs and expectations): This component is about authorities' and emergency organizations' needs and expectations from society to enhance societal resilience. Patel et al. [15] identified 9 main elements that describe the concept of societal resilience. These elements are local knowledge, community networks and relationships, mental outlook, governance and leadership, health, preparedness, communication, resources, and economic investment. Two of these elements (economic investment and health) do not relate to the direct involvement of society in enhancing societal resilience; "economic investment" covers the money the government invests in disaster mitigation activities before and after a crisis, while "health" covers the availability and vulnerability of the existing health services. Considering the other seven elements identified by Patel et al. [15], we grouped them into three main constructs, namely, *communication*, *public capacities*, and *public perception* (Fig. 2). These three constructs are the main building blocks of this component of the survey. In the "communication" construct we cover all the questions related to the knowledge the citizens should have when a crisis occurs and how communication between citizens and emergency organizations should take place. As effective communication is crucial to disaster management [37] since it aids in responding and handling the situation and decreasing uncertainties [38]. In the "public capacities" construct, we focus on the skills and resources individuals should have in different phases

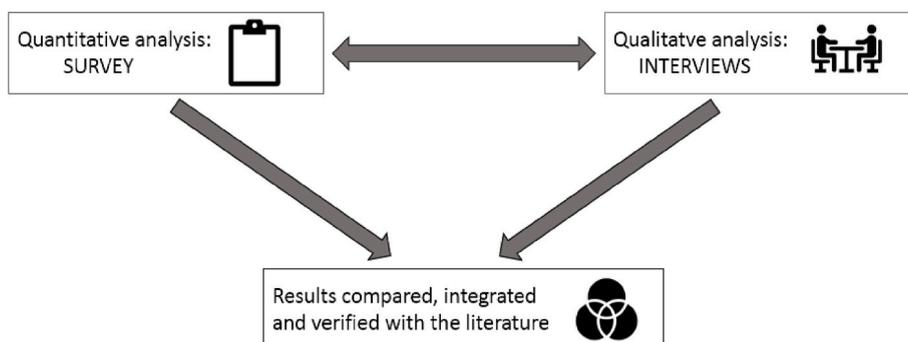


Fig. 1. Research methodology.

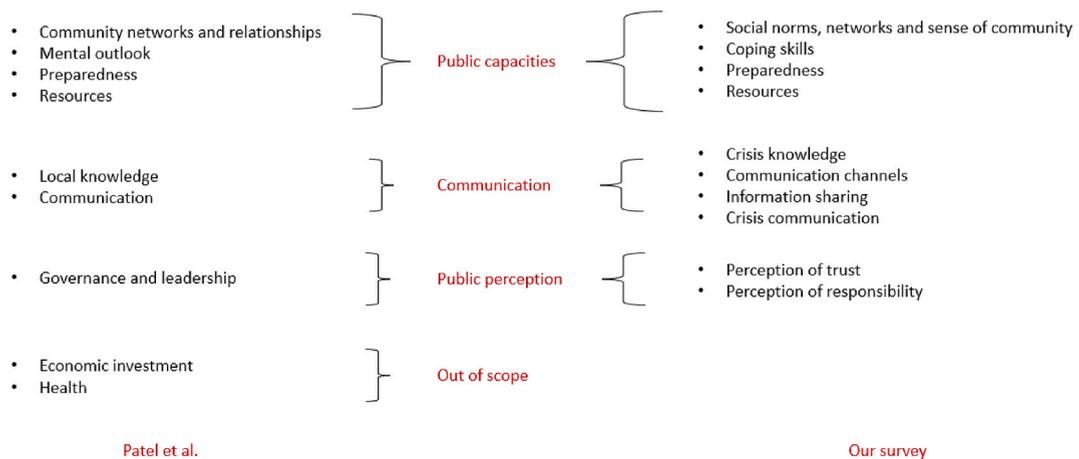


Fig. 2. Linking between Patel et al. societal resilience elements and this study.

of the crisis life cycle. Taking into account that the ability of a community to function well and to quickly adapt to new normality are key aspects to handling disasters [39]. The last construct “public perception” is related to two vital concepts in any kind of cooperation, trust and responsibility. The lack of trust jeopardizes the citizens’ desire to abide by the rules and policies set by the emergency organizations. Considering these three constructs and the objective of this study -which is identifying how society can be involved in disaster prevention and management activities to help emergency organizations in dealing with disasters-we analyzed already existing societal resilience scales [39–45]. We adapted these scales to serve the purpose of our study.

Below we define each of the elements, mentioning the references of validated scales from which we obtained and adapted the corresponding options. The first four elements belong to the “public capacities” construct, the following two elements belong to the second construct “public perception”, and the rest belong to the “communication” construct.

- Social norms and sense of community refers to the implicit rules that exist in society when handling disasters, as well as the degree to which people feel part of their community and assist each other in emergencies [46].
- Coping skills refer to a society’s ability to respond appropriately to a crisis [40,42].
- Resources to face a crisis refer to physical resources such as water, food, medical supplies, and other items that people should have on hand in the event of a disaster [41].
- Preparedness refers to the capacities that society can acquire beforehand to better cope with a disaster. The options we included in the survey for this element were populated based on our knowledge and the literature.
- Perception of responsibility shows which entities should be held accountable for handling a crisis [41].
- Perception of trust reflects how much society trusts the entities in charge of dealing with crises [42].
- Crisis knowledge refers to the forms of information transferred to and from society to know how to cope with disasters. The options for this element were populated based on the literature.
- Communication channels are the outlets used to communicate information from society to emergency responders [43].
- Information sharing focuses on determining the most key parameters to consider when exchanging information [44].
- Crisis communication deals with defining the skills the individuals need to have to properly communicate with emergency services [43,44].

The survey aimed to rank the options to prioritize in which activities the society can help more in dealing with a crisis. We considered that all the options might be important for the emergency responders and therefore, using a rating scale would not have added much value to the study since the differences in values would have not been significant enough. Instead, using a ranking scale would help us to prioritize among the most promising options. Thus, the Best-Worst scaling technique defined by [47] was adjusted for our research. Each element was presented by two questions. The first question requires participants to choose the most relevant option from a list of options within each element that define emergency organizations and authorities’ needs and expectations. The second asks them to choose the least important options. To determine the options that come in the middle, we considered the ones that were not selected in any of the questions. Covering each element with two questions allowed respondents to prioritize the most relevant options without forcing them to assign a rigid order of preference, since all the options could be required to better deal with disasters.

Component 3 (demographics): In this section, we collect data related to respondents’ demographics. There are seven questions spanning gender, age, country of work, job, years of experience, work level, and previous experience dealing with crises.

Additionally, an open-ended question to allow respondents to provide additional information not addressed by the survey was

included.

3.1.1. Data collection

We used the SurveyMonkey² service to host the survey to collect the necessary data. Due to the specific characteristics of the targeted survey respondents, we utilized the Snowball sampling technique to distribute the survey and gather the necessary data. We depended on the project partners in the seven countries to disseminate the survey among their contacts in government and emergency services, who in turn shared the questionnaire with their contacts and colleagues. We aimed to find people with direct experience with emergencies and who came from a variety of backgrounds. The four job profiles we were looking for were:

1. Health services: medical staff, paramedics, and members of NGOs who work in health-related emergencies.
2. Law enforcement: police officers and coastguards.
3. Emergency responders: civil defense, firefighters, and members of the army.
4. Authorities: members of national, regional, and local governments.

We kept the questionnaire open for replies for 45 days.

3.1.2. Analysis

To study the collected data, we divided the survey into four main constructs, the three constructs mentioned in section 3.1 (description of component number 2) plus the risk awareness (component number 1):

- Risk awareness
- Public capacities: questions related to social networks and sense of community, coping skills, preparedness, and resources to face a crisis.
- Public perception: questions related to the perception of trust and responsibility.
- Communication needs: questions related to crisis knowledge, information sharing, communication channels, and communication characteristics.

We used descriptive statistics and visualization tools to study the collected data. In order to create a rank of preferences corresponding to each element of the survey, we used a weighted score considering the responses in the two questions associated with each element. In equation (1) we show how we calculated the score for each option within each element in the question.

$Score_i$ represents the overall score for option i , index j represents the respondent number, and N is the number of responses. The sub-indices b , m , and w stand for best, medium, and worst respectively. x_b^j is a binary variable, it equals to 1 if respondent j chose option i as the best option, and 0 otherwise; similarly x_m^j , and x_w^j . w_b represents the weight assigned to the most important factor, w_m and w_w follow the same logic.

The options ranked as most important are given a weight of 5, the options ranked as least important are given a weight of 1, and the ones that were not selected (middle ones), are given a weight of 3. We used this method to create a rank to be able to determine which answer option (needs in our case) is preferred overall, which one comes in second place, and so on.

$$Score_i = \sum_{j=1}^N w_b * x_b^j + w_m * x_m^j + w_w * x_w^j \quad (1)$$

3.2. Interviews

The second method we employed to collect the necessary data is semi-structured interviews. This allowed us to have more information about authorities and emergency organizations' needs without restricting them to a predefined set of options. Furthermore, it enabled us to contextualize the needs and investigate the disaster phase where they have the highest impact.

3.2.1. Data collection

We carried out the interviews in the seven countries participating in ENGAGE. Before the interview, we shared the interview script with the interviewees to familiarize them with the questions. During the interview, project members conducted the interviews in the participant's mother tongue to make it comfortable for the interviewees. Then, the interviewers transcribed and translated the interviews into English and filled in a specific template with the information to facilitate the analysis process. Participants had the right to withdraw from the interview at any time. They signed a consent form to be part of the study and the data were completely anonymized. Furthermore, the study was approved by the ethical committee in Tel-Aviv university (the project partner in Israel) approval no. 0002752-1.

To ensure consistency, we conducted the interviews with the same job profiles we targeted with the survey.

3.2.2. Analysis

A deductive thematic analysis [48] was used to study the data from the interviews. We considered a deductive approach because we had the main constructs of the survey in mind as our initial themes. We followed the following steps to conduct our analysis:

² <https://www.surveymonkey.com/r/K7T5VZR>.

1. Data familiarization: through reading all the interviews templates and getting an initial idea of what the interviewees are considering as needs, obstacles, and examples of their experiences; and highlighting these points.
2. Initial coding: through reading all the templates again, and adding initial codes to the data excerpts (covering the needs and expectations from society).
3. Codes merging: through collating all the data related to the codes and merging the similar codes.
4. Themes identification: through clustering the codes into potential themes.
5. Themes reviewing: checking if the identified themes are relevant to the codes and data assigned to them, any needed merging, deletion, creation is done in this step.
6. Themes naming: through assigning appropriate names to each theme, that are coherent and represent the idea behind each theme.

4. Results

In this section, we show the results from the questionnaire followed by the findings of the interviews. Also in the interviews section, we link the results from the survey to their explanation from the interviews.

4.1. Survey

4.1.1. Demographics

Table 1 shows the number of responses we received from each of the seven countries. We can see a huge difference between the number of responses across countries, ranging from as few as 17 in Sweden to 5154 in Romania, which resulted in a bias in the data collected. In order to eliminate this geographical bias and analyze the data, we decided to disregard the results from Sweden, France, and Italy, given the small sample size; and sample 200 responses out of the 5154 in Romania. Hence, we have a balanced data set that includes 786 responses distributed across Romania (200), Israel (227), Norway (186), and Spain (173). We used this aggregated data set to conduct our analysis.

66% of the participants are males, while 32% are females, and 2% prefer not to disclose their gender. The distribution of the jobs of the participants is presented in Fig. 3. The figure shows that there are more responders from the third profile (emergency responders) than any other profile. There is also a considerable percentage (9.2%) of responders who prefer not to mention their job. The “other” category includes participants from the Red Cross, volunteer organizations, the army, and civil protection. Regarding the job level of the participants, 40% are employees, 19% are volunteers, 18% come from mid-level management, 16% are top-level management, and 7% prefer not to say. We can see that volunteers and employees represent the majority of our sample.

Table 1
Number of responses per country.

Country	Romania	Israel	Norway	Spain	Italy	France	Sweden
Number of responses	5154	227	186	173	36	24	17

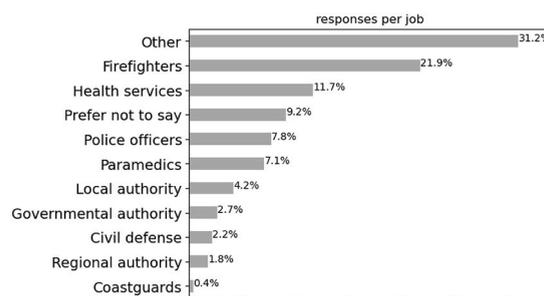


Fig. 3. Distribution of survey participants' jobs.

Table 2
Mean and standard deviation across risks.

Risk type	Extreme weather	Nature related events	Social disruption	Critical services dependencies	Pandemics
Mean	3.13	3.14	3.26	3.19	3.72
Standard deviation	1.25	1.3	1.28	1.27	1.16

4.1.2. Risk awareness

The respondents were asked to rate their awareness level of the following risks: extreme weather events, nature-related events, social disruptions, critical services, and pandemics. The rating was on a scale from 1 “not at all concerned” to 5 “extremely concerned”. Responders also had the option of “do not know”. Table 2 shows that “Pandemics” is the type of risk that responders are concerned about the most. This aligns with the current situation of the coronavirus pandemic. Fig. 4 provides more details about the distribution of the answers across the different types of risks. Looking at Fig. 4, we find that most of the responders are “moderately” or “extremely” concerned about “Pandemics”. On the other hand, participants are more relaxed about the other types of risks, as demonstrated by the increased replies on the “not at all,” “slightly,” and “somehow” scales.

To further investigate the differences in the level of awareness across the five types of risks, we used the Mann-Whitney *U* test. We applied this test as we could not ensure the normality of the responses’ distribution. We hypothesize that the value of the population mean of both types of risks is the same (null hypothesis). Table 3 presents the p-values resulting from the analysis. We accept the null hypothesis when the p-value is higher than 0.05. Considering the table, we can confirm that “pandemics” follows an entirely different distribution than the other categories of risks. Therefore, we can say that the participants are extremely aware of pandemics compared to other types of risks.

4.1.3. Public capacities

In this section, we cover the responses to the questions related to social norms and sense of community, coping skills, resources to face a crisis, and preparedness. We used equation (1) to calculate the rank of options for every element. Fig. 5 shows this ranking across the four elements. By investigating the range (*maximum* – *minimum*) of values for each element, we can determine whether there is an agreement among participants about a certain set of options. The range for “social networks and sense of community” is 23–11.5 = 11.5, “coping skills” = 5.2, “resources to face a crisis” = 6.7, while it is 5.6 for “preparedness”. The range for “social networks and sense of community” is the highest, which shows that there is a consensus among the participants about the most important options in this category. On the other hand, we cannot find this kind of agreement in “coping skills” and “preparedness” categories, as the difference between an option and the following one in each rank is minor.

We can also observe that society’s participation is a key component in all the questions: “volunteering” is ranked first in “preparedness”, “social solidarity” is ranked second in “coping skills,” and “engagement in recovery activities” is ranked second in “social networks and sense of community”. This reinforces the notion that citizens are the foundation of a resilient community; they play a significant role not only during the crisis, but also in the preparation phase and, later, in the coping phase.

4.1.4. Public perception

This section covers the two items in the questionnaire that deal with the perception of trust and responsibility. We asked the participants to name the entities they believe their society trusts the most when it comes to the perception of trust. In terms of responsibility, we asked them to select which parties they believe should be held accountable in the event of a disaster.

Fig. 6 summarizes the participants’ choices regarding the entities most trusted by society. The figure shows that emergency responders and health services are perceived to be more trusted by society than authorities and members of the government. The media and coastguards are the two entities that are perceived to be the least trusted. On the other hand, when it comes to responsibility, we find that members of authorities and the government, especially the national and local ones, are ranked first (Fig. 7). The difference in ranking between trusted and responsible entities poses a problem, especially for national and local authorities. When the most responsible entity (national government) is not trusted this compromises the willingness of the citizens to cooperate and comply with the public policies and laws set by the government. However, the lack of trust could be a double-edged sword, on one hand, citizens may not abide by the rules. But on the other, they could resort to relying on themselves, self-organize, and becoming more proactive in the response and recovery activities.

We investigated the relationship between the job of the respondent and how he/she perceives the most trusted and responsible entities (Tables 8 and 9 in Appendix). We noticed that the majority of the participants believe that the public trust them the most; for instance, firefighters see themselves as the entity most trusted by the public. The same pattern applies to all other profiles except for coastguards, national authorities, and regional authorities. Interestingly, respondents consider themselves responsible for disaster management together with the authorities. This demonstrates a strong sense of responsibility among members of emergency services and the government.

4.1.5. Communication and knowledge sharing needs

In this section, we cover the questions related to communication and information sharing. Looking at Fig. 8, we find that there is a clear ranking of needs across all the questions, except for “needed information”. The range of the responses for each question is as follows: “needed information” (10.8); “information sharing” (15); “communication characteristics” (16.3); and “communication

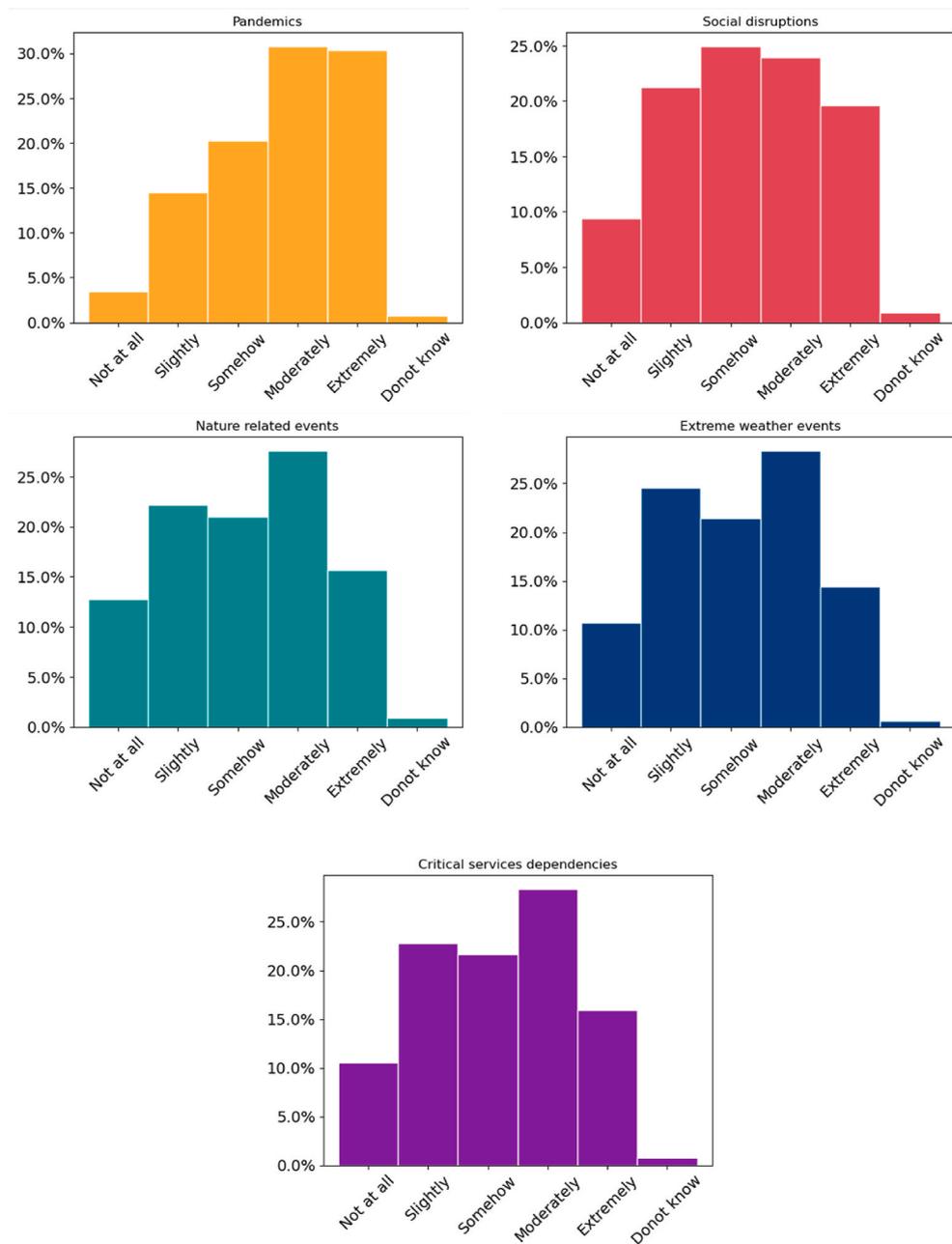


Fig. 4. Participants' level of concern across different kinds of risks.

channels' (19.7).

Responders consider mobile channels such as calls, texts, and messaging applications the most important way for the public to share information on emergencies. Social media comes in the second position. This demonstrates that members of emergency organizations and the government are aware of citizens' behavior and usage of technology in their areas and are adapting their needs to this type of attitude.

Regarding the "information sharing" question, participants find that sharing credible information is crucial, followed by sharing information in a timely matter. Sharing information that diverts citizens' attention is of the least importance. Participants also prefer that individuals share with them only the essential information about what is happening. Moreover, the responders need individuals to be aware of the different emergency plans available and how to execute them.

4.2. Interviews

We conducted 30 interviews: five in Romania, Norway, and Israel; four in Italy, Spain, and Sweden; and three in France. Fig. 9

Table 3
Mann-Whitney *U* test results.

	Extreme weather	Nature related events	Social disruption	Critical services dependencies	Pandemics
Extreme weather		0.8525	0.0558	0.3842	0.0000
Nature related events			0.0920	0.5085	0.0000
Social disruption				0.2976	0.0000
Critical services dependencies					0.0000
Pandemics					

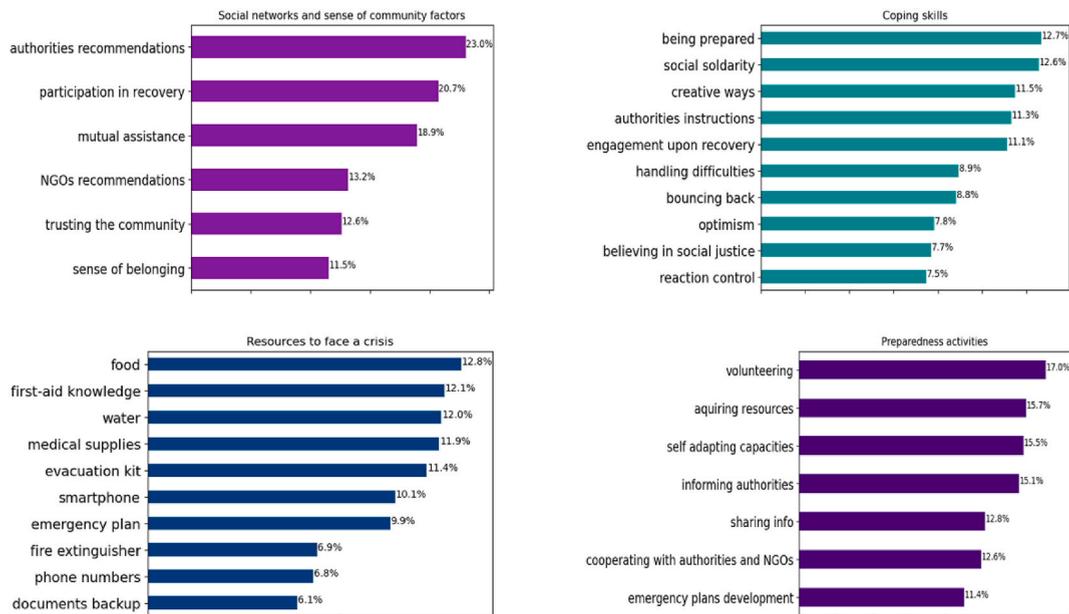


Fig. 5. Public capacities.

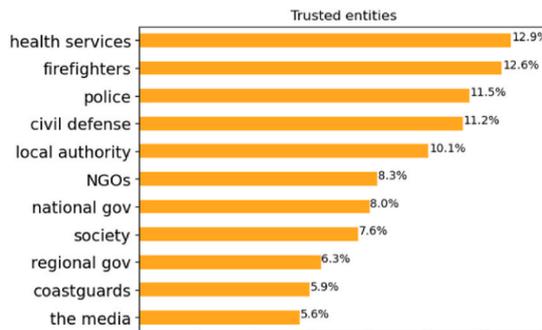


Fig. 6. Trusted entities.

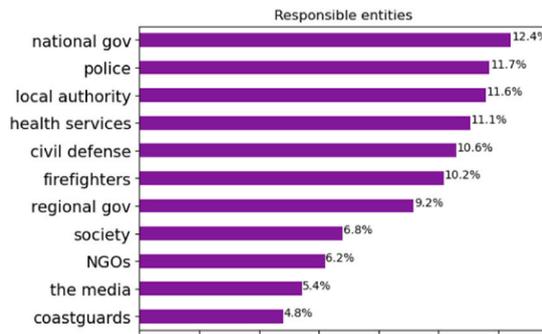


Fig. 7. Responsible entities.

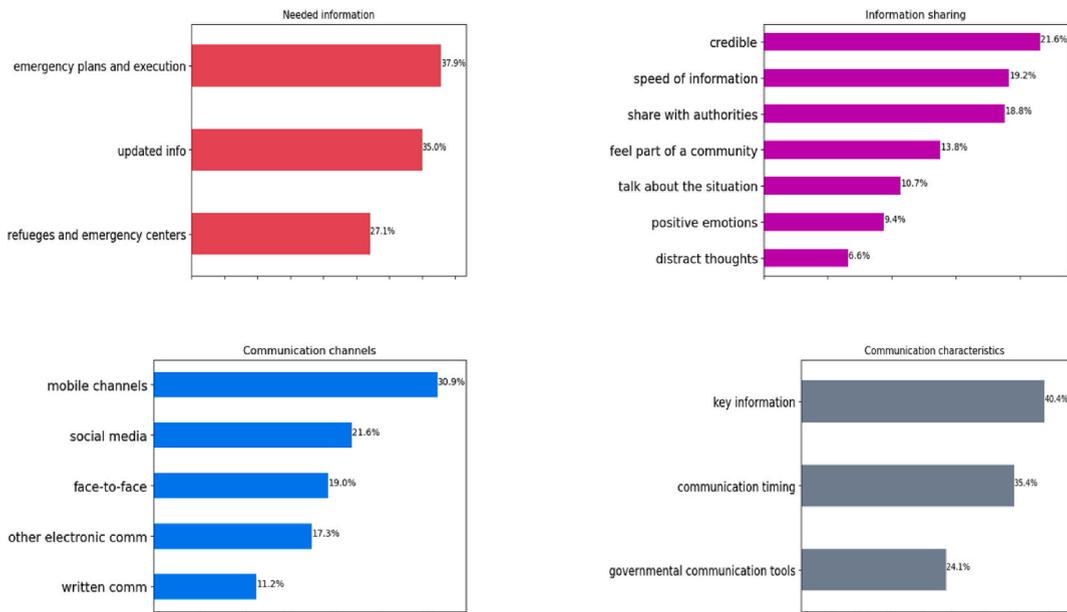


Fig. 8. Communication and knowledge sharing needs.

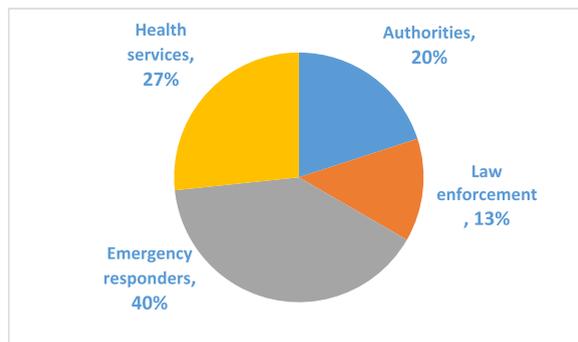


Fig. 9. Percentage of interviews per job profile.

Table 4
Thematic analysis results.

Theme	Code	#interviews
Attitude toward emergency responders	Trusting authorities and responders	9
	Understanding the nature of first responders' job	6
Coping abilities	Showing appreciation and support	5
	Relying on society for recovery	7
	Social solidarity and depending on community networks	7
Information exchange	Bouncing back to normality	6
	Sharing correct information from the disaster scene	11
	Accessing updated info	9
	Local knowledge	7
	Knowing what information to share and with whom	5
Involvement	Not spreading false info and destructive criticism	3
	Following authorities recommendations	16
	Volunteering in organized entities	14
	Providing resources	14
	Being ready to collaborate	9
	Doing simple tasks	7
	Helping victims and each other	5
	Handling the situation till emergency responders come	4
	Citizens shouldn't be an obstacle to emergency responders work	4
	Self-organization	4
	Being independent	3
	Participating in decision making	1
	Preparedness	Being prepared with information about potential risks and how to handle them
Participating in disaster exercises/courses		14
Risk culture		12
Having survival resources		7
Being mentally prepared for disaster implications		4
Utilizing feedback	Embracing lessons learned	4
	Participating in debriefings	3
	Feedback after the crisis	2

shows the distribution of the interviewees' jobs. The majority of interviews were conducted with males (28 interviews) and only two with females. Table 10 (in the appendix) presents the number of interviews per profile in each country.

Table 4 presents the results of our thematic analysis of the interviews. We deduced six main themes from the interviews: 1) attitude toward emergency responders, 2) coping abilities, 3) information exchange, 4) involvement, 5) preparedness, 6) utilizing feedback. We came up with these themes through the deductive thematic analysis process; we can see that themes number 2,3, and (5 and 6) directly correspond to these elements in the questionnaire (coping skills; information sharing, crisis communication, and communication channels; preparedness and resources). In each of these themes, we identified needs and expectations.

The first theme *attitude toward emergency responders* is related to how emergency responders and authorities need citizens to consider that emergency responders are also human beings, which encounter losses and need respect and support. As interviewee (RO3) stated "*Appreciation can be important for the morale of the first responders and for their future interventions. Sometimes, crises have a negative impact on the first responders (i.e.: mental, psychological, etc.) and any kind of support from the community helps at that moment.*" Another responder from Romania (RO1) mentioned that he needs society to be "*empathetic*". Also, participants emphasized the importance of the citizens understanding the nature of their jobs. This helps in many directions; first, if citizens understand the nature of the work of first responders this will save first responders a lot of time explaining what they are doing and what they will do, freeing up this time to do more critical work handling the situation at hand. Second, it will help civilians to know the type of things they should not do to avoid harming themselves and hindering the response process; and what kind of things they can do to help. For example, in case of a fire, citizens can clean the bushes around fire-sensitive areas, facilitating the work of firefighters. Third, such an understanding allows citizens to be patient hence they do not push responders to do things out of their hands. One of the interviewees from Spain (ES2) explicitly asks society for "*patience*". Furthermore, respondents highlighted their need to be trusted by society members since the lack of trust creates disarrangements and hamper the cooperation between emergency responders and citizens to handle crises. According to an expert who works in emergency preparedness in Norway (NO5), "*Trust in authorities is central to crisis management. The voluntary work is directly tied to trust and confidence in authorities, if inhabitants trust the authorities they will follow their advice, recommendations, and instructions because they have faith that these actions will help the society overcome the crisis.*"

In the second theme *coping abilities*, participants describe the role society could play in the aftermath of a crisis, that is, in the recovery phase. They emphasize that community members have the most important role in this phase of the crisis management cycle, as emergency responders have limited resources. This lack of resources in the recovery phase is justifiable as emergency responders' role is limited to coping with the emergency (e.g. wildfires); they are not responsible for housing the people who lost their houses due to the catastrophe or rebuilding bridges that collapsed. An important part of recovery is resuming normality and accepting the new reality. An example of that behavior was mentioned by a participant from Israel (IL1), during the Corona situation, businesses kept

evolving and inventing new ways for business development, teaching was done through Zoom³ and new online and interactive courses were developed to support the routine. Another example that was mentioned by the same interviewee is: during two wars (the Gulf war, and the 2014 Gaza war), when people wanted to leave their homes, which were under missile attacks, they found creative ways to do it such as going to relatives or creating projects that enabled families from more “quiet” zones to host other families from “war” zones. The last example also reflects the importance of having strong social ties that could help affected members of the society to recover and cope with new normality. The importance of community networks was also highlighted by an interviewee from Spain (ES2) who works as one of the directors in the Spanish Red Cross. He mentioned that citizens have lost the sense of being part of a bigger community, especially in urban areas, however, it is important that citizens know their neighbors and create some social networks on which they could depend to assist each other. Another example that was mentioned by an interviewee from Italy (IT2) is “in Trentino (the region where the speaker works) there is a strong network in the community, and its presence made it possible to face emergencies far better than in the rest of the country”.

Regarding the *information exchange* theme, participants emphasize that civilians are their first source of information from the emergency scene. Interviewees explain that citizens are the first ones in the disaster location, having an advantage over emergency responders. It is crucial that citizens share correct information about the disaster situation with emergency responders. For example, in case of war, civilians can provide information about the places where the missiles hit, and the wounded people (IL1), or information about who is injured, the magnitude of their injury, and the location of people, in case of a natural hazard such as the Aquila Earthquake in Italy in 2016 (IT3). One way to make sure of the reliability of information is through citizens sharing footage and images from the disaster scene (ES3, NO1, and NO2). The first interviewee from Norway explains how they utilize citizens’ capacities in this vein; when a citizen calls the emergency center, the operator starts developing a holistic situation overview to direct resources to the callers’ position. The operator might send an SMS with a link to the caller so that the citizen can open up an application that streams his/her cell phone’s camera to the emergency center. This is helpful for the operator and protects the citizen by relieving time and confusion to explain the situation with words. Another type of information that an interviewee from Italy (IT2) wanted from members of the community, is to post online information that could prevent confusion of possible hazards in a specific place. For instance, the expert mentioned if a company is using an electricity generator (that produces a smoke similar to fire smoke for non-expert eyes), the company shall share this information online so people know it is a normal thing and they do not call the firefighters, hence, saving the firefighters’ time, effort and resources.

Moreover, civilians know their communities and neighborhoods the best, so they can provide responders with “local knowledge”. For instance, a participant from Romania (RO5) said “I remember one case when our intervention teams had to save lives because of a flood. It was night and the rescuers’ ability to orient themselves during the night decreases in any emergency, it is not the same as the intervention during the day. We increased the operational capacity, however, it was important to receive support from the local community as they can show you a road or shortcuts, they can guide you, they know the areas and the land.” An interviewee from Spain (ES4) mentioned that they use social media to ask society for such local information, for example, they posted “House X of these people is at risk, do you know where are its inhabitants?” so people reply saying “I know where they are, I will get in touch with them.” Furthermore, interviewees emphasized that citizens need to know what information to share and with whom. For instance, a Norwegian participant (NO1) mentioned an example where the opposite happened, a family called a security company instead of the fire center where the building caught fire. In this case, it took more time for the fire service to arrive, as the family went through the security company. He also mentioned that municipalities must inform the public about the right line of contact. Additionally, the study participants emphasized the importance of following updated news about the crisis, for example, two interviewees from Israel (IL2, IL3) mentioned that citizens should follow municipalities’ communication channels, download relevant applications sign up for newsletters, and join relevant WhatsApp groups. Although these information channels are recommended to be used they are built upon the assumption that electricity and cellular networks are still functioning during a crisis; this was highlighted by interviewee FR1. Moreover, the first Swedish interviewee (SE1) asks this question: “How can we communicate in case of power loss?” It is a dilemma that faces first responders.

Interviewees also emphasized the importance of society’s *involvement* in dealing with disasters. This involvement can take many forms such as helping with resources, following authorities’ recommendations, helping victims, facing the crisis until emergency responders arrive, and volunteering. Regarding following responders’ instructions, interviewees (IL2, IL4) summarize the society’s role in facing a disaster in “*listening to the instruction*”, but interviewee (IL2) also mentions for this to happen emergency organizations should gain citizens trust. Listening to emergency personnel recommendations could spare civilians’ lives, facilitate the crisis handling process, and concentrate the responders’ attention on handling the crisis. In the same vein, society should not be an obstacle to crisis handling efforts. According to one of the Italian participants (IT2), people were sometimes reluctant to leave their houses despite the warnings the fire operators tell them about the possibility of second waves of flood and possible landslides. Likewise, they hinder the crisis handling efforts by parking their cars near fire trucks or taking pictures of the fires. According to a French participant (FR2), in his experience with floods in 2020 and wildfires, members of the society were rather an inconvenience than help since they did not respect security measures and tended to think about their individual properties rather than participating in collective tasks.

Another way for society to be involved in crisis management is through providing first responders with resources. These resources vary from food and water to shelter to special types of machinery. In this direction, an interviewee from France (FR1) describes the population as “*a compassionate population*” since the members of the community provided first responders and victims with electric equipment, accommodation and clothes after a huge hospital fire. Another example was mentioned by a Romanian pilot (RO3), “I remember a situation when I was forced to have a helicopter emergency landing caused by an engine failure. I was not alone, the injured person

³ Video conferencing application (<https://zoom.us/>).

was back in the helicopter. The support received from the local community consisted of offering the transportation means from where the helicopter landed to the hospital, aspects that sometimes are essential, even crucial, in rescue interventions. ". The society also provides resources such as monetary or blood donations to help the impacted personnel. By providing those resources, donations besides psychological support, members of the society are helping each other along with first responders. Moreover, society members not only can support the rescue team with resources but also can do some simple tasks. For example, a participant from Norway (NO1) mentioned that emergency responders could ask some people who are calm and not panicking – due to the fire - to go and wake up their neighbors. They can also search for missing people according to interviewee (NO4). Additionally, he mentions that if people are organized they present more "legs, arms, hands and eyes" which helps responders to handle the crisis. Moreover, citizens cleared bushes around fire-sensitive areas during a wildfire in France in 2019 (FR3). Another example is stacking sacks of sand during floods (FR1). A different direction where the community can be involved is through doing some tasks to handle the situation till emergency responders arrive. For instance, in Romania (according to interviewee RO4), in the Moldavian region, the church had a major impact in covering the time up to the arrival of first responders and providing food and accommodation for the flood victims. In Israel, citizens stopped a Palestinian with a knife who stabbed five people until the police came (IL4), although the participant highlighted that this was a good job, he emphasized that citizens should go away once the police arrive.

Moreover, interviewees highlighted that society members need to be independent. According to interviewee (IL1), the role of society is "to walk by itself", help itself physically and psychologically. For instance, considering the Covid-19 situation, the interviewee claims that in 90% of the cases the public can take care of itself because the emergency organizations gave them the tools to do it (e.g., first aid, epidemiological diary), this will free the time of first responders to only work on urgent cases. Also, participant (NO5) emphasizes the same idea of being independent but this goes hand in hand with risk awareness. Interviewees also explained that they need society to be ready to collaborate, this readiness is related to civilians and NGOs. Regarding civilians, a Spanish interviewee (ES2, one of the directors in the Spanish Red Cross) mentioned that he needs the society to be "available", he was reflecting on his experience working in developed and developing countries, he said that in developed countries people have gone from "a state of responsibility to state of right", so they are expecting that emergency organizations are going to provide them with everything, so they do not make themselves available for collaboration. On the other hand, the role of NGOs is to have collaboration agreements with emergency organizations, based on these agreements they have a specific role and responsibilities to carry out. For example, in Italy, NGOs play a key role in mediating the information to a part of the population (e.g. people with linguistic difficulties).

Relating to being ready to collaborate, almost 50% of the interviewees emphasized the importance of volunteers in the disaster management process. "Volunteerism is crucial" said interviewee (NO3). Volunteers could act as extra "legs, arms, hands and eyes" to the emergency organizations. Volunteering also has an impact on community members' trust in first responders. On one hand, volunteers are part of the community so their family and friends trust them, for example, interviewee (IT2) said "There is a good trust in Trentino due to historic reasons. The fire brigade is based on volunteers and each village has some volunteers. This is very local and appreciated." On the other hand, volunteers work directly with first responders building relationships with them hence, trusting them more. Although volunteering is important, interviewees would rather people join volunteers organizations to best utilize their efforts since spontaneous, emergent volunteers are hard to manage and to reach, and can cause more harm than good in some situations; as they may lack the needed capacities to handle an emergency. By joining organized groups, volunteers acquire the necessary skills to face a crisis; it also makes them easily reachable by emergency responders as part of the collaboration agreements with the volunteers' organizations.

The last code mentioned under this theme is "participating in decision making", although that was mentioned only once by a Spanish firefighter, it is a way of involving society members, by making them co-responsible for the decisions taken, and resolving conflict of interest. The way he mentioned they do it, is in case of a fire, they ask people which place they shall start with to stop the fire, explaining the losses that could result from. They started following this method of involving the citizens in the decision making after they were sued by some of the community members because they chose to stop the fire in a house (a summer house owned by some Dutch people) first, instead of stopping the fire in a park in the neighborhood. So, in this way, people are co-responsible in the decision making, knowing the consequences.

Another theme we identified is related to *Preparedness*. This theme covers how emergency responders need society members to be ready for facing a crisis, what they should do in the "pre" crisis phase. This preparedness could be by having physical resources, mental readiness, and knowledge about potential risks. Regarding the physical resources, interviewees highlight that society members need to have some "survival resources" in their houses to use if a crisis happens; these resources cover food and water for three days, some medicines, and a first-aid kit. Moreover, civilians need to be mentally prepared for crises implications and the losses they may encounter. For example, Participant (NO3) mentioned that mental preparedness is as important as the material one; the population must be aware that the "normal" may change, thus, they need to act differently, COVID-19 is a reminder of that. Being psychologically prepared goes hand in hand with having a risk culture. Having a risk culture is not only about having the information about potential risks or the skills to handle them but also about having the attitude and the understanding that vulnerabilities exist and that there is always a space for improvement. For example, in France, if someone buys a house next to a nuclear power plant, she is subjected to a specialized rescue plan (plan particulier d'intervention), and this is mentioned casually at the moment of buying the house. According to interviewee (FR3), this shouldn't be the case, people should be cautious and eager to know more about the potential risks even when doing something that is not directly related to any kind of risks. Moreover, according to interviewee number five from Israel (IL5),

Table 5
Mean and standard deviation of risks across Israel, Norway, Romania, and Spain.

Risk type	Israel		Norway		Romania		Spain	
	μ	σ	μ	σ	μ	σ	μ	σ
Extreme weather	2.6	1.2	2.94	1.15	3.32	1.17	3.75	1.14
Nature related	3.11	1.29	2.66	1.16	3.51	1.29	3.28	1.27
Social disruptions	3.25	1.21	2.82	1.14	3.3	1.36	3.62	1.22
Critical services dependencies	3.05	1.26	3.03	1.15	3.3	1.31	3.44	1.27
Pandemics	3.55	1.15	3.44	1.0	3.63	1.19	4.28	1.08

people need to notice the early signs of fires, report and evacuate even if the fire looks distant. According to participant (RO4), having a risk culture also means that citizens should be dropping the attitude of “*this is not going to happen to me*” and learning from where to get the essential information, protecting themselves and their properties.

Having the necessary information about potential risks and how to handle them, is also part of being prepared. According to interviewee (IL5), having the necessary information could save lives, for example in case of a fire, citizens need to know when and how to evacuate and what not to do. Italian participant number two (IT2) mentioned that not only do people need to know what to do and how to act in case of an emergency, but also they need to know their roles, the effect of their actions, how to cooperate with the rescuers, and how not to hinder rescuers work. Interviewee (ES3) highlighted that citizens need to learn some vital techniques, such as controlling a hemorrhage, doing CPR (Cardiopulmonary resuscitation). They should also follow some protocols to enhance their preparedness, such as Protocol Ibero in case of a terrorist attack. Also, in Norway, participant (NO5) mentioned that he would like individuals to be aware of the available self-preparedness campaign such as the DSB (Norwegian Directorate for Civil Protection) one. One way to have the necessary information about potential risks is through training, exercises, including risk classes in the school curriculum, and emergency drills. Interviewee number four in Romania (RO4) gave an example of how attending training sessions and drills could help, “*in case of floods, some communities help their citizens without the involvement of any authority (either local or central). Thus, the local community was organized enough to offer the necessary support to its citizens, this being the result of training and awareness activities that have been conducted with both decision-makers and citizens (to prepare in advance and to help each other, without relying on support - in the first phase - from outside the community).*” Another Romanian interviewee (RO5) reflects on his experience saying that “*We conduct preparedness and evacuation exercises in case of an earthquake, flood or fire, in schools, in the private sector, etc., and we check how employees and other personnel contribute to the application of procedures, basically to see if they are responsible and ready to intervene in a crisis or emergency. Thus, it is necessary to insist on promoting behavioral measures before, during, and after a crisis*”.

The last theme relates to *utilizing feedback*, the idea of embracing lessons learned and learning from what happened in the past and applying this knowledge to new crises was highlighted by four interviewees (IL1, IT4, SE4, and RO4). Moreover, participation in debriefing sessions was promoted by three interviewees (NO2, NO3, and RO3). Participant (NO2) mentioned that emergency responders are seldom in contact with people after the event, except for when debriefing is offered to citizens (outsiders) that helped in the situation; such a situation allows them to benefit from citizens’ opinions. In the same direction, two participants from Romania (RO1, RO3) mentioned that they need the society to provide feedback after the crisis; on one hand, it allows for improvement, on the other hand, it shows appreciation to the responders’ efforts - of course, if it is positive – which is important for the responders’ morale.

5. Discussion

5.1. Insights about risk awareness

By examining the results from the risk awareness construct in the survey, we can determine to what extent the survey respondents’ perception of risk aligns with what is happening in their countries.

To be able to map the risk awareness level to the countries, we calculated the mean and standard deviation of responses based on the country (Table 5). The table shows that pandemics is the type of risk everyone is extremely aware of in all the countries. This is justifiable given the current COVID-19 situation; that is why we will consider the risk in the second place as the most representative risk a country faces. In Israel, respondents are most concerned about “social disruptions”, while in Spain, the greatest concern is “extreme weather conditions”. “Nature-related event” and “critical service dependencies” are the kind of risks responders are most aware of in Romania and Norway, respectively. In general, Norwegian respondents are more relaxed about the various categories of risks than respondents from other countries.

We compiled the data in Table 6 from several sources (Tables 11–14 in Appendix, the data sources used to compile these tables are [53–71]) to investigate how well survey respondents’ perceptions of risk correlate with what is taking place in their countries (apart

Table 6
Number of deaths associated with each risk type in the last 20 years across the four countries.

Risk Type	Israel	Norway	Romania	Spain
Extreme weather	83	69	768	826
Nature related events	7	19	38	291
Social disruptions	1343	78	0	268
Critical services dependencies	909	850	170	698
Pandemics	6407	781	29,716	73,744

	IS_Auth	NO_Auth	NO_ER	NO_HS	NO_LE	RO_Auth	RO_ER	RO_HS	SP_Auth	SP_ER	SP_HS	SP_LE
IS_Auth		30.1	29.9	27.6	34.2	26.8	27.7	28.2	30.6	25.7	25.1	29.3
IS_HS	14.3	32.9	30.7	27.1	37.0	22.0	20.8	20.9	32.0	25.4	24.5	28.0
NO_Auth						39.1	42.4	43.0	24.1	26.8	26.0	26.0
NO_ER		17.2				37.6	40.4	41.4	28.5	27.8	25.7	26.6
NO_HS		17.9	12.9		26.2	35.3	37.4	37.3	27.7	26.6	24.3	26.7
NO_LE		23.2	20.2			42.7	45.7	47.2	34.7	32.7	31.9	31.0
RO_Auth									39.3	32.7	32.8	32.0
RO_ER						16.2			39.9	30.0	31.0	31.7
RO_HS						18.4	7.0		39.1	29.7	30.8	32.5
SP_ER									17.7			
SP_HS									21.2	13.6		16.1
SP_LE									20.1	12.9		

Fig. 10. Euclidian distance between job profiles across countries (IS = Israel, NO = Norway, RO = Romania, SP = Spain, Auth = authorities, ER = emergency responders, HS = health services, and LE = law enforcement).

from pandemics). The table presents the number of deaths per risk type in each country. These numbers are used as a proxy⁴ to indicate the impact of various types of risks in a particular country. We used the number of deaths as a proxy instead of the economic indicator based on the assumption that the value of human life is equivalent in all countries, while this is not the case about a dollar worth of damage, because it is highly dependent on the income level of the country and its ability to access financial resources for reconstruction activities [49]. Another factor that we took into consideration is the data availability of the economic losses, it was difficult to obtain economic losses data compared to the number of deaths. Respondents' risk perceptions line up with the data in the table on Spain, Norway, and Israel. However, the case of Romania is different since participants are more aware of natural disasters, but the number of deaths shows that they should be more concerned about extreme weather events.

The analysis shows that the results are reliable enough, as the responses from three out of four countries align with the real situation in these countries. Even the deviation in the case of Romania could be because nature-related events and extreme weather events can be easily confused.

5.2. Similarities and differences across countries

We did a similarity analysis to test the extent to which the countries or job profiles cluster together. In this analysis, we considered the data from the four countries: Israel, Norway, Romania,⁵ and Spain. In each country, we divided the data into the four job profiles; health services, law enforcement, emergency responders, and authorities. The number of profiles included from each country depends on the sample size. For example, in Israel we got 227 responses, 142 of which belong to responders from health services, 4 to law enforcement, 8 to emergency responders, 29 to authorities, and the "other" category includes the remaining 44 responses. Hence, we only considered two profiles from Israel in the analysis: health services and authorities. The same logic was applied to the other three countries. From Norway and Spain, we included the four job profiles, while from Romania, we included all the profiles except law enforcement. In total, we had 13 (2 + 4 + 4 + 3 = 13) profiles across the four countries. The distribution of responses per profile per country is shown in Table 15 (in the Appendix).

We used the Euclidean distance as a measure of similarity between the different profiles. Euclidean distance measures the distance between two (or more) points in a plane, as shown in equation (2). The number of dimensions we used to calculate the distance is equivalent to the total number of alternatives in all the questions (excluding the ones related to demographics). Each data point represents a profile in one of the countries.

⁴ This is not a particularly precise indicator as it does not take into account the frequency of the event and the likelihood of its occurrence, but it was difficult to gather enough data to support this type of analysis.

⁵ We used the whole data set of Romania in this analysis.

Table 7
Top 10 alternatives across all constructs.

#	Option	The question is related to	Number of times the option was chosen as the most relevant	Percentage of respondents who choose an option as most relevant
1	mobile communication channels (calls, texts, including texting apps)	Communication channels	686	87.3%
2	credible information	Information sharing	661	84.1%
3	speed of information (providing information as fast as possible)	Information sharing	539	68.6%
4	share with authorities (ability to actively share information with the authorities/organizations acting in the situation)	Information sharing	530	67.4%
5	authorities' recommendations (following the recommendations of authorities and emergency organizations)	Social networks and sense of community	528	67.2%
6	being prepared (individuals look for ways to become more prepared and avoid risks and failures)	Coping skills	424	53.9%
7	food (A 4-day supply of non-perishable food items per person/household)	Resources	423	53.8%
8	participation in recovery (participating along with emergency organizations to facilitate the response and the recovery process)	Social networks and sense of community	421	53.6%
9	social solidarity (having high levels of social solidarity)	Coping skills	416	52.9%
10	key information (having the skills to inform emergency services with key information about a crisis)	Communication characteristics/crisis communication	378	48.1%

$$d_{x,y} = \sqrt{\sum_{i=1}^n (x_i - y_i)^2} \quad (2)$$

Fig. 10 shows the distance between each pair of profiles. We see that the four profiles in Norway are the most different from the three profiles in Romania (darkest cells in the heat map). Spanish authorities are distant from Romanian authorities, emergency responders, and health services. Moreover, the responses of Norwegian law enforcement and authorities vary from those of Israeli authorities and health services. In contrast, the shortest distance is always between profiles from the same country. For example, the Romanian health service and emergency responders, the Norwegian health service and emergency responders, and so on. As a result, we can say that the data is, to some extent, clustered by country rather than job profile.

5.3. Ranking of needs

To get an overall idea about the needs and expectations from the survey without considering the question where they appear, we created a ranking of all the options (needs) that were proposed in all the questions, except for the questions related to risk awareness, trusted entities, and responsible entities. We built this ranking based on the number of times an option was chosen as “most” relevant. The top 10 options are shown in Table 7. These 10 options are the ones that respondents showed the highest degree of consensus on. The table shows that the first four options and the last option are related to communication and information sharing. This demonstrates that practitioners have a high level of agreement on what they need in terms of communication for an effective disaster management process, compared to other needs. Moreover, there is a strong consensus on the importance of using mobile channels, as 87.3% of the respondents chose this as the most important communication channel; the same applies to sharing credible information (84.1%). The first need that is not related to communication and information sharing is “following authorities’ recommendations”, which ranks fifth. The percentage of responders who choose this as the most important is 67.2%, which is roughly 20% less than “mobile channels”, which ranked first.

Looking at the top 5 needs, we can see that emergency responders are giving a higher priority for what is happening in the disaster site. This reflects their desire to respond to the immediate emergency and minimize the damage, then think about other aspects. They give less importance to what individuals should do themselves, such as being prepared or participating in the recovery. The same idea is also emphasized in the interviews, emergency responders care about the information shared with them from the disaster scene and the local information about the surrounding area. Also, they do not want the public to act as a barrier to their response efforts, so they want individuals to follow their instructions and join volunteering organizations.

5.4. The role of authorities and emergency responders

Another dimension that we encountered in the interviews is what authorities and emergency responders should do, not only what they expect from society. This dimension covers two main aspects: communication and building trust in emergency responders and authorities. These two aspects are interrelated as building trust starts with communication.

Regarding communication, interviewees believe they should continuously communicate updated accurate information with the different media outlets. This eliminates the need for the media outlets to get information from unofficial sources, thus reducing the amount of fake news. This is important in all phases of the crisis life cycle, but it is critical during the crisis event phase. In the same vein, monitoring social media for fake news was highlighted. Moreover, during all phases of the crisis, participants highlight the need for listening to society, its needs, and problems. The most direct way to do this is through social media, searching for specific keywords related to a specific problem, neighborhood, etc.

In the preparation phase for a crisis, the interviewees emphasize multiple points: informing the public about the potential risks in their community; how to deal with such risks; existing emergency plans, where to find them, and how to execute them; promoting self-readiness campaigns; and integrating this information in school programs. A Swedish participant (SE3) highlighted the necessity of incorporating such material into school programs, as children share this information with their families at dinner time; in this way, not only are the children informed but also their families. Another interviewee in France (FR3) revealed how some community members lack fundamental knowledge about the risks where they live. People who reside near a nuclear power plant, for example, are unaware of a specific risk plan known as a *plan particulier d'intervention*; they learn about it casually when they buy the house and then forget about it.

As for building trust, all the interviewees agree that trust-building is a process of continuous improvement that starts before a crisis occurs. Analyzing the interviews, we found that interviewees covered three components of trust from the four mentioned in [50]. The three components are credibility, intimacy, and reliability. Being transparent, sharing routine credible information to keep society informed, and replying to inquiries are just a few activities that help promote the credibility of authorities and emergency responders. Another activity that increases the responders' credibility is including volunteers within the emergency services, which also helps to promote their activities. Additionally, engaging volunteers enhances the emotional trust between responders and the public, since they work alongside responders and build personal relationships, thus increasing the intimacy among them. Another aspect that plays a key role in this direction is the relationship between authorities and the local population and their leaders; these kinds of synergies help build confidence in authorities and consequently help respond to a crisis. To enhance the level of trust through promoting reliability, the interviewees emphasized that the basis for building trust is doing their job right and providing high-quality service to the public, especially during normal times.

5.5. Incorporating emergent volunteers as part of the plan

Most of the interviewees believe that spontaneous volunteers play a crucial role in crisis management, consistent with [11,21–25]. Additionally, they believe that volunteers can help carry out simple tasks so that they can focus on specific work to deal with the crisis; this resonates with [8].

However, a couple of interviewees were strongly opposed to civil society involvement, believing that it causes more problems than it solves, in agreement with [11,21–25]. Some of the challenges mentioned by the study participants that hinder the full utilization of emergent volunteers are: lack of protective equipment that enables volunteers to safely respond to a crisis; lack of proper training and skills to handle an emergency, which could result in volunteers harming themselves and others either physically or psychologically; managing a large number of volunteers may divert emergency responders from their primary responsibilities and duties. The same barriers were highlighted in Refs. [7,8,12,29,51].

Other challenges were presented in the literature. For example, in Ref. [11] Skar mentioned that it is hard to ensure the availability of the volunteers in times of emergencies; the emotional response of volunteers is unpredictable; and volunteers may not follow the standardized procedures which affect the response effort. Related to the last point, the authors in Ref. [7] highlight that emergency response efforts are well established and depend on formal arrangements which may not align with the nature of informal volunteers. The current procedures – which are based on command and control – not only complicate the involvement of volunteers in handling emergencies but could also hold them liable to prosecution [7].

In order to facilitate the involvement of society in crisis management, more flexible and adaptable laws that allow for more spontaneous actions should be established. Additionally, to solve the problem of volunteer management and lack of training and protection, many of the interviewees suggest that volunteers should join organized volunteering organizations. However, this presents a conflict with the idea that now traditional volunteering tends to disappear [7,26]. One way to solve this dilemma is as the authors in Ref. [7] suggest, by embracing digital volunteering in which volunteers decide when, how, and why they want to participate.

Furthermore, an interviewee from Israel highlighted the importance of community-based emergency response teams as a way to handle volunteer management problems, in alignment with [24,52].

6. Conclusions and limitations

In this paper, we conducted an empirical study to identify what European emergency responders and authorities need and expect from society to better handle a disaster. This is based on the idea that the public's involvement is a must for building a resilient community, thus facing hazards more effectively. To capture the voice of the emergency personnel, we adopted a mixed-methods approach by combining quantitative data (questionnaire) with qualitative data (interviews). The survey provides data from a large sample size while the interviews offer in-depth information from a small sample size. We used the interviews to identify new needs,

support our findings from the questionnaire, give a justification for some of the needs, and contextualize the research findings. For example, survey responders highlight the importance of volunteering, the reason for that could be extracted from the interviews. Despite society's positive attitude toward assisting emergency personnel in the face of disasters, sometimes volunteers have the potential to cause more harm than good. Because spontaneous volunteers may lack the necessary expertise and specialized skills to deal with a crisis, they risk harming themselves and others. To avoid this, it is critical to join volunteer organizations. If volunteers are part of an organized group, they will not only have well-defined collaboration agreements with emergency organizations to facilitate the management process, but also proper training and skills to handle an emergency.

Based on our analysis we provided a ranking of the emergency personnel' needs from the society to better face a crisis. We also identified a few dilemmas that need to be handled to improve the crisis management process and thus societal resilience. The top needs identified span: 1) sharing credible information from the disaster scene with emergency responders. 2) following the recommendations of emergency personnel who are on the scene to spare people's lives and minimize any harm from spontaneous intervention. 3) being prepared with the needed information and resources to face a crisis. 4) playing a significant role in the recovery phase. First, because emergency responders do not have enough resources to help in this phase, as they are mainly in charge of managing the emergency, not the recovery phase. Second, community members have strong social ties that aid in supporting each other to cope with the disaster and restore normality. 5) volunteering through organized entities; as volunteers are extremely valuable to emergency responders if they are well organized and properly trained. The last point about volunteering raises a dilemma, which organized volunteering is now declining; so the question is how to attract citizens to volunteer through civil organizations instead of the current behavior of spontaneous and emergent volunteering. Another problem that needs to be solved is that citizens hold the governments accountable in the face of a disaster however, they do trust them less than other public services such as firefighters and the police.

By identifying emergency responders' needs and ranking them, we can provide and prioritize recommendations, policies, guidelines, and tools to better incorporate society in the emergency management process and capitalize on their potential. Some areas where recommendations would be useful are volunteer management, legislation to include emergent volunteers, building trust in the government, and social media best practices.

Although we have a rich data set covering a wide spectrum of emergency responders from several countries, we encountered some bias in the data due to the special characteristics of the respondents needed for this study. This bias could be found in multiple aspects. First, the bias in the snowball sampling method, which meant we could not ensure the same number of responses across different job profiles. Although we tried to cover a broad spectrum of profiles at the beginning, we cannot control the subsequent rounds of survey sharing done by the participants themselves. Second, the bias in the number of responses from each country ranges from 17 in Sweden to 5154 in Romania. This led us to disregard the data from Sweden, Italy, and France due to the unrepresentative sample size, and sampling the data from Romania to have a balanced data set including Spain, Norway, Romania, and Israel. Additionally, gender bias appears in the interviews since only two out of 30 interviewees are females.

One of the findings of this study that still needs further research is that the preferences of emergency personnel cluster based on the countries they work in, not based on their job. This supports the idea that community resilience is highly related to the place and dependent on the contextual factors surrounding a specific community. However, this finding needs more data to support it and a thorough analysis of the contextual factors in each of the countries.

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Data availability

The raw/processed data required to reproduce the above findings cannot be shared at this time due to legal/ethical reasons.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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7 Appendix

7.1 Job profile VS trusted and responsible entities

In Table 8 and 9 we used the questions asking about the "most" trusted entities and the "most" responsible entities respectively. We did not include the questions of the "least" trusted or the "least" responsible entities.

Table 8

Job VS trusted entities.

*All the values are in percentage. The values highlighted in bold correspond to the perception of trust associated with the responder's job and themselves. The values in red represent the most trusted entity by the members of a specific job.

Job/Trusted entity	National authority	Regional authority	Local authority	Civil defense	Firefighters	Police	Coastguards	Health services	NGOs	Society	The media
Firefighters	31.4	12.79	42.44	43.02	88.37	55.23	1.74	70.93	20.35	24.42	9.3
Health services	40.22	13.04	44.57	54.35	47.83	45.65	0	84.78	26.09	28.26	15.22
Paramedics	33.93	5.36	48.21	62.5	62.5	48.21	1.79	75	26.79	17.86	17.86
Police officers	27.87	18.03	32.79	37.7	63.93	86.89	1.64	81.97	16.39	19.67	13.11
Coastguards	66.67	33.33	66.67	33.33	66.67	66.67	33.33	33.33	0	0	0
Civil defense	29.41	17.65	58.82	100	64.71	47.06	0	52.94	11.76	5.88	11.76
Local authority	30.3	15.15	72.73	54.55	63.64	60.61	0	42.42	27.27	18.18	15.15
Regional authority	21.43	57.14	28.57	42.86	64.29	71.43	0	71.43	14.29	21.43	7.14
Governmental authority	19.05	14.29	57.14	71.43	47.62	42.86	0	76.19	38.1	14.29	19.05
Prefer not to say	23.61	4.17	37.5	66.67	70.83	47.22	5.56	79.17	23.61	22.22	19.44

Table 9

Job VS responsible.

*All the values are in percentage. The values highlighted in bold correspond to the perception of responsibility associated with the responder's job and themselves. The values in red represent the most responsible entity by the members of a specific job.

Job/Responsible entity	National gov.	Regional gov.	Local authority	Civil defense	Firefighters	Police	Coastguards	Health services	NGOs	Society	The media
Firefighters	56.98	33.14	52.91	40.12	72.67	59.3	1.16	50	9.3	15.7	8.72
Health services	76.09	42.39	52.17	44.57	18.48	44.57	10.87	51.09	23.91	18.48	17.39
Paramedics	58.93	16.07	51.79	53.57	53.57	55.36	1.79	64.29	23.21	12.5	8.93
Police officers	83.61	57.38	65.57	24.59	18.03	60.66	1.64	44.26	3.28	16.39	24.59
Coastguards	66.67	66.67	66.67	100	33.33	0	0	0	33.33	33.33	0
Civil defense	88.24	64.71	82.35	70.59	11.76	23.53	5.88	23.53	0	11.76	17.65
Local authority	75.76	39.39	69.7	45.45	21.21	72.73	6.06	42.42	9.09	15.15	3.03
Regional authority	85.71	85.71	78.57	42.86	14.29	35.71	0	35.71	0	7.14	14.29
Governmental authority	52.38	42.86	61.9	76.19	23.81	33.33	9.52	61.9	4.76	14.29	19.05
Prefer not to say	62.5	23.61	58.33	56.94	47.22	43.06	5.56	51.39	18.06	23.61	9.72

7.2 Interviews per country

Table 10
Number of interviews per profile per country

Country	Authorities	Emergency responders	Law enforcement	Health services
France		2		1
Israel	2	2	1	
Italy	2		1	1
Norway	1	2	1	1
Romania		3		2
Spain	1	1	1	1
Sweden		1		3
Total	6	11	4	9

7.3 Number of deaths data sources

In this appendix, we show the data sources we used for validating the risk awareness level in each Israel, Norway, Romania, and Spain. The data was last accessed on May 21, 2021. We used a variety of data sources ranging from newspaper articles to more structured disaster databases such as the EM-DAT database. We cover the events that happened from 2000 to 2021.

Table 11
Data sources for the number of deaths per risk type in Israel.

Risk group	Event type	Number of deaths	Data sources	Total
Extreme weather events	Snow	4	[53]	83
	Floods	21	[54]	
	Wildfires	44	[54]	
	Temperatures	3	[55]	
	Thunderstorm	11	[56]	
Nature related events	Storms	7	[54]	7
Social disruptions	Terrorism	1343	[57]	1343
Critical service dependencies	Transport (Rail, air, water)	31	[54]	909
	Industrial accident	863	[58]	
	Miscellaneous accident	15	[54]	
Pandemics	Epidemic	12	[54]	6407
	Covid-19	6395	[59]	

Table 12
Data sources for the number of deaths per risk type in Norway.

Risk group	Event type	Number of deaths	Data sources	Total
Extreme events	weather Snow Avalanche	30	[60]	69
	Wildfires	39	[61]	
Nature events	related Earthquakes	4	[62]	19
	Landslides	11	[54]	
	Storms	4	[54]	
Social disruptions	Terrorism	78	[63], [64]	78
Critical dependencies	service Transport (Rail, air, water)	50	[54]	850
	Industrial accidents	800	[58]	
Pandemics	Covid-19	781	[59]	781

Table 13
Data sources for the number of deaths per risk type in Romania.

Risk group	Event type	Number of deaths	Data sources	Total
Extreme events	weather Snow	2	[65], [66]	768
	Floods	244	[54]	
	Temperature	435	[54]	
	Cold wave	86	[67]	
	Wildfires	1	[68]	
Nature events	related Storms	38	[54]	38
Critical dependencies	service Transport (Rail, air, water)	80	[54]	170
	Industrial accidents	14	[54]	
	Miscellaneous accidents	76	[54]	
Pandemics	Covid-19	29716	[59]	29716

Table 14
Data sources for the number of deaths per risk type in Spain.

Risk group	Event type	Number of deaths	Data sources	Total
Extreme events	weather	826	[69]	826
Nature events	related	291	[54]	291
Social disruptions		268	[70]	268
Critical dependencies	service	698	[71]	698
Pandemics		79601	[59]	79601

7.4. Job profiles per country (the survey)

Table 15 shows the number of responses in the survey per country distributed across the different job profiles. The ones highlighted in Grey were not included in the analysis due to the unrepresentative sample size.

Table 15
Distribution of survey responses per different job profiles across countries.

Profile\ Country	Health services	Law enforcement	Emergency responders	Authorities	Other
Spain	29	39	63	25	17
Romania	947	10	3304	105	788
Norway	108	21	32	19	6
Israel	142	4	8	29	44

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