



engage

Engage Society for
Risk Awareness and Resilience

Deliverable D5.6 – Collaboration and involvement of stakeholders in DRR

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Abstract: ENGAGE aims at linking the informal resilience naturally inherent in citizens with the formal work of authorities to prevent, prepare for, respond to, and recover from disasters. It brings together 14 partners from 8 countries aiming to show how individuals and local practices can interrelate effectively with planned preparedness and response, practitioners, and technology.

This deliverable provides a report about the involvement of the different stakeholders (citizens, first responders, authorities, civil society organizations) in Disaster Risk Reduction. It describes how these stakeholders have been involved in the ENGAGE project, with a description of the tools and methods used to elicit their opinions, feedback and contributions. The Deliverable analyses also their expectations with regards to the way they are involved in Disaster Risk Reduction and the problems and opportunities in the relation with the other stakeholders. Particular emphasis is posed on the contribution and role of citizens as both spontaneous and organized volunteers. The Deliverable closes with a set of comments and recommendation emerged from the project activity on this subject.



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Executive summary

The document describes how stakeholders have been involved in the ENGAGE project and reports the main findings collected from this involvement. It evidences the main role of stakeholders in disaster risk reduction (DRR) and emphasizes the importance of collaboration among diverse entities, including government agencies, non-governmental organizations and local communities. The document underscores the project's commitment to interacting with stakeholders and leveraging their diverse perspectives.

The main stakeholders in ENGAGE encompass first responders, national authorities, civil society organizations, business organizations, researchers, various community representatives and citizens. These stakeholders have been involved as partners of the ENGAGE consortium, members of its Advisory Board (Knowledge and Innovation Community of Practice – KICoP) or through a set of dedicated exercises. Special attention in the exercises has been given to the engagement of citizens, highlighted as a key factor in enhancing overall resilience. Volunteering contribution of citizens as been classified as organized and non-organized. Organised voluntary engagement is provided within an institutionalized context. These entities ensure a more smooth and organized collaboration with first responders and authorities. Non-organised forms of volunteering are triggered by individual engagement beyond the context of an organization. They are divided into externals and locals. The first ones offer their help and may arrive unsolicited at the scene of the event. The latter are local people responding to the disaster. They are usually the first on the scene and being local have a deep knowledge of important characteristics of the area of the event, such as the inhabitants distribution and the vulnerable people location.

ENGAGE used a large variety of methods and tools to interact and involve stakeholders. These included:

- Seven case studies, useful mainly to understand the role of the different stakeholders and their contribution to DRR.
- Two surveys, for understanding the role of citizens and their relation with public authorities (e.g. first responders, local and national authorities).
- Six workshops, spread during the whole lifecycle of the project. The aim was to involve and interact with the stakeholders on the specific problems and needs of relevance during the project.
- One public interactive event with the citizens to: i) listen the citizen experience in disaster management and in particular their relation with public authority; ii) understand how they managed informal Solutions; iii) understand the role of citizens in the different phases of disaster management.
- Four large scale exercises to validate projects solutions.
- Two table top and collaborative serious games. To guide discussions around the main topics emerged during the project and related with the interaction between stakeholders.

These methods and tools brought to the identification of important aspects of the interactions between stakeholders, showcasing the benefits of collaboration among formal stakeholders and organized and non-organized volunteers in disaster management. It highlights the advantages of resource sharing, knowledge collaboration, and coordinated communication among stakeholders.

The main advantages regarding the interaction between formal stakeholders (first responders and authorities) include:

- Resources like personnel, equipment, and supplies that can be shared more easily ensuring a more efficient response.

- Scientists, emergency responders, and community leaders can collaborate to combine their knowledge and expertise;
- Accurate and timely communication can be provided and different stakeholders can more easily reach the desired audience;
- More simple and unified and coordinated response;
- Collaboration between public, private, and non-profit sectors can result in a more comprehensive and effective approach.

Advantages regarding collaboration between first responders and authorities with volunteers include:

- Organized volunteers can assist in medical care, provide emergency services in areas or side activities not completely covered by dedicated emergency personnel, provide psychosocial support, help in the provision of supplies, and logistics;
- Local volunteers can support preparedness actions with their local knowledge and traditional practices;
- In the immediate aftermath of an event local spontaneous volunteers are the first one on site during and can provide essential first aid to those hit by the events;
- Local spontaneous volunteers know their territory and have information that can be essential for the intervention;
- Local spontaneous volunteers have consolidated social relationships with the members of the community and are close to citizen in vulnerable conditions, and can facilitate interactions with them;
- Spontaneous volunteers can provide additional resources that emergency services can miss especially during the first phases of an intervention;
- Local spontaneous volunteers are also those remaining on site after the emergency and they need to have a role on the planning of the intervention actions that can have an influence on the return to normal life.

However, the project identified also several challenges in collaboration. For formal stakeholders these include communication barriers, lack of standardization, resource allocation issues, and interagency coordination. For the interaction between formal stakeholders and volunteers the issues include:

- Inconsistent training and skill levels between volunteers;
- Limited availability of time by volunteers, especially in the long term and after the first phases of an emergency;
- Lack of volunteers familiarity with the established communication channels and protocols used by professional responders bringing to coordination and communication challenges;
- Risk for the volunteers who may not have the same level of training and protective equipment as professional responders;
- Legal and liability issues associated with the intervention of volunteers;
- Citizen consider inadequate most of the training and preparedness actions organized for them, that should be more contextualized and explained (for example explaining the reasons of the intervention choices);

- Spontaneous and non organised volunteers, are often not considered by the authority, especially after the first phase of an emergency, this is also true for local volunteers who could have an important role while planning and organising recovering;
- Information and situational awareness are always a key problem for volunteers including when they are part of an organized group;

The project identified some solutions that could solve some of the issues listed above and that are available in the ENGAGE Catalogue of Solutions.

1 INTRODUCTION

This Deliverable represents one of the outcomes of Task T5.5 Knowledge and Innovation Community of Practice (KI-CoP). This body has played an important role in supporting project activity providing updates on needs, and collaborating in the creation and evaluation of solutions. KI-CoP included a representative sample of the Disaster Risk Reduction (DRR) stakeholders including for example several categories of first responders, and types of authorities. The task set collaboration strategy, organized meetings and enhanced the KI-CoP activity. In addition, it considered the involvement of citizens, eliciting their opinion about their involvement in DRR. This deliverable focuses on how KI-CoP members as representative of professional stakeholders and citizens have been involved in the ENGAGE project, with a description of the tools and methods used to elicit their opinions, feedback and contributions.

1.1 GOAL OF THE DELIVERABLE

Hence, the aim of this deliverable is to provide indications about the best methods and tools used in the project to involve the different types of stakeholders, with a particular attention to citizens. The Deliverable presents also the main hints, comments and recommendations obtained from the methods and tools application to suggest how the involvement of citizens could be improved. This report does not enter in details about the Solutions identified since details have been provided in the related Deliverables, nor does it provide an analysis of the exercises, since more details on all validation exercises will be provided in deliverable D4.3 that synthesizes results from the validation activities.

1.2 INTENDED READERSHIP

The intended audience for this document comprises several distinct groups:

Researchers and partners involved in European research projects: This Deliverable offers insights on how to involve the different types of Stakeholders in DRR. It provides a list of methods and tools with suggestions and recommendations for their use. It also analyses the role of citizens emphasizing the importance of their contribution and discussing the main problems for their active participation.

Knowledge and Innovation Community of Practice (KI-CoP) Members: This group holds operational expertise and also represents first responders, researchers, authorities, and civil society – the very stakeholders the project aims to influence. Their inclusion ensures relevance and a broader reach of impact. The report provides them with important aspects related to their collaboration and contribution.

Other Stakeholders and End-Users: Those with a stake in the project, including its rationale, methods, risks, and outcomes, as for the KI-CoP members this report provides them with important aspects related to their collaboration and contribution.

General Public: Any citizen, even if not directly targeted by the project, could find interest in this document. It offers information about the role of citizens in DRR, including their perspectives and the problems experienced.

European Research Council, European Commission, and Project Reviewers: The document is also relevant to entities affiliated with the European Research Council, the European Commission, and project reviewers as it provides them with project's own vision on collaboration among stakeholders.

In essence, this deliverable's dissemination level is public, allowing it to be shared beyond the consortium, the European Commission, and the project reviewers.

1.3 RELATION WITH OTHER DELIVERABLES

This Deliverable references several other deliverables of the ENGAGE project. There are relationships with WP1, WP2 and WP3 since these WPs describe the material produced by the project, and with WP4 dealing with the evaluation in which the Stakeholders have been involved. In particular this deliverable receives input from:

- D1.2 – "Local perceptions, risk awareness and expectations about societal resilience" Summarises needs, perceptions and expectations of individuals and communities drawing conclusions about the relationship between risk perception, risk awareness and actual societal resilience, considering gender variance. This deliverable is relevant because it gives important information about the perception and expectations of citizens with regard to RDD.
- D2.2 – "Formal solutions to improve societal resilience", Gather all the "formal" solutions identified for first responders and authorities to improve societal resilience. This deliverable is relevant because it gives information about the Formal Solutions including those that could facilitate the collaboration between stakeholders.
- D2.3 – "InFormal solutions to improve societal resilience", Gather all the informal solutions identified for first responders and authorities to improve societal resilience. This deliverable is relevant because it gives information about the InFormal Solutions including those that could facilitate the collaboration between stakeholders.
- D 2.5 – "Revision and update of solutions to improve societal resilience", Document adaptations and improvements during the final validation process of the project. It is relevant because it gives information about the final list of Formal and InFormal Solutions including those that could facilitate the collaboration between stakeholders.
- D 3.1 – "Initial catalogue of societal resilience solutions", Selected solutions, description of contextual issues and guidelines for implementation. It is relevant because it gives a list of Solutions integrated with indications for their application.
- D 3.3 – "Final catalogue of societal resilience solutions", Selected solutions, description of contextual issues and guidelines for implementation. It is relevant because it gives a list of Solutions integrated with indications for their application.
- D 4.1 – "Validation plan", This Deliverable identifies the characteristics to be validated, the techniques to be used and plan the validation activities. It includes information about the involvement of the different stakeholders in the Validation activity.
- D 4.2 – "Initial validation report", This Deliverable reports the results of the initial validation and provide feedback for improving project results. It describes how the different stakeholders have been involved in the initial validation.
- D 4.3 – "Final validation report", This Deliverable reports the final results of the Validation, providing recommendations and feedback for improvements and future applications of the approach. It describes how the different stakeholders have been involved in the final validation.

1.4 ACRONYMS AND ABBREVIATIONS

Table 1. List of abbreviations and terms

Term	Explanation
CA	Consortium Agreement
EC	European Commission

GA	Grant Agreement
KI-CoP	<p>Knowledge Innovation Community of Practice.</p> <p>Community of Practice involving practitioners (e.g first responders, authorities, members of civil society organizations) and citizens supporting the project activity with the role of users and co-owners of its solutions</p>
CoS	<p>Catalogue of Solutions.</p> <p>ENGAGE project presents a list of solutions that could be implemented by emergency services and authorities to improve the interaction with the citizens. These solutions cover methods, apps, campaigns, guidelines, practices, tools, strategies etc.</p>
DRR	Disaster Risk Reduction.
Formal Stakeholders	Public and private organized stakeholders, such as: local, regional and national authorities, first and second responders, law enforcement agencies, business companies and similar.
Informal Stakeholders	Non public and non for profit organizations, spontaneous organizations, such as: civil society organizations, local communities, associations, groups of and isolated volunteers, and similar.

2 ROLE AND CONTRIBUTION OF STAKEHOLDERS

2.1 IMPORTANCE OF STAKEHOLDERS' PARTICIPATION IN DRR

The involvement of a wide array of stakeholders and citizens is nowadays considered very important for enhancing overall community resilience and managing DRR [UND, 22]. In the wake of increasing natural and human-made disasters, understanding the importance of involving all stakeholders in DRR, particularly during the preparedness phase, becomes paramount. This deliverable aims to study the intricate relationships between stakeholders, citizens, and disaster resilience.

The importance of a stakeholders comprehensive involvement in DRR is emphasised by landmark references. In their UNDRR Annual Report, the United Nations underscores the importance of a comprehensive approach to disaster management [UND, 22]. The report underlines that effective collaboration among stakeholders during the preparedness phase significantly contributes to risk identification, assessment, and mitigation. Collaborative governance, as advocated by the UNDRR, forms the bedrock of a resilient society.

Stakeholders, include several different organisations and communities, from government agencies, to non-governmental organizations, from businesses companies to local communities and citizens. All play a unique role in disaster preparedness and management. Collaborative governance, as endorsed by the UNDRR, is not a mere suggestion but a necessity. Several studies [Moj, 17], [ALF, 19] delve into the nuanced dynamics of stakeholder involvement. These studies evidence how the collaboration of diverse stakeholders, facilitated by open communication and shared resources, contributes significantly to the development and implementation of robust preparedness plans. A holistic, inclusive approach ensures a more resilient and interconnected community.

Citizen engagement in particular stands as a cornerstone in the foundation of effective DRR. The concept of community-based disaster risk reduction [Kaf, 10] empowers citizens to be active participants in identifying risks, devising plans, and cultivating a culture of preparedness, illuminating the transformative potential of citizen engagement. Empirical evidence shows how educated and engaged citizens can contribute significantly to community resilience [Rya, 20]. By synergizing the expertise, resources, and knowledge of various stakeholders and actively involving citizens, we can collectively enhance our capacity to mitigate, respond to, and recover from disasters. Through partnerships, collaborative governance, and the empowerment of communities, we pave the way for a more resilient and prepared society in the face of evolving disaster challenges.

However, while all the benefits of stakeholder engagement are evident, challenges persist. Barriers to effective collaboration include effective coordination, optimization in the usage of resources, effective sharing of information and real governance. This deliverable analyses these problems and especially how they are perceived by citizens, and discusses the way for stakeholders involvement and empowerment used in ENGAGE.

2.2 MAIN STAKEHOLDERS IN ENGAGE

The importance of interacting and eliciting the opinion of stakeholders was well understood by the ENGAGE staff since the definition of the project. The project partnership is composed by several types of DRR stakeholders. It includes first responders, national authorities, civil society organizations, business organizations, and researchers. The presence of an ENGAGE Advisory Board, named Knowledge Innovation Community of Practice (KICoP), offered the opportunity to involve and interact with other stakeholders. In particular, other types of first responders, local and regional authorities, law enforcement agencies, citizen representatives, representatives of vulnerable categories. In addition, the set of events, activities and open initiatives organized by the project

during its lifecycle brought in contacts with other categories of stakeholders not present in the Consortium nor in the KICoP. In particular, local communities, citizens and volunteers

These Stakeholders offered the opportunity to grasp the different points of views, the problems and opportunities of interactions and the needs expressed by the different categories and in particular by the citizens to ensure a better integration and coordination in DRR.

In discussing about citizens we adopted a classification of their contribution as volunteers into organised and non-organised. While organised voluntary engagement is provided within an institutionalized context (organization, association or other institution), non-organised forms of volunteering are triggered by individual engagement beyond the context of an organization. A recurrent phenomenon in the aftermath of a disaster or an emergency are spontaneous volunteers: individuals or groups that spontaneously offer their help and may arrive unsolicited at the scene [Neu, 13]. In addition, following the principle of neighborly help, local people respond to the disaster as well. They are usually the first on the scene of the disaster and being local have a deep knowledge of important characteristics of the area of the event, such as the inhabitants distribution and of the vulnerable people location. The following Section will show how these categories have different type of contributions and interactions with the other stakeholders.

Table 2. Classification of Volunteers

	Local	External
Organised	Organised Volunteers	
Non Organised	Affected citizens in the area	External Volunteers

2.3 METHODS AND TOOLS USED FOR STAKEHOLDERS INVOLVEMENT IN ENGAGE

A variety of methods and tools were used to interact with the different stakeholders during the project lifecycle. In some cases the purpose of using this methods and tools was to involve the stakeholders in the project, and to empower them offering the opportunity to shape the directions and influence the results. In some other cases, the purpose was more to know the stakeholders position with regard to the project activity and to understand their role, contribution and collaboration with the other stakeholders in DRR. This aspect was particularly important for citizens and especially for citizens acting as volunteers. Volunteering is one of the key initiatives for enhancing societal resilience to disasters [Twi, 17]. Volunteers can provide essential support in disaster response through a wide range of roles. These aspects are discussed in the "Interaction between Stakeholders" Section, while tools and methods used in the project are presented in the remaining of this Section. Methods and tools are numbered in sequence (MTx) to be referenced in the following of the document.

2.3.1 CASE STUDIES

Description - The project used a combination of case studies, concerning well-known past events, revisiting the facts and analysing the role of the different stakeholders and the impact of their roles on the evolution of event and ultimately on societal resilience. The events are well documented and in addition, in most of them, the project staff was involved in the management, or "after the fact" analysis of these events. Analysis was combined with grassroot experiences based on data collected in interviews and focus groups. The project had the seven case studies, described in detail in Deliverable D1.1, listed below:

MT1 - Case Study Fukushima Daiichi Nuclear Release (Japan 2011). The analysis of this case study was focused on distribution of information to the population and creation of consensus.

MT2 - Case Study East Japan Tsunami (Japan 2011). The analysis of this case study was focused on the effect of education and training as a measure of preparedness for surviving a disaster.

MT3 - Case Study Thalys Train Attack (France 2015). The analysis of this case study was focused on the risk awareness and the self organization capabilities of the passengers involved, especially in relation to the climate created by the different previous events in Europe.

MT4 - Case Study Wildfires (Sweden 2018). The analysis of this case study was focused on inter-organizational collaboration and coordination among volunteers, emergency services, government agencies and technical systems from across Europe also the spontaneous volunteers.

MT5 - Case Study Flood in Negev Desert (Israel 2018). The analysis of this case study was focused on the role of social media in information and the balance between backchannels and official channels.

MT6 - Case study Earthquake at L'Aquila (Italy 2009). The analysis of this case study was focused on the influence of gender and cultural issues in the immediate reaction to the earthquake.

MT7 - Case study Terrorist attack in Utøya (Norway 2011): The analysis of this case study was focused on the role of volunteers in rescuing and the positive and negative contribution of social media in managing the event.

Stakeholders concerned - Citizen and volunteers (mainly affected citizen in the area)

Stakeholders involvement - The analysis of case studies and the different interviews conducted to investigate the events, were not directly aimed at involving stakeholders in the project but had an important role in understanding their role and contribution to DRR. In particular, in investigating the roles of citizens, their self-organising ability, the influence of risk awareness and the influence of other important aspects such as local culture and knowledge, use of communication channels and social media.

Main hints regarding stakeholders involvement - Volunteers can provide essential support in disaster response through a wide range of roles. They assist in medical care, information & communication, psychosocial support, shelter, provision of supplies, and logistics. Their contributions, including search and rescue, first aid, data management, psychological counseling, and more, are vital in alleviating suffering and aiding recovery efforts during and after disasters.

Project references - The following project references can provide additional information regarding the case studies:

D1.1 Preliminary model for assessing and methods for improving societal resilience offers a full description and analysis of the seven case studies.

D1.4 Revision of the model assessing and methods for improving societal resilience proposes a theoretical framework of societal resilience based on data coming from the Case Studies.

2.3.2 SURVEYS

Description - Two surveys were conducted by the project for a better understanding of the aspects contributing to public readiness to emergencies and disasters. These aspects included the relationship between citizens and local authorities, a key element for engaging citizens in DRR. The two surveys are described in Deliverable D1.2 and D4.3 and summarised in the following:

MT8 - International Survey - This survey was conducted during the first year of the project activity interviewing a sample of more than 8000 individuals from 8 countries (Italy, Romania, Spain, France, Sweden, Norway, Israel, and Japan). The purpose was comparing views and perceptions of diverse populations, and understanding the relationships between risk awareness and actual resilience

among different civil societies. Of particular relevance for the engagement of stakeholders was the study of the trust of citizens in varied responder and authorities.

MT9 - Italian Survey - This survey was conducted online in the period March April 2023 in Italy in collaboration with the project CommunityPRO of Cittadinanzattiva, with more than 800 respondents. The purpose was to investigate the level of preparedness with regard to the higher risks of the country and the experiences, problems, expectations as spontaneous or organized volunteers.

Stakeholders concerned - Citizens (including citizens acting as volunteers)

Stakeholders involvement - Surveys were not directly aimed at involving stakeholders in the project but had an important role in understanding the role of citizens and contribution in DRR management. In particular, surveys offered the opportunity to study the relation between public authorities (e.g. first responders, local and national authorities) and citizens as both individual subject and spontaneous or organized volunteers.

Main hints regarding stakeholders involvement - Trust levels by citizens are relatively high for emergency organizations, followed by health services and civil protection agencies. Least trust is ascribed to the politicians, governments, and media. Since trust is a major component in societal resilience and the surveys evidenced that it could even serve as a predictor of societal resilience, it is imperative that wherever trust between the public and the authorities is not strong enough, it will be increased. Volunteers consider their contribution as very important but not adequately considered and organized by public authorities.

Project references - The following project references can provide additional information regarding the surveys:

D1.2 Local perceptions, risk awareness, needs and expectations about societal resilience offers a description and analysis of Survey 1.

D4.3 Final Validation Report offers a summary of Survey 2, conducted in collaboration with the project CommunityPRO of Cittadinanzattiva.

2.3.3 STRUCTURED WORKSHOPS

Description - Workshops were used to interact especially with the KICoP members and with external first responders and authorities. These events were aimed at collecting essential contributions for research activities. Participants were able to share first-hand experience, define actual needs and discuss project research directions. Participation and contribution were facilitated structuring the workshops around scenarios or guided discussions. The project had two online workshops, two workshops in presence and two workshops arranged around the project exercises. These six workshops, described in detail in Deliverable D4.2 and D4.3, are listed in the following:

MT10 - Workshop I Online (17/2/2021) - This workshop was based on a set of scenarios regarding the COVID 19 events followed by an analysis of the possible first responders responses to the events presented in the scenarios. The main aim was to collect and evaluate Solutions to prepare for and manage the events with special focus on the Communication with the citizens. This was also an opportunity to collect feedback about the workshop mechanism to improve the organization of the following ones. Using scenarios was considered an effective approach to focus the discussion but there was a clear recommendation for reducing their number and focusing more the discussion.

MT11 - Workshop II Online (14/6/2021) - This workshop was organised following the feedback and recommendations of the previous one. It was based on a COVID 19 related scenario about the vaccination of hard to reach/convince people, with a special focus on the evaluation of applicability and effectiveness of a set of possible Solutions identified by the project.

MT12 - Workshop III in presence in Marseille (26/4/2022) - The scenario based approach was used for this workshop as well, but it was more structured and with different phases. The scenario was a

landslide event in the city of Trondheim, Norway. Participants received information about the landslide risk in the city of Trondheim, due to presence of quick clay soil in some areas. They were asked to identify preparedness Solutions for this risk using the Catalogue of Solutions produced by the project. Then a fictional landslide event was presented and analysed to evaluate the effectiveness of the Solutions selected by the participants. Focus of the workshop was on identification and selection of solutions and on the role and management of volunteers. Comments and feedback from participants led to a re-design of the interface of the Catalogue of Solutions, a more in depth analysis of its possible usage within a first responder organisation and a more in depth investigation about the role of volunteers in DRR.

MT13 - Workshop IV in presence associated with the exercise in Targu Mures, Romania (11/5/2023) - This workshop was organised with the KICoP members who attended as external participants the exercise in Romania. It was an opportunity for an open discussion on the use of the Catalogue of Solutions and for the evaluation of its new interface guided by a usability questionnaire.

MT14 - Workshop V in presence at Rotterdam (22/6/2023) - This workshop was dedicated to one of the issues emerged as very important for the KICoP stakeholders from the previous workshops: the management of organized and spontaneous volunteers. The workshop was introduced by letting the stakeholders play with a serious game (described in the following) designed to simulate the main problems of working with volunteers. The game session was followed by a guided discussion on the subject. The discussion evidenced the different roles and contributions of spontaneous vs organised volunteers.

MT15 - Workshop VI in presence associated with the exercise in Trondheim, Norway (27/9/2023) - This workshop was organised with the KICoP members who attended as external participants the exercise in Trondheim. The workshop was introduced by the serious game simulating the main problems of working with volunteers and a table top game focussed on the interaction between stakeholders. Games and the discussion evidenced the issue of the coordination between stakeholders.

Stakeholders concerned - KICoP and external first responders and authorities.

Stakeholders involvement - Workshops were spread during the whole lifecycle of the project. The aim was to involve and interact with the stakeholders on the specific problems and needs of relevance during the project. Starting from the beginning focus was on: the definition of the Solution, the evaluation of their usefulness, the evaluation of the catalogue of solutions, the interaction of the first responders with the volunteers, the interaction between stakeholders.

Main hints regarding stakeholders involvement - The workshops provided several indications related to their specific aims. These indications had a significant impact on the project activities bringing to: i) a revision of the workshop structure; ii) a redesign of the way the catalogue of solutions should be used within an organisation; iii) a complete redesign of the catalogue of solution interface; iv) a more in depth investigation of the role of citizens and volunteers; v) a better understanding of the differences between the type of volunteers (e.g. organized, spontaneous, local) their possible contributions and the problems for their management; vi) the need for a more in depth understanding of the problems associated to the coordination between volunteers.

Project references - The following project references can provide additional information regarding the workshop:

D4.2 Initial Validation Report offers a full description and analysis of the workshops 1, 2 and 3.

D4.3 Final Validation Report offers a full description and analysis of the workshops 4, 5 and 6.

D5.3 Contribution to SENDAI policy and standardization contains a summary of the workshop results regarding policy and standardization issues.

2.3.4 PUBLIC EVENT

Description

MT16 - Public interactive event Rome. Organized for the 30/11/2022, with the collaboration of the association "Assaggi di Scienza", aimed at raising citizen scientific culture. About 60 participants either local community representatives (comitato di quartiere) or citizens active in civil society life. About 40% of the citizens were active and/or had experience in volunteering organizations, 20% had experiences as spontaneous volunteers and 40% had no experience as volunteers.

Stakeholders concerned - Citizens (mainly citizens acting as volunteers)

Stakeholders involvement - This event had multiple aims of relevance for the stakeholder involvement: i) listen the citizen experience in disaster management and in particular their relation with public authority; ii) understand how they managed informal Solutions and related attitude of formal actors before, during and after an emergency; iii) understand the power the citizens have in taking decisions in the different phases of disaster management (preparedness, management, recovery, learning). In addition, there was also the intention to involve citizens in the KICoP or have other forms of participation.

Main hints regarding stakeholders involvement - Citizens are willing to be prepared and aware, even if they recognize the problems of preparedness (e.g. need for frequent updates, motivation may decrease with time). However, current preparedness actions are not very useful and they have limited power in shaping them. Spontaneous volunteers are often not considered by the authority, especially after the first phase of an emergency, the result is a limited information and situational awareness.

Project references - The following project references can provide additional information regarding the public event:

D4.3 Final Validation Report offers a summary of the event.

2.3.5 EXERCISES

The project used a set of exercises to validate the effectiveness and the usability of the Solutions selected and investigated during the activity. With the exercises the project could also validate the other outcomes and in particular the Knowledge Base (e.g. its functionality, user friendliness) and the fit of the functions with the decision process of the first responders when selecting Solutions. The project had four exercises selected to include a large variety of contextual characteristics such as population involved, risk culture, trust in authority. Exercises were fictitious events or disasters delineated in collaboration with the first responders using their extensive experience with similar events, representing a real test bed for the solutions identified in the project. Exercises are summarised in the following.

MT17 - Exercise Heat Wave in Rome

The health effects of extreme temperatures and heat waves are consistent in the literature showing an increase in adverse health effects like mortality and hospital admissions associated with an increase in temperatures. Since 2004 in Italy, the Ministry of Health and National Civil Protection developed a national heat adaptation plan and prevention guidelines for the implementation of local heat-health responses, including: heat-health early warning systems, health surveillance, information campaigns, the identification of vulnerable groups and city-specific heat response plans modulated on warnings and targeted to these subgroups. The Department of Epidemiology ASL ROMA 1 (DEPLAZIO) manages both the national heat plan on behalf of the Ministry of Health and the Lazio Regional Heat Plan.

The heat plan, traditionally based on the identification of elderly subjects most at risk during heat waves and their active surveillance by medical doctors, has been extended to the use of tele-monitoring services. Using the LAZIO ADIVCE operational web-based platform, and an APP that provides heat warnings and information on the heat prevention plan (App Caldo e Salute), GPs, health care professionals and primary care services carry out active surveillance and patient care during heat waves. The problem of less favored people is particularly important in the case of heat waves because of: less comfortable housing; lack of essential facilities to fight the high temperature; lack of interrelations considered as essential for resilience in this type of events [Kli, 15]; communication difficulties.

The exercise applied ENGAGE Solutions to enhance health response by improving citizen awareness and empowerment. In particular, the exercise was based on social actions in support of the active heat surveillance in Rome, through setting up a collaboration network of stakeholders and an information campaign between health services and social action at community level.

MT18 - Exercise Cyber-attack in a Critical Infrastructure in Spain

In response to the increase cybercrimes, especially among individuals aged 18 to 35, the Basque Country has established a dedicated cybersecurity centre, called Basque Cybersecurity Centre. Its primary objective is to proactively address potential cybercrimes by early detection, offering training to private enterprises, disseminating preventive strategies, and coordinating response actions in the event of cyberattacks. When cyberattacks target critical infrastructure, the resulting damage escalates significantly, affecting the entire population and disrupting essential services crucial for citizens' well-being.

Considering these potential issues the exercise aimed at: i) enhancing citizen risk awareness; ii) improve communication between citizens and authorities; iii) improve response and recovery capacities of stakeholders. A set of initiatives based on ENGAGE Solutions was put in place to achieve these aims and their effectiveness evaluated with questionnaires, measurement of key indicators and a table top exercise with experts. A part of the exercise simulated a cyberattack targeting critical infrastructure, specifically the energy delivery sector and the entire crisis lifecycle, encompassing mitigation, prevention, preparedness, response, and recovery stages, was considered.

MT19 - Exercise Quick clay landslide in Trondheim

Historically, Norway experiences one major quick clay landslide every year; Quick clay is a marine clay that completely liquifies during a landslide, meaning that large areas of the ground can start sliding also in nearly flat terrain. Due to its multiple large quick clay zones, Trondheim is especially vulnerable to this risk, including the densely populated area of Øvre Baklandet. Moreover, a landslide in this terrain will go into the river Nidelven, likely crating a massive flooding or even a tsunami going both upwards towards a residential area, and downwards, affecting industrial areas at the Trondheim Harbor.

Such an event would call for massive and coordinated engagement from a broad range of actors such as the local and regional authorities, emergency services, volunteer organizations, and many others. Both the Trondheim Red Cross (TRC) and the local chapter of the Norwegian Women's Public Health Association (NKS) are non-governmental organizations (NGOs) that hold agreements with Trondheim Municipality to assist in major emergencies. The civilian population, including residents, school children, workers, and tourist, is by far the largest group affected if a quick clay landslide was to occur in this area.

To assess the current state of preparedness among authorities and first responders for effectively dealing with the risks related to quick clay, as well as to evaluate their risk communication strategies and public awareness about this risk, the exercise had multiple meetings with various stakeholders.

These meetings involved representatives from Trondheim municipality, the police department, the fire department, TRC, and citizen representative organizations. Citizens and children were engaged with small preparatory exercises and through class visits organized by local partners. The exercise experimented a set of ENGAGE Solutions aimed at: i) enhancing preparedness and collaboration among authorities and first responders; ii) streamline resource allocation and clarify roles and responsibilities; iii) improve autonomy, coping abilities and proactive engagement among volunteers and citizens; iv) improve citizens' awareness of local risk scenarios, such as the risk of quick clay landslides in densely populated areas; v) ensure effective and timely communication among authorities and citizens (i.e., regarding evacuation, updates); vj) ensure the psychosocial first aid provided to evacuees and others affected.

The effectiveness of the solutions was evaluated through dedicated debriefing sessions involving all participants. These sessions provided insights from various actors, through observation notes, follow-up questionnaires, and participant debriefings.

MT20 - Exercise Migrant Emergencies in Romania

In the light of the current war in Ukraine, Romania through the Department for Emergency Situations (DSU) was on the frontline in providing humanitarian assistance to the displaced people/refugees coming from Ukraine. The exercise was based on a scenario involving an influx of displaced persons, which is a situation that is very relevant in Romania nowadays. The purpose of this exercise, was to test and sustainably exploit the various Solutions that ENGAGE has identified to enhance collaborations between citizens, first responders, and public authorities. At the same time, the exercise aimed to raise awareness about the importance of collaboration and coordination in such situations among civil society organisations to ensure that adequate support and efficient allocation of resources can be facilitated.

All solutions have been implemented in virtual reality environment. The virtual reality environment facilitates the involvement of the participants in the exercise individually or in teams, to apply their disaster relief activities enhanced by different levels of sensory and psychological immersion. The stress situation that is generated is safe but, at the same time, close to reality. Virtual reality was complemented by tabletop exercises, providing a comprehensive image of the fieldwork procedures and the chain of command and control. Based on this environment, the participants analyze the usage of the selected solutions in the given scenarios to validate their usability and suitability to address the raised problems.

The ENGAGE catalogue of solutions has been accessed, tested and validated, by the international organisations' representatives, public authorities, first responders, civil society organisations, and consortium members. At the end of the exercise, the consortium met with experts in the field of migration, social and medical assistance, and representatives of civil society to discuss lessons learned from the exercise. The exercise benefited from the presence of external observers from the International Organisation of Migration (IOM) and the United Nations High Commissioner for Refugees (UNHCR).

Stakeholders concerned by the exercises

First responders of different organizations, authorities at local, regional and national level, citizens (as simple participants and/or volunteers), law enforcements agencies, civil society organizations. These stakeholders were external experts and organizations contributing to the exercises, members of the KICoP or partners of the project.

Stakeholders involvement



The exercises were mainly aimed at validating project solutions. Validation offered the opportunity to involve and interact with a large number of stakeholders, and to offer them the possibility to contribute with their ideas and feedback to the project activity.

Main hints regarding stakeholders involvement

The exercises provided several information regarding stakeholders involvement and collaborations between stakeholders. These are summarised in the following:

Several solutions have been tested and validated, including those facilitating the interactions between first responders and authorities in one site and citizens and volunteers on the other site. Exercise demonstrated how these solutions cannot be applied as they are. Solutions should be regarded as a stimulus, a source of ideas for methods, tools and processes to apply.

When there is an interaction of different types of first responders in the exercise, collaboration and coordination between them is very important to let the citizens understand more clearly their role and potential contribution. Contradictory messages and duplication make citizens feel less effective and underused during the management of the event.

All citizens, no matter what the role they had in the exercises, were very positive regarding their involvement and willing to participate in further exercises and training activities. They were all convinced (even more than the first responders) the role of citizens is of primary importance in disaster management and interested in being better prepared for possible future events. Below are their main comments:

- Citizens perceived the ENGAGE validation exercises and the implementation of the solutions as very useful when fostering awareness raising and preparedness capacities. In the case of citizens who were less active in the validation exercises, for example when they were used to simulate mass movement or evacuations, the positive perception was less strong, but still positive.
- Citizens were even more positive when they could have an active role in the identification and implementation of the solutions, for example when participating as volunteers, or when their role and contribution was clear and well explained in the context of the solution application. In a short questionnaire with close answers the citizens evidenced the following as the two most important factors for improving their participation: i) having a more active role in the exercise execution; ii) being more able to understand what is going on during the exercise.
- All the citizens considered essential to have a clear understanding of what was going on during the exercises, their role and what was expected from them. Again, they think their role could be very important for better management of the event and therefore, the understanding of their role is a key factor for providing their best during the exercise. They also expressed interest in being involved in the design of the exercises to bring their own opinion and needs and for a better understanding of their role.

Project references

The following project references can provide additional information regarding the exercises:

D4.1 Validation Plan describes how the exercises have been planned and provides details about their organisation

D4.3 Final Validation Report offers a detail description of the exercises and of their results.

2.3.6 TABLE TOP AND COLLABORATIVE SERIOUS GAMES

Description - Serious games are of frequent used in DRR, where scenarios such as natural disasters, acts of terrorism, danger prevention and emergency care can be simulated. Challenges such as acting under time and pressure to succeed can thus be realistically tested with fewer resources and costs. Exposure to the requirements and constraints of disaster management can allow to study the interactions between actors and to define to a better response in a real disaster management case. In addition, well planned and designed serious games can offer to participants the opportunity to reflect about the problems emerging during the management of an event and stimulate related discussions. ENGAGE developed a serious game to investigate specific aspects of the coordination between stakeholders, and made use of another game developed in the past by one of the partners for training purposes. These two games are described in the following. Other ad hoc table top games have been designed to support the validation exercises, however their use was limited to very specific cases and are not discussed here.

MT21 - Collaborative Serious Game - This game has been developed by the project to simulate and let the participant experience some of the classic problems emerging when different stakeholders work together in DRR. In particular the game offers the opportunity to experience an event requiring: i) optimization of the usage of resources; ii) exchange of information between stakeholders with different views and knowledge about the event; iii) coordination between stakeholders with different priorities; iv) coordination of first responders with volunteers, and definition of a common strategy for DRR. The game is followed by a debriefing session and by a structured discussion guided by a questionnaire where all these aspects are discussed with the participants. The main objective of the players is to extinguish or control a fire while preserving life and limit the other damages produced by the fire for the duration of the game. There are four groups of players, each one representing a different stakeholder (two groups of first responders, organized and trained volunteers, local volunteers). The presence of these different stakeholders in the game offer the opportunity for professional to experience the point of view and the problems of volunteers. The game has been used in different workshops, exercises and project events contributing effectively to the research activity.

MT22 - Emergo Train System - Emergo Train System (ETS) is a table top simulation system used for education and training in emergency and disaster management. Aimed at testing and evaluating incident command systems, disaster preparedness, impact on the medical management system and resilience within organisations. It is focused on the evaluation of processes, use of resources and coordination. It was used as part of a decision game during the Trondheim exercise, as a complementary activity based on the same scenario and involving the same authorities and first responders of the full scale exercise. The aim was to enhance collaboration among stakeholders clarifying roles and responsibilities and improve resource allocation.

Stakeholders concerned - First responders of different organizations, authorities at local, regional and national level, citizens.

Stakeholders involvement - The games offered the opportunity to guide and discuss some of the main issues emerged during the project, and related to the interaction between stakeholders and to the problems and opportunity offer by a more active engagement of citizens and volunteers in DRR.

Main hints regarding stakeholders involvement - The game evidenced the importance of coordination and a clear understanding between stakeholders. However, this could also be the result of the game organization, where the players of the game played the role of stakeholders with different priorities (see the description above). Communication and optimal exploitation of all the resources including those of different types of volunteers emerged as the most important aspects for managing DRR.

Project references - The following project references can provide additional information regarding the exercises:



D4.3 Final Validation Report offers a description of the games and of their use during the exercises and the workshops.

2.3.7 INTEGRATED CONTRIBUTION TO STAKEHOLDERS INVOLVEMENT

The integrated combination of the methods and tools listed above contributed to the progressive involvement of the different stakeholders and in particular of the citizens in the project activity and in orienting the research directions. Table 3 evidences how these contributions are complementary.

Table 3. Contribution of Methods and Tools

Type	No.	Method/tool	Aspects investigated and contribution for engaging Stakeholders
Case Study	MT1	Fukushima Daiichi Nuclear Release	Understanding the role and contribution of the different stakeholders, including organized and spontaneous volunteers, in DRR. Understand the interaction between the different stakeholders in the different cases and how the local and cultural characteristics (e.g. age, risk awareness, trust in authority) influenced this interaction.
	MT2	East Japan Tsunami	
	MT3	Thalys Train Attack	
	MT4	Wildfires in Sweden	
	MT5	Flood in Negev Desert	
	MT6	Earthquake at L'Aquila	
	MT7	Terrorist attack in Utøya	
Survey	MT8	International Survey	Understanding views and perceptions of diverse populations, and relationships between risk awareness and resilience. Knowing the level of trust of citizens in varied responder and authorities.
	MT9	Italian Survey	Study the problems and opportunities related to the organized and spontaneous volunteers and the perception of citizens with relation to their role in DRR.
Workshop	MT10	Workshop 1 online	Point of view of first responders and authorities about communication with the citizens during emergencies.
	MT11	Workshop 2 online	Possible contribution of the early ENGAGE Solutions to the problems of communicating with the citizens during emergencies.
	MT12	Workshop 3 in Marseille	Use of the Catalogue of Solution and management of volunteers in DRR
	MT13	Workshop 4 in Targu Mures	Use of the Catalogue of Solution and management of volunteers in DRR

	MT14	Workshop 5 in Rotterdam	Full focus on role of citizens and volunteers, their possible contribution, the interaction with the first responders and authorities and the problems and opportunities of their participation to DRR.
	MT15	Workshop 6 in Trondheim	Analysis of the interactions and coordination between the different stakeholders.
Public event	MT16	Public event in Rome	Point of view of citizens and volunteers about their role, their possible contribution, the interaction with the first responders and authorities and the problems and opportunities of their participation to DRR.
Exercise	MT17	Exercise Heat Wave	Real participation of volunteers in interaction with formal actors (authorities and first responders) in preparedness actions in favour of vulnerable categories.
	MT18	Exercise Cyber attack	Raising awareness actions for citizens.
	MT19	Exercise Quick Clay	Interaction between formal actors (authorities, law enforcement agencies and first responders) and contribution of citizens as spontaneous or organized volunteers.
	MT20	Exercise Migrant emergencies	Interaction between first responders and authorities and civil society organizations.
Game and Table Top	MT21	Collaborative Serious Game	Investigation about the issues of: exchange of information between stakeholders with different views and knowledge about the event; coordination between stakeholders with different priorities; coordination of first responders with volunteers, and definition of a common strategy for DRR.
	MT22	Emergo Train System	Assessment of the use of resources and coordination to explore roles and responsibilities between professional first responders, volunteer organisations and the public.

3 INTERACTIONS BETWEEN STAKEHOLDERS

3.1 BENEFITS OF COLLABORATION BETWEEN FORMAL STAKEHOLDERS

Collaboration between official stakeholders such as different types of first responders and authorities is crucial for effective disaster management and preparation. It leads to a more comprehensive, efficient, and resilient approach that addresses the diverse challenges posed by natural and human-made disasters. It is an established and widely recognized and accepted practice well described in the literature.

We are not going to list the different advantages here, but only those that emerged using methods and tools listed in the previous Section. The list is not complete, it is limited to the advantages emphasised by the stakeholders during the project activity. For each of the following point we identify the methods and tools (MT) through which the claim was collected. The main advantages of collaboration among official stakeholders, that have been reported, are listed in the following.

- Resources can be shared more easily, for example in the aftermath of an event various stakeholders can share resources like personnel, equipment, and supplies to ensure a more efficient response. Reported in: MT3; MT4; MT18; MT20; MT21; MT22.
- Scientists, emergency responders, and community leaders can collaborate to combine their knowledge and expertise in risk assessment, early warning systems, and disaster response planning, leading to more informed and effective strategies. Reported in: MT6; MT14; MT19.
- Accurate and timely communication can be provided when stakeholders collaborate between them (as long as these communication are well coordinated). Different stakeholders can more easily reach the desired audience. Reported in: MT1; MT2; MT4; MT12; MT14.
- When multiple agencies work together, there is a better chance of a unified and coordinated response. For instance, in the case of a wildfire, firefighters, local law enforcement, and environmental agencies can collaborate to address the fire from different angles. In addition, collaboration between public, private, and non-profit sectors can result in a more comprehensive and effective approach. For example, private companies can provide logistical support, and non-profits can contribute their community outreach expertise during disaster response. Reported in: MT1; MT4; MT10; MT17; MT18.
- Collaboration allows stakeholders to share lessons learned from previous disasters, facilitating continuous improvement in disaster management strategies. This knowledge-sharing can involve after-action reviews, workshops, and joint training exercises. Reported in: MT12; MT14; MT15.

3.2 BENEFITS IN COLLABORATION WITH ORGANIZED AND NON ORGANIZED VOLUNTEERS

Organized volunteers are those providing their support within the framework of an institutionalized context, for example: an organization like the red cross; an association such as the boy scout; or other institutions such as the amateur radio operators. These are usually well coordinated with the formal stakeholders and the authorities and play a crucial role in DRR. For example, they can assist in medical care, provide emergency services in areas or side activities not completely covered by dedicated emergency personnel, provide psychosocial support, help in the provision of supplies, and logistics. In addition to their activity there are contributions from non organized volunteers, that are sometimes less recognized but equally essential in DRR, both during the preparedness, the management and the recovery phase. For example, it is well recognized that their local knowledge and traditional practices are crucial, starting from the disaster preparedness where incorporating indigenous approaches enhances the overall resilience of communities [Ber, 13]. The main advantages of collaboration with organized and non organized volunteers, that have been reported, are listed in the following.



- In management local spontaneous volunteers are the first one on site during an emergency and can provide essential first aid to those hit by the events. Reported in: MT3; MT6; MT7; MT9; MT13; MT14; MT16
- Local spontaneous volunteers know their territory and have information that can be essential for the intervention such as the distribution of the population, the localization of the vulnerable people to be assisted, the place where essential resources could be available (e.g. water) or hidden dangers could be present (e.g. location of flammable products). Reported in: MT6; MT7; MT16; MT21.
- Local spontaneous volunteers have consolidated social relationships with the members of the community. They are close to citizen in vulnerable conditions, they know how to support and how to deal with them (e.g. convince elderly people of the need of evacuating). Reported in: MT6; MT16; MT21.
- Spontaneous volunteers can provide additional resources that emergency services can miss especially during the first phases of an intervention (e.g. goods, transportation service). Reported in: MT5; MT6; MT7; MT16; MT21.
- Local spontaneous volunteers are also those remaining on site after the emergency and they need to have a role on the planning of the intervention actions that can have an influence on the return to normal life. Reported in: MT6; MT16.

3.3 ISSUES IN COLLABORATION BETWEEN FORMAL STAKEHOLDERS

Despite their shared goal of ensuring public safety, first responders face numerous challenges in working together seamlessly. Difficulties emerged from workshops and exercises at the interaction between different organisations of first responders. In this Section we discuss these issues. For example, problems emerged by the stakeholders during the discussion, aspects noted during the analysis of the case studies, problems emerged during the exercises.

Communication Barriers - One of the primary challenges in collaboration among first responders is communication barriers. Different agencies often use incompatible communication systems, making it difficult to share vital information in real-time. During disasters, timely and accurate communication is critical, but these barriers hinder the flow of information, leading to delays in response and potential gaps in coordination. Reported in: MT1; MT7; MT12; MT14; MT21.

Lack of Standardization - This a well known problem and several European projects are trying to address it. For example with focused pre-standardization activity [STG, 23]. The absence of standardized procedures and protocols across various first responder agencies contributes to difficulties in collaboration. Each agency may have its own set of guidelines, terminology, and operating procedures, leading to confusion and misunderstandings during joint operations. Standardization is essential to create a unified response system that facilitates seamless collaboration among diverse entities. Relevant standards, to which the ENGAGE recommendations could contribute, and which could help with this issue are described in [ENG, 23]. Reported in: MT12; MT14.

Resource Allocation Challenges - Disaster situations demand a swift and well-coordinated allocation of resources. However, first responders often face challenges in determining the appropriate allocation of personnel, equipment, and supplies. Competing priorities, jurisdictional issues, and a lack of centralized resource management can hinder the efficient utilization of available resources, compromising the overall effectiveness of the response effort. Reported in: MT4; MT17; MT21.

Interagency Coordination - In many disaster scenarios, multiple agencies and organizations are involved in the response. Coordinating efforts among these diverse entities poses a significant challenge. Jurisdictional boundaries, differing mandates, and varying levels of expertise can impede smooth collaboration. Reported in: MT15; MT19; MT21; MT22.

3.4 ISSUES IN COLLABORATION WITH VOLUNTEERS

Even if volunteers play a vital role in disaster management, there several challenges emerged from the project activities, especially regarding limitations and risks associated with volunteer involvement. First responders and authorities evidenced the difficulties of the balance between harnessing the goodwill of volunteers and ensuring a professional and efficient disaster response. The topic of management of spontaneous volunteers was considered as extremely important by authorities and first responders, confirming its relevance in the context of the project. Indeed, such a topic covers many dimensions of public involvement in disaster management, including, for instance: risk awareness and preparedness in local populations, members of the population as a source of information or resource for emergency actors, tasking and tracking of volunteers. In addition, this is an issue associated with difficult trade-offs (e.g., additional capacity vs. additional risk) and levels of uncertainty (e.g., cannot be planned in detail). As a result, the phenomenon has been described for a long time in all types of crises, but the development of approaches or solutions remains limited and authorities and emergency actors struggle to effectively leverage this resource. Main issues, emerged during the project activity, included:

Inconsistent Training and Skill Levels - One of the primary challenges in utilizing volunteers for disaster management is the inconsistency in their training and skill levels. Unlike professional emergency responders who undergo rigorous and standardized training, volunteers may have varying levels of expertise and experience. This diversity can lead to inefficiencies in crisis response, as volunteers may struggle to effectively collaborate and execute tasks. This is especially true in the case of spontaneous, non organized volunteers. Reported in: MT8; MT9; MT14; MT16.

Limited Availability and Sustainability - Volunteers often have other commitments such as work, family, and personal obligations, making their availability unpredictable. In disaster situations where a rapid and sustained response is crucial, the reliance on volunteers can result in a shortage of manpower at critical moments. Moreover, the long-term sustainability of volunteer efforts may be challenging to maintain, as volunteers may experience burnout or find it difficult to commit for extended periods. Volunteers often bring their own resources, such as vehicles, tools, and equipment, to disaster management efforts. However, the availability and type of resources can vary significantly among volunteers. This unpredictability makes it challenging for disaster management authorities to plan and allocate resources effectively, potentially resulting in imbalances and inefficiencies in resource utilization. Reported in: MT6; MT16.

Coordination and Communication Challenges - Effective disaster management relies on seamless coordination and communication among various stakeholders. Volunteers, often unfamiliar with the established communication channels and protocols used by professional responders, may face challenges in integrating into the existing system. Again this is especially true in the case of spontaneous, non organized volunteers. This lack of coordination can lead to delays, confusion, and inefficiencies in delivering aid and responding to emerging crises during disaster situations. Integration of spontaneous volunteers per se may not be easy because volunteers tend to operate differently than formal stakeholders. They should rather form more of a "bridge" to more effectively facilitate the volunteers involvement rather than trying to integrate them into their system of working [ENG, 23]. Reported in: MT6; MT16.

Risk to Volunteers and legal issues - Disaster situations are inherently dangerous, with risks ranging from physical harm to exposure to hazardous materials. Volunteers, who may not have the same level of training and protective equipment as professional responders, are more susceptible to injury or health issues. Ensuring the safety of volunteers becomes a critical concern, and inadequate risk management measures can jeopardize both the well-being of volunteers and the overall effectiveness of disaster response efforts. First responders can have legal responsibilities with regard to the use of volunteers and legislation is not always clear across Europe about the legal implications of actions from volunteers. Reported in: MT2; MT3; MT4; MT7; MT12; MT14.

3.5 ISSUES EVIDENCED BY VOLUNTEERS

Using the methods and tools discussed before the project staff had several opportunities to interact with citizens acting as volunteers and elicit their opinions. They identified several specific issues in the interaction with the official stakeholders. These are listed in the following.

- There is a strong interest in being prepared and aware, even if citizens recognize the problems of preparedness (e.g. need for frequent updates, motivation may decrease with time). Most of them participated to preparedness actions, however, often these were rather theoretical or focused on pleasing regulatory requirements rather than on the needs of the local context, making them less useful. Training actions should be more contextualized and explained (why some choices?) rather than being mechanical (e.g. an evacuation). Reported in: MT2; MT6; MT9; MT16.
- Citizens evidenced how non organised volunteers, are often not considered by the authority, especially after the first phase of an emergency. This is especially important for local volunteers who feel they could have an important role while planning and organising recovering but they report they are often ignored. Reported in: MT6; MT9; MT16.
- Information and situational awareness are always a key problem for volunteers including when they are part of an organized group. This is particularly important because a full comprehension of the situation is a key element for a better contribution and for motivating citizen participation. Reported in: MT1; MT5; MT6; MT9; MT16.
- Feedback, experiences, comments are occasionally exchanged with other volunteers but never with the authority. Reported in: MT9; MT16.
- There is a day by day emergency (e.g. poverty, migration, degradation of social ties) that can not be considered as a disaster per se but that is anyway having a cumulative effect and a negative influence on the quality of life. This day by day emergency is perceived by the volunteers more than by the authority and it is difficult to be shared with them. Reported in: MT16.

4 CONCLUSIONS

4.1 SOLUTIONS PROPOSED BY ENGAGE

The Catalogue of Solutions is one of the main outcome of the ENGAGE project. It is a repository of experimented processes, methods and tools aimed at improving the interaction between the emergency services and authorities with the citizens as well as improving societal resilience through raising risk awareness, informing the citizens about what to do in case of some events or organizing evacuation. Some of these Solutions are of particular relevance for the issues listed in the previous Sections and may contribute to ease the problems identified. Of particular relevance are Solutions listed in the following.

“The Communities Advancing Resilience Toolkit (CART)”, is a theory-based and evidence-informed community intervention designed to enhance community resilience by bringing stakeholders together to address community issues in a process that includes assessment, feedback, planning, and action. Tools include a field-tested community resilience survey and other assessment and analytical instruments. The CART process encourages public engagement in problem-solving and the development and use of local assets to address community needs. CART uses four interrelated domains that contribute to community resilience.

“The Enabling Social Action programme”, presents guidance and recommendations for the public sector to enable and foster social action. Social actions refer to people investing their time and other resources to help the community and provide to the common good. Therefore, social action is about people coming together to solve problems in their communities and help improve lives. The aim of this program is to provide learning and resources for commissioners and other public sector leaders to enable social action.

“30days30ways” is a national campaign of preparedness activities for citizens via social media. It is an evidence-based, structured social media emergency risk communication, education and engagement initiative. The aim is to increase household and community preparedness and resilience in a world increasingly impacted by climate change and a wide range of risks. It focuses on empower personal preparedness through enhancing knowledge and understanding

Preparedness Guard The solution is used by NGOs in several countries, such as the Red Cross in Austria. The Preparedness Guard is also used in some places in Norway. In Trondheim, it started with the deployment and basic training of volunteers at vaccination centres during the COVID 19 pandemic. After that, there was interest from the volunteers and the TRC to expand the cooperation and use it in future crises. This solution aims to create a low threshold offer for citizens to help local NGOs with simple tasks as volunteers in the event of a crisis. The NGOs thus increase the resources available to them in the event of a crisis. Red Cross volunteers who are working in areas other than crisis management, or new volunteers, can be deployed after a short basic training course in first aid and emergency psychological care. Refresher training takes place one day a year, otherwise, volunteers are only alerted in the event of a crisis. They are then mobilised to carry out tasks such as transport, manning information points and administrative tasks such as registering people.

Dopomoha Developed in Romania in open source-code. It allows NGOs, (unorganised) volunteers, and private companies to register their available resources, such as transport, food and housing. Moreover, national and UN agencies located in Romania can access and make use of the resources to help the refugees, for example with finding safe housing. Hence, the platform is a form of inventory where resources and needs can be matched in a similar way as done in sharing economy platforms.

Emergency chatbot, developed and provided by One2Many. Aims to answer specific questions from citizens about crises. Chatbot for information delivery before, during, and after emergencies. Crisis situations are complex, and it can be difficult to access time-sensitive and critical information relevant

to individual safety and response. The chatbot can answer questions and provide information such as the type of disaster, recommended behaviour, or how far away the disaster is from the person making the inquiry.

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

Community Recovery Management Toolkit, this toolkit is compiled by the US Federal Emergency Management Agency. After a crisis, in the recovery process, local leadership is under intense pressure and must manage many tasks at once. The toolkit provides them with an organized collection of tools that can support their activity. It is designed to help them do their job in the best possible way and to ensure a just, thoughtful, resilient rebuilding at the same time. It includes tools the involvement of citizens or the organization of volunteers.

EU Modex is a simulation exercise promoting a well-coordinated joint response to disasters. A joint approach further helps to pool the expertise and capacities of first responders, avoids duplication of relief efforts, and ensures that assistance meets the needs of those affected. Pooling together civil protection capacities and capabilities allows for a stronger and more coherent collective response. The importance of the solution is that it helps in anticipating the needs of different organisations participating in the response activities to large-scale casualties.

Community opinion leaders" is a solution implemented at the national or community level, that leverages the influence of opinion leaders to disseminate information, thereby guiding public opinion. An opinion leader is a respected figure within a specific group, either in a formal or voluntary capacity, who imparts details and insights to less active members of the group. A prime example of this are religious leaders.. Studies and anecdotal evidence have indicated that greater cooperation and compliance were witnessed in communities where information channels included these opinion leaders. However, a key challenge of this approach is ensuring the willingness of opinion leaders to collaborate with formal authorities and organizations.

Community emergency & resilience teams" (CERTs). These are groups of volunteers that receive basic training to intervene and aid during varied emergencies, as well as be used in routine to raise risk awareness, and assist in the reconstruction phase following a disaster. They offer help to individuals, groups, and other community members in different areas, from medicine, mental help, search & rescue, social help and more. In large cities they operate on a community (specific geographic boundaries) level, while in rural areas they operate as a regional (more expansive) level.

4.2 FINAL REMARKS AND RECOMMENDATIONS

Collaboration is not just a goal but a necessity in the face of the complex and evolving challenges posed by disasters. These challenges are multifaceted and demand comprehensive solutions. Overcoming communication barriers, promoting standardization, addressing resource allocation challenges, enhancing interagency coordination, are essential steps toward creating a more effective and coordinated response system. By acknowledging these difficulties and actively working to overcome them, first responders can better fulfil their mission of safeguarding communities and minimizing the impact of disasters.

Volunteers represent an essential resource in DRR. They assist in medical care, information & communication, psychosocial support, shelter, provision of supplies, and logistics. Their contributions, including search and rescue, first aid, data management, psychological counselling,

and more, they are vital in alleviating suffering and aiding recovery efforts during and after disasters. Their local knowledge and traditional practices are crucial both in preparedness and in management.

However, even if the level of perception of the risk of natural hazards between citizens is high, only a few of them: know where to find information on the risk of natural hazards in their territory; have previously joined trainings on emergency management; and are aware of the measures to implement in the event of a natural hazard. There is a strong interest in being prepared and aware, even if there are several challenges linked to awareness and preparedness. Citizen's complaint about lack of regular training, considered one of the main obstacles preventing them from participating in disaster response activities. Lack of knowledge is another barrier they mentioned whether this knowledge is about what to do in the case of a disaster, how to act, where to go, who to contact; or knowledge of the organizations that could support them in disaster situations.

Surveys and interviews have shown how the main factors enabling the participation of citizens as volunteers in emergency response operations are related with information and training. In the preparedness phase the effectiveness of exercises is higher when citizens are involved with a clear and defined role during the exercises such as the ones to simulation of events or preparedness actions. The interaction between different types of first responders should be carefully planned and coordinated to let the citizens understand more clearly their role and potential contribution. Having an active participation in the exercises, for example as volunteers, ensures a better involvement of the citizens and having a clearer understanding of their role in case of a disaster situation. Their involvement not only contributes to the effectiveness of exercises but also empowers them to autonomously contribute during actual crisis situations. Providing citizens with the necessary skills, knowledge, and resources will enhance their ability to contribute effectively during crises.

Dialogue is needed in all the phases of disaster management to share common terminology, build trust between authorities and citizens and better understand others' perspective. It is essential to establish common terminology, build trust, and better understand each other's perspectives. Effective communication can bridge the gap between authorities and the public, ensuring a more coordinated and responsive disaster management system.

Citizens and their representatives (e.g., civil society organizations) are interested in being involved in the design of actions related to preparedness and raising awareness. Furthermore, their interest in the well-being and resilience of their community motivates them to actively engage in the planning and executing preparedness initiatives. Consequently, citizens and their representatives become invaluable contributors, providing essential insights, grassroots perspectives, and a strong sense of community ownership to the disaster management strategies.

Intervention as volunteers during an emergency is a form of training and awareness raising in itself. Volunteers who participated to the management of an emergency are not only more aware of risks, know what do, and how to collaborate. They are also well motivated and tend to be those more interested in maintaining an adequate training level and in participating to the design and implementation of preparedness actions.

There are no methods and processes and not even practices to consider the role, experience and feedback of spontaneous volunteers about the management of emergencies during the post facto analysis. First responders and authorities often under-evaluate the importance of this aspect and ignore their potential contributions. There is a significant loss of knowledge and opportunities that could be collected from volunteers [ENG, 23].

The needs and expectation of volunteers and the type of contribution they can provide is related to their links, knowledge and organization. There are several possible classification of volunteers proposed in the literature, see for example [Mar, 22]. Table 2 (in Section "Main Stakeholders in ENGAGE") introduces a classification based mainly on the problems and opportunities deriving from the collaboration between formal stakeholders and volunteers. These problems and opportunities have been discussed in the previous Sections. The discussion evidences how what one can expect and the actions to do to improve the collaboration are related to the type of volunteers presented

in Table 2. In particular, most of the problems evidenced by the first responders are in the interactions with non local spontaneous volunteers. Specific tailored actions should be organized to plan the use and manage the volunteers of this group before, during and after an emergence.

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