



## D6.6 STAKEHOLDER VALIDATION OF RESEARCH FINDINGS AND CO-CREATION OF INNOVATIONS

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## EXECUTIVE SUMMARY

Within the Work Package 6 of BuildERS project, we established a “living lab” to create innovations for crisis management. We have run several iterative processes with our Stakeholder Forum, which comprises currently of more than 100 different organizations and 362 persons. Our stakeholders represent both public, non-profit, and private sectors. Most of them are practitioners and experts in the field of crisis management like first responders. Especially important stakeholders have been intermediaries of individuals in vulnerable situations: non-governmental and faith-based organisations who provide help and support before, during and after various natural and man-made disasters.

The BuildERS project has produced several peer reviewed scientific articles where it has paved path towards more nuanced and holistic assessment of people’s vulnerability in disasters and crisis. Furthermore, BuildERS has brought new knowledge of communication-related vulnerabilities and how to reduce them. Together with our Stakeholder Forum we have co-created several practical solutions that help practitioners to assess who are vulnerable, learn how to interact and communicate better, and how to establish partnerships that help to reach and support people in a vulnerable situation.

In the making of innovations, we have used facilitated, co-creative methods like scenario-based tabletop exercises, workshops to validate research results, brainstorming events, technology testing and demonstrations, research webinars and expert panel discussions. Furthermore, our Stakeholder Forum members have validated our policy recommendations, and assessed their operative relevance and feasibility.

In this document, we provide a summary of our *Toolbox for Inclusive Crisis Management*. It comprises nine different tools. Some of them enable more sophisticated vulnerability assessments and more-informed resource allocations. Others help to make risk and crisis communication more accessible and effective. In addition, we have developed tools that assist crisis managers in strategic preparedness planning.

All our tools support inclusive crisis management that builds the resilience of the whole society: including those who may lack capacities to cope due to age, health, or psycho-social everyday challenges. Important actors who - “building bridges” between the official crisis management agencies and individuals in a vulnerable situation - are the intermediaries: non-profit sector organisations, spontaneous volunteers and informal social support networks, and the new opinion leaders of digital age: like social media influencers. BuildERS tools help to build collaborative relationships and trust networks with these intermediaries, and thereby reduce peoples’ vulnerabilities in crisis.



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## LIST OF ACRONYMS

AB	Advisory Board
BuildERS	Building European Communities Resilience and Social Capital project
COVID-19	Global coronavirus pandemic
D	Deliverable
DoA	Description of Action
NGOs	Non-governmental organisations
WP	Work Package
VTT	Technical Research Centre of Finland
UNEP	United Nations environment programme




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# STAKEHOLDER VALIDATION OF RESEARCH FINDINGS AND CO-CREATION OF INNOVATIONS

## 1. Our Aims – Common vision of BuildERS

According to the common vision of the BuildERS project, the overall aim is to improve the resilience of European societies against natural disasters and man-made crisis. We try to empower especially those individuals, whose situation can be very vulnerable during a crisis. By not taking vulnerability for granted, we have innovated *novel ways and methods to identify and measure* people's vulnerability together with our Stakeholder Forum and Advisory Board.

In this report, we present assessment tools that help to analyse who is or may become vulnerable. These tools are designed for practitioners, who need to plan resource allocations and prioritise crisis management actions and, most importantly: evaluate in advance the impacts of crisis management actions on various individuals. According to our research findings, *crisis management itself may affect people's vulnerability* in crisis. For instance, during the COVID-19 pandemic we have witnessed several unfortunate consequences from actions that helped to protect people from getting physically ill but had also unwanted negative impacts on psycho-social wellbeing.

All the practical innovations of the BuildERS project are based on state-of-art scientific findings generated by the project itself and by the academic community. For example, our recommended vulnerability assessment framework is based on *intersectionality*, which means that the elements that make different groups vulnerable can overlap according to the context. As people may be simultaneously vulnerable in many ways, we need a deeper analysis of societal inequalities, exclusion, and lack of access to and control over resources. Our vulnerability assessment tool gives a more nuanced analysis of various elements of vulnerability that might intersect and overlap. We recommend that the crisis managers consider the differences that may coexist within groups that are currently portrayed as vulnerable. Furthermore, we argue that research should focus more on *individuals' self-perceptions* of their vulnerability (i.e., self-perceived vulnerability) and examine *cases of crises* according to the level and/or likelihood of individual exposure to hazards, to better nuance issues of vulnerability.<sup>1</sup>

From the very beginning, our working hypothesis has been that the *communication* of hazard-related risks and sharing information on the ongoing crisis situations affect people's vulnerability in crisis. Our second assumption has been that people's social relations and trust networks (that is their social capital) can either reduce or increase their vulnerability. Both these hypotheses have been empirically

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<sup>1</sup> Read more of the theoretical framework of BuildERS project in the peer reviewed articles: Hansson S. et al. 2020; Kuran C.H.A. et al., 2020; Orru K. et al. 2021 and Morsut C. et al 2021.



validated during the project. According to Hansson et al. (2020), communication-related vulnerability can be understood as being driven by (a combination of) factors that fall under three types:

- ✓ *Individual factors* arising from personal physical, mental, emotional, or behavioural conditions and that could make it difficult or impossible for people to send, receive, understand, or react to information about hazards. These include cognitive, sensory, and mobility impairments (e.g., one cannot hear, see, read, walk), limited skills (e.g., a small child cannot read; a tourist may not understand the local language), and limited resources (e.g., one has no spare money to buy a communication device for sending or receiving disaster information).
- ✓ *Social-structural factors* arising from various historically, politically, and culturally constructed forms of social inequality, and configurations of government policies that exacerbate (or fail to mitigate) these. People in some areas may suffer from poor communication infrastructure. Disaster information may be distributed by authorities via channels that certain groups cannot (afford to) access or do not usually use, or in a language that they cannot understand. Social support for some disadvantaged groups may be lacking and, due to social marginalisation, distrust may grow among them towards officials and news media as sources of warning messages and disaster information.
- ✓ *Situational factors* or complications to disaster communication that emerge in the specific context of a particular disaster. Some of these complications may affect access (e.g., communication channels may be disrupted due to power outages caused by storms or wildfires) while others affect understanding (e.g., exposure to false or misleading information) or reactions (e.g., lack of previous experiences with a particular type of hazard).<sup>2</sup>

Furthermore, following our Common Vision, we have explored *factors that hinder individuals from coping with crisis and making their lives better after disasters*. Again, in close co-operation with our external Stakeholder Forum and Advisory Board, we have innovated means to build capacities and make crisis management more *inclusive*. Inclusiveness means that everyone's potential to contribute to crisis management is recognised – including those who are in a vulnerable situation. Inclusive crisis management enables also to assess people's preparedness capacities and address their various needs in terms of coping with crisis. Process and product innovations have been co-created with various stakeholders: communication experts, crisis management agencies, care providers from both public, private, and non-profit sectors, to name a few. The end results are concepts and prototypes for education, training, strategy building and operational planning – all helping to lower the threshold of engaging vulnerable individuals and listening their voice.

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<sup>2</sup> See more of the communication-related vulnerability factors in an article by Hansson et al. (2020) and of managing false information in Torpan et al. (2021) and Hansson et al. (2021).



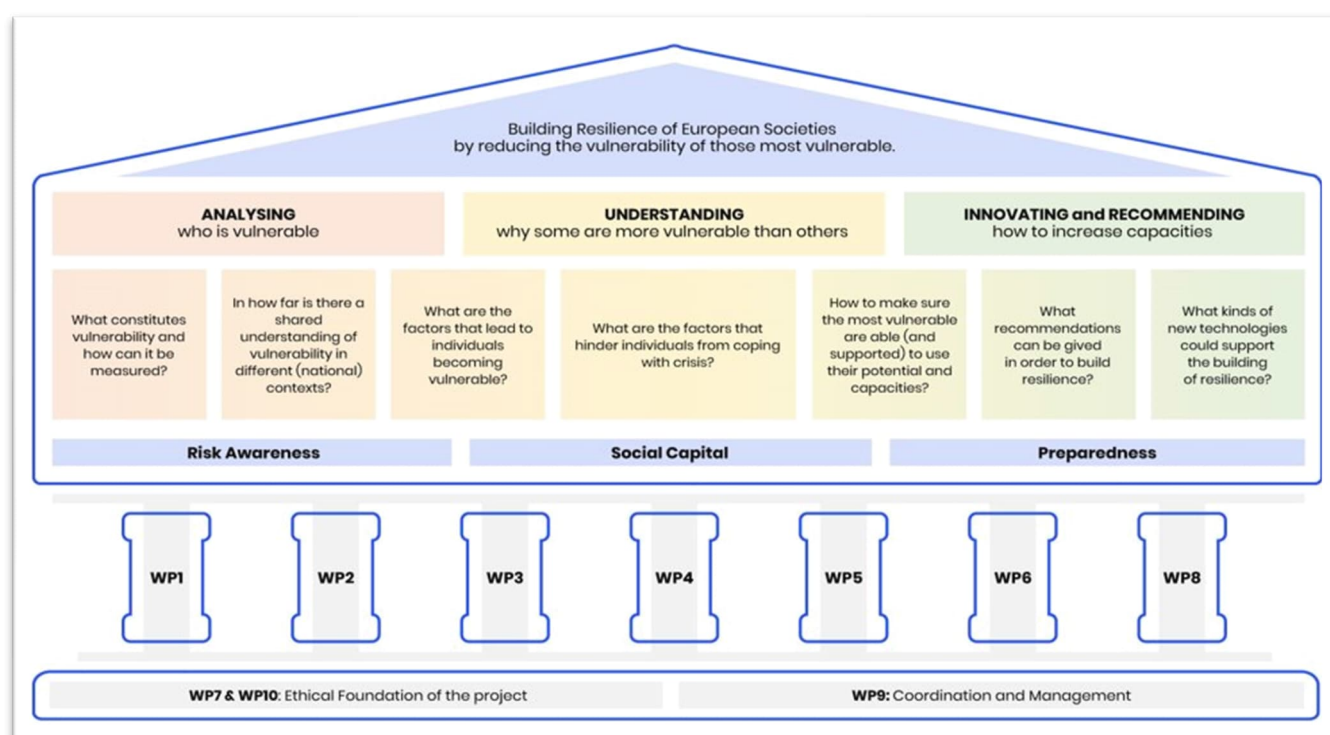


Figure 1. The visualisation of the Common Vision of BuildERS project

Our practical innovations, such as process guidelines and products, are primarily targeted for the first responders (civil society organizations, civil protection authorities, fire and rescue services, law enforcement, health care, social services, and psychological support in crisis) and other agencies responsible of crisis management (to empower individuals). In addition, these innovations benefit their strategic partners, like the non-profit and civil society organizations active in inclusive and participatory resilience building.

In the next chapter (2), we will open the iterative processes of the BuildERS project and make a short summary of these practical innovations. In chapter three (3), we will explain in more detail the BuildERS Toolbox for Inclusive Crisis Management. We will begin with showing the tools and technologies for a more nuanced vulnerability assessment, then continue with tools for building knowledge: Guidelines for Ethical Assurance, First Responder Training Prototype, and Board Game: Preparedness Skills for Children. Finally, we introduce two tools for establishing collaboration with the intermediaries of vulnerable individuals. The first tool, the Inclusive Crisis Communication Canvas, is meant for designing a communication strategy and building strategic partnerships in risk and crisis communication. The second tool promotes collaboration with social media communities and networks in reaching vulnerable individuals; we have developed guidelines for collaborating with the new opinion leaders of digital age: social media Influencers.

In line with the abovementioned practical tools, we have articulated recommendations for policies to support the effective use of BuildERS innovations. The full *Report on Innovation Policy Recommendations* (D5.2), can be found in our project website. It includes, for example, recommendations for how to improve the collection of data that can be used for vulnerability assessments using the BuildERS Vulnerability Assessment Tool, as well as guidance to generate

dynamic population statistics with passive mobile positioning data, implement it to dashboards and use it within disaster management. The Report on Innovation Policy Recommendations also offers more general guidance for ensuring that national- and EU-level innovation policies improve resilience. Along these lines, we suggest that the EU and member states fund follow-on research projects to BuildERS, to further understand the causes of vulnerability and resilience in different contexts, as well as research that develops innovations to address vulnerabilities before, during, and after a crisis. We also suggest that policymakers provide additional support for publishing and disseminating scientific findings and innovations to a wider group of intermediaries and relevant stakeholders (e.g., social care organizations, journalists, policymakers), and to gather regular feedback from the same wider group.

On a broader level, we suggest that EU- and national-level innovation agencies implement evaluations of how existing innovation policies and proposals for innovation policies may exacerbate inequality and have the related effect of undermining resilience and social capital in the face of disasters. For instance, they could consider adding a Vulnerability Impact Assessment requirement for innovation policy proposals – not unlike Environmental Impact Assessments currently required. This can highlight any hidden or unexamined problems that might undermine resilience or social capital, making people more vulnerable during disasters. Such an assessment should include considering the impacts of the private distribution and accumulation of profit from innovations, as well as the potential impacts on workers (incl. wages and working conditions), consumers, other supply chain actors, and the environment.<sup>3</sup> (UNEP, 2020.)

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<sup>3</sup> These stakeholders are taken from the Social Lifecycle Assessment methodology, developed by United Nations environment programme UNEP (UNEP 2020).



## 2. Our Outcomes – Three Clusters of Innovations Designed for the Crisis Management

The BuildERS project has facilitated an agile iteration process amongst practitioners, policy makers and the BuildERS project consortium members. All the participants have literally been co-creators with their ideas and recommendations, not just passive respondents, or knowledge providers. Due to the restrictions during the global COVID-19 pandemic, most of our co-creation activities have been organised online via video conferencing or a digital facilitation platform called *Howspace*.<sup>4</sup> We organised altogether *25 co-creative events*: tabletop exercises, virtual and face-to-face workshops, simulations and pilot tests, polls, and surveys.

Our Stakeholder Forum has grown steadily along the project, and now includes *476 persons*. Participants represented 22 countries and more than 150 different organisations. We are very grateful of their feedback and ideas for novel solutions for more inclusive disaster management. Stakeholders represent public, non-profit and private sectors. Some have become *experts by personal experience* from various crisis situations: survivors, volunteers, and other care takers. Other stakeholders are *experts by working practice*: operational level first responders, risk and crisis communication specialists and coordinators of volunteer actions. A third group is represented by *experts by knowledge*: practitioners in managerial positions, academic scholars, and advisors for policy makers.

Very important lessons learned have been shared by the intermediaries with knowledge on vulnerable situations, like the representatives of non-profit organisations and social initiatives. We have also engaged individuals who have not been working in the BuildERS project but represent our first responder<sup>5</sup> and emergency service provider project partners (Police of Finland/Police University College of Finland, Estonian Rescue Board, the Salvation Army, the German Red Cross, the Civil Protection Department of the Autonomous Province of Trento, in Italy).

### The role of stakeholders

The main role of our stakeholders has been to *validate research findings* by inviting them to critically engage with the following questions: Do our results make sense? Do they see them as credible? Do our results match with their experiences? To what extent can we generalize the findings to other European contexts?

In addition, we have *demonstrated, simulated, and tested technological tools and solutions* with stakeholders, especially with the potential end users of these technological solutions through

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<sup>4</sup> More of the use of Howspace in the BuildERS project is found in the report: Jukarainen et al. (2019) D6.1 Online platform open and in operation, BuildERS project deliverable. [BuildERS D6.1 final.pdf \(buildersproject.eu\)](#)

<sup>5</sup> First responders are organizations or trained persons who respond immediately to an emergency or larger disaster. In practise they are emergency medical technicians, paramedics, firefighters, rescuers, police officers or (para)military personnel.





questions like: Would technologies support them in assessing vulnerabilities? Would they help in addressing the needs of vulnerable individuals? Would they help to learn to understand the factors and dynamics behind vulnerabilities?

Furthermore, we have *ideated and brainstormed together solutions to identified challenges* raised by our research. Several questions were addressed in this regard: How to identify, assess and measure individuals' vulnerability? How to learn skills to reduce vulnerabilities? How to engage representatives of people with high risk of becoming vulnerable and various kinds of volunteers in the raising of risk awareness? How to collaborate with actors like informal/spontaneous volunteers and (social media) influencers? Finally, we have invited our stakeholders to *evaluate preliminary policy recommendations*. Are they feasible? Are they too ambitious? Are they conventional? Can they be applied in different contexts?

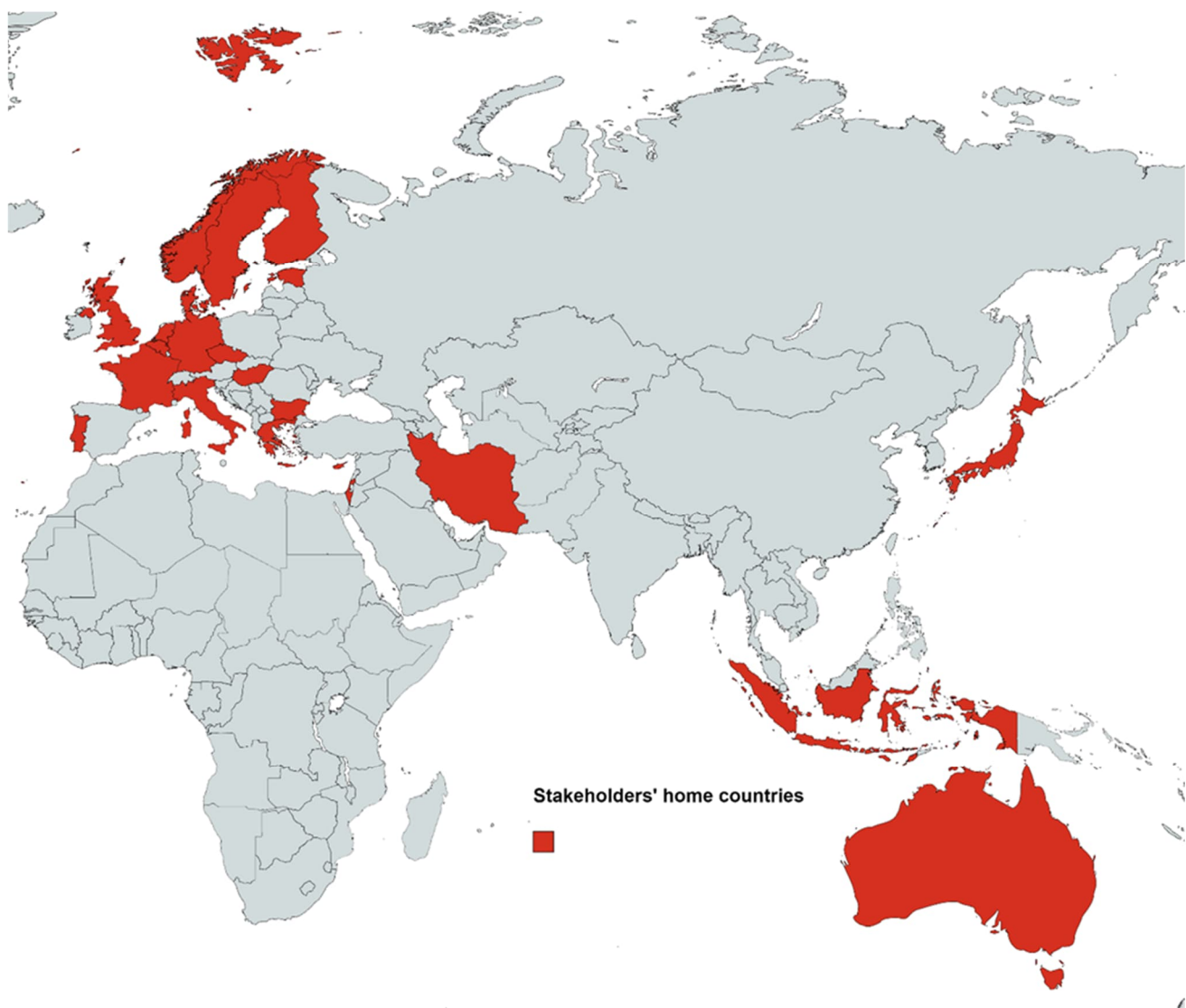


Figure 2. External stakeholders' home countries (22)



### Iteration process in a nutshell

Co-creation in BuildERS comprises the following sequential stages: Framing, Knowing, Analysis, Synthesis and Creating (Figure 3). The process has primarily been iterative. The first stage was *framing*, where we clarified our focus and outlined the overall potential for various innovations. This stage began with a thorough reading of the project plan (Description of Action (DoA)) and continued by defining the strategic Common vision for the BuildERS project.

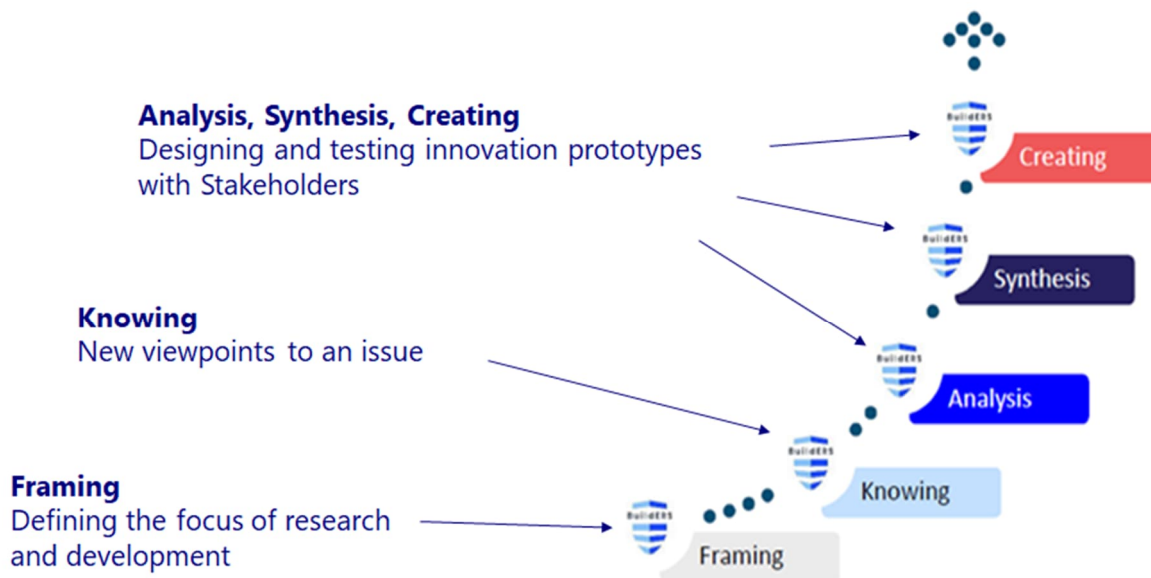


Figure 3. The main stages of co-creative process

During the next *knowing* stage, we engaged some external stakeholders and our Advisory Board with a simplified Delphi-process, which supported the generation of the theoretical framework and glossary of key concepts for the project, contained in report titled: *Final report of the unified theoretical framework on the concepts of risk awareness, social capital, vulnerability, resilience, and their interdependencies* (Morsut and Kuran eds. 2020).

An iterative simplified Delphi process over a five-month period was applied to discuss the definitions of the concepts used in the BuildERS theoretical framework: resilience, vulnerability, social capital, and risk awareness (see figure 4 on page 16). The process comprised of workshops and questionnaires, with the goal of receiving feedback on the conceptual model's development and the definitions of the concepts from a total of 22 experts, mainly academics and stakeholders working with crisis and disaster management. From the synthesis of conceptualisations and definitions of the four notions, stemming both from the scoping and the semi-systematic reviews, we isolated the most frequently occurring characteristics.

Through the iterative simplified Delphi process, we raised questions about their relevance within the three phases of a crisis. Definitions, agreed for each notion, and the model were the outcome of the Delphi process. The definitions do not pretend to be exhaustive but, rather, to encourage reflection among researchers on how resilience, vulnerability, social capital, and risk awareness can be 'measured' and which relationships are the most relevant in the crisis phases. (Morsut et al., 2021.)

In the first workshop (stage 1), the model and definitions of the concepts were generally discussed, while, in the Howspace workshop (stage 3), the new expert panel was presented with the model and definitions of the concepts stemming from the first workshop, which, in turn, was based on the semi-systematic review. The model was first presented without explanation and then with a short explanatory text. The experts were invited to engage in questions on their expertise, on definitions and on the model. (Morsut et al., 2021.) The Howspace platform was organised in such a way that experts could write their comments and suggestions, answer questions, and see other experts' comments and eventually interact with them anonymously, to mitigate bias (Morsut et al., 2021).

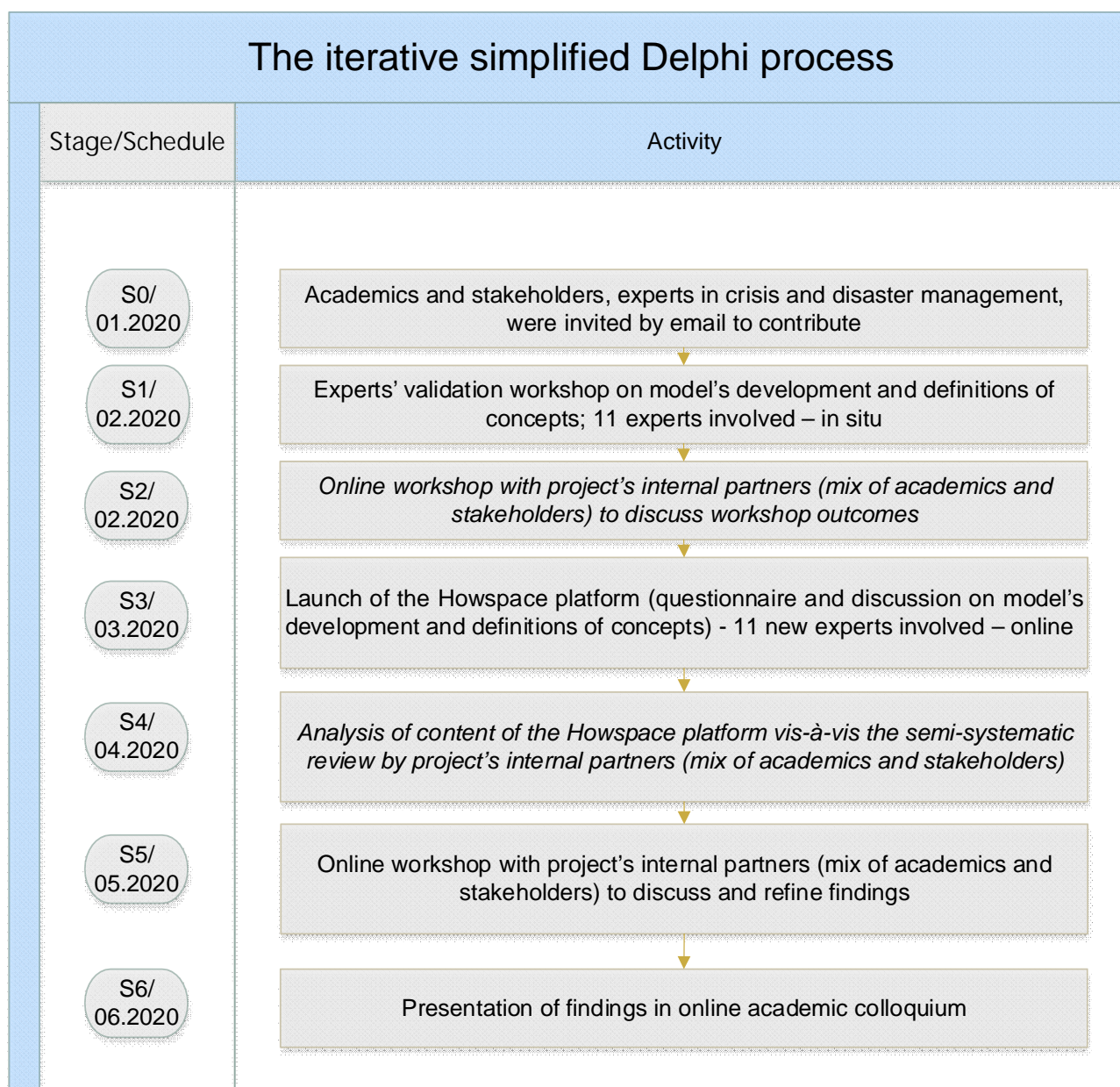


Figure 4. The iterative simplified Delphi process (elaboration from Morsut et al. 2021)

During the *knowing stage* of the co-creation cycle, we also validated and assessed the timeliness of the research knowledge. In addition, we collected experiences from the field and added to our knowledge the knowledge stemming from the capacities and competencies of practitioners. During this stage, we organised a variety of co-creation activities, such as scenario-based tabletop exercises, workshops to validate research results, brainstorming events, technology testing and demonstrations, research webinars and expert panel discussions.

In spring 2020, Finnish, Estonian, German, and Italian practitioners joined tabletop exercises on crisis communication. The first part of the exercise collected participants' experiences of identifying and tackling false information including information influencing, which deliberately aims at harming the crisis management efforts. The second part of the exercise comprised of a SWOT analysis of the current communication environment. We invited the participants to look at their intra organizational capacities in terms of communication and we requested them to assess their organizational strengths and weaknesses in trying to reach vulnerable individuals.

In autumn 2020 and early in 2021, we organized four online workshops to discuss further the difficult challenge of tackling false and harmful information (mis-, dis- and malinformation). The first three workshops were organised in native languages for the practitioners located in Sweden, Norway, and Belgium. The fourth workshop was international and open for all relevant stakeholders. We asked the participants to share their experiences and share their lessons learned from their working practises.

Between June and September 2021, we validated our WP3 research findings together with the representatives of non-profit organisations, which provide services for people in a difficult socio-economic situation. We discussed about coping with COVID-19 pandemic and how their ability to help has changed along the waves of pandemic. We learned from these validation workshops that the non-profit sector has a very central intermediary role: it can help to reach people who do not trust authorities or for various reasons do not receive official public services.

Furthermore, our three online *Research Colloquiums* have been key events belonging to the knowing stage. During these webinars we have discussed and validated the research findings created within the Work Packages 1, 2 and 3.<sup>6</sup> Altogether 15 scholars and other interested persons outside the project Consortium plus four Advisory Board members joined the first Colloquium in June 2020; in addition, there were 19 members of the Consortium sharing views with the participants on the first drafts of the theoretical framework and its key concepts.

The second Colloquium was a larger event, and there were 30 external participants from universities and polytechnics/applied sciences, RDI-institutions, crisis management specialists' associations and networks, and technology developers. In addition, two Advisory Board members and 24 Consortium members took part. The presentations were related to social media for emergency alerting, satellite imaging and hazards and other emerging technologies, managing information disorder (false and harmful information) in crises and the coping of social service providers during the COVID-19 pandemic. The presentations served as openings for later discussions and a basis for later co-creation of solutions to the challenges addressed in the webinar.

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<sup>6</sup> The recorded Colloquium presentations and the summaries can be found in BuildERS project reports Keränen et. al (2020) D6.7 *Colloquium 1*, Keränen et al. (2021) D6.8 *Colloquium 2*, and Keränen et al. (2022) D6.9 *Colloquium 3*. All reports can be viewed in the [BuildERS project website](#).



The third Colloquium took place in January 2022. The goal of the colloquium was to find out what role care organisations play as intermediaries between individuals in vulnerable situations and authorities. There were 42 participants, who represented various public and non-profit social service providers, such as representatives of Unions for people with impairment, home care, long-term care, and care for marginalised groups like homeless, migrants and drug rehabilitation clients.

The event was divided into three sessions. First, brief presentations of research done in Work Packages 3 and 4 were shared, respectively on how care organisations act as advocates of the most marginalised during the pandemic; on results and compared experiences from the study on flood management and the COVID-19 pandemic in Germany; on upraising the needs of earthquake survivors in displacement strategies in Italy; and on ways to engage the needs of diverse society in vulnerability assessment. After these presentations, facilitated workshop-type discussions were organised in six different languages.<sup>7</sup> Key discussion themes were 1) care organisations' experiences of involvement in disaster management so far, and 2) care organisations contribution to the disaster management in the ideal world. Finally, a joint discussion and wrap-up of the results from the language-based discussion sessions was carried out.

The last three stages, *analysis*, *synthesis* and *creating*, refer to the drafting and testing the prototypes of practical and process innovations together with the external stakeholders and Advisory Board. A prototype of the vulnerability assessment tool has been tested and iterated several times in a row with the practitioners in tabletop exercises and virtual workshops. We have also designed a prototype for the first responders' training on risk and crisis communication and tested it with the potential end users in the form of preparedness drills and an e-learning course. Equally, pedagogical experts have assessed the instructions and the visuals of a preparedness-themed board game for children.

We have also prepared blueprints of guidelines for collaborating with the social media influencers and collected communication experts and social media marketing specialists' views on these guidelines. In addition, we re-defined a communication strategy design tool that was developed within another EU Horizon 2020 Research and Innovation Action -programme funded project [Unity](#) and piloted it with our own first responder partners. During these stages, we have also evaluated the potential and risks related to the selected, relevant technological fields and solutions.<sup>8</sup>

Finally, we have included our *ethics assurance process* in our catalogue of innovations. In the BuildERS project potential ethical issues have been watchfully monitored throughout the project within WP7. University of Tübingen (EKU) has been responsible of the overall ethics management, and the project coordinator VTT has monitored the processing of personal data together with the project consortium. Since we collected sensitive data, ethical issues have been carefully paid attention to. All research and co-creation actions were ethically screened, and the practical steps were documented in altogether 15 reports concerning the ethical principles of the project (deliverables D10.1 – D10.15).

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<sup>7</sup> There were discussion groups in English, Estonian, Finnish, German, Italian and Norwegian languages.

<sup>8</sup> The studied technologies are listed in BuildERS project report Latvakoski et al. (2020) D2.4 *Catalogue of tools, technologies, and media opportunities for disaster management*. [BuildERS.D2.4.pdf](#) ([buildersproject.eu](http://buildersproject.eu))





## Benefits for the European societies

In sum, our innovations strengthen European societies' resilience through:

- ✓ introducing more comprehensive approach to assess and identify, who is at risk of becoming vulnerable when a natural or man-made crisis unfolds
- ✓ providing guidance for ethical assurance in inclusive RDI-projects (like BuildERS) that engage individuals in vulnerable situations and their intermediaries/representatives
- ✓ providing examples of potential technological solutions that assist in the risk assessment and preparedness planning, to reduce people's vulnerability
- ✓ suggesting new means to manage information disorder and to tackle false and harmful information in crises, which increases or creates new vulnerabilities
- ✓ providing creative ways to train first responders to communicate and interact with individuals, who have challenges in social interaction and/or communication
- ✓ providing entertaining education material for children to learn preparedness skills
- ✓ providing guidance for crisis managers to build strategic partnerships with intermediaries of vulnerable individuals and their social communities

## Three clusters of innovative practical solutions

The practical innovations can be grouped under three clusters, which are related to our policy recommendations. The first cluster of innovations introduce a more nuanced and holistic assessment model to identify and measure people's vulnerability in disasters or crises. As explained earlier, this assessment model promotes an intersectionality perspective, where various interconnected and mutually reinforcing aspects of vulnerability are considered (see more in Kuran C.H.A et al. 2020). It is also based on a heuristic framework of communication-related factors that may affect people's capacity to prepare for and respond to disasters (Hansson et al. 2020).

Second, the innovations within the 1<sup>st</sup> cluster help practitioners to collect data of these vulnerabilities in an ethically sound manner and allocate resources more effectively so that the needs of the most vulnerable are met. We have developed tools for the researchers and crisis managers that can assist in the vulnerability assessment process.



These tools are at the proof-of-concept stage and have been tested and validated with the potential end-users. They comprise of general guidelines and instructions for the practitioners and some model templates (charts and tables) that illustrate the basic ideas of how to carry the assessment process. The abovementioned tools have been designed within a series of research validation workshops and colloquiums, and three case studies (two held in Estonia and one in Indonesia). Furthermore, the Catalogue of Tools and Technologies (D2.4) provided central background information for these innovations.<sup>9</sup>



Figure 5. The three clusters of BuildERS project innovations

<sup>9</sup> Latvakoski et al. (2020) D2.4 Catalogue of tools, technologies, and media opportunities for disaster management. [BuildERS.D2.4.pdf \(buildersproject.eu\)](https://buildersproject.eu/BuildERS.D2.4.pdf)

The *second cluster* of innovations comprises of methods and materials for training and education. For the first responders, we have developed a prototype for training, which aims at increasing their knowledge of different types of difficulties in communication and/or social interaction and providing practical skills to be applied in risk and crisis communication. In other words, aim is to raise awareness of people's communication and social interaction-related vulnerabilities and improve the first responders' communication and interaction skills. As it is also a proof-of-concept, it serves as a "starter kit" type of repository for teachers and trainers, who may find inspiration to design even more developed forms of training. The training has been developed within the case study in Finland.<sup>10</sup>

For the school children, we have developed a serious board game that builds their overall capacities to cope with different types of crises. The scope of the game is to introduce different crisis scenarios and educate children of the necessary steps to be taken in case of these emergency situations.<sup>11</sup> The game will be formed of downloadable, easily printable elements. Online channels and digital educational platforms will be used for dissemination (e.g., those maintained by the European Schoolnet).

The *third cluster* of innovations assist practitioners in building collaborative relationships or even long-standing strategic partnerships with the intermediaries of individuals in vulnerable situations. We recommend crisis management agencies to work especially with a) non-profit organisations, which provide social and psychological support and care for the individuals who may not be reached by the officials, and b) various kinds of social media influencers. The variety of different types of influencers with different scales of audiences can help to manage the common information overflow and disorder during crises by sharing verified information for their followers. Influencers could also narrate information and share it in an entertaining way (thus providing infotainment or edutainment). This way, even the serious facts would be better accepted.

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<sup>10</sup> See more in the BuildERS project report: Jukarainen P. et al. (2021) Managing chemical spill emergency and mis-/dis- information through simulated responses, BuildERS project deliverable (Finnish case study). <https://buildersproject.eu/assets/content/BuildERS%20D4.1%20final.pdf>

<sup>11</sup> The game has four different types of crises: flooding, fire (in house or forest), epidemic and earthquake.



### 3. BuildERS Toolbox for Inclusive Crisis Management

Within the BuildERS project, we have developed three clusters of tools for the crisis managers:

- 1) tools for assessing who is vulnerable in crisis, and for what reasons,
- 2) tools for building knowledge: training, education and research related to vulnerabilities and
- 3) tools for establishing collaboration with the intermediaries of people identified as vulnerable in crisis.

In the following chapters, we explain the main idea behind each tool and their potential end-users. Some of the tools are more advanced than others; however, they have all been validated and cocreated by our stakeholders, including the members of our Advisory Board. Next to each tool, we describe shortly the innovation process, plus the related theoretical framework.

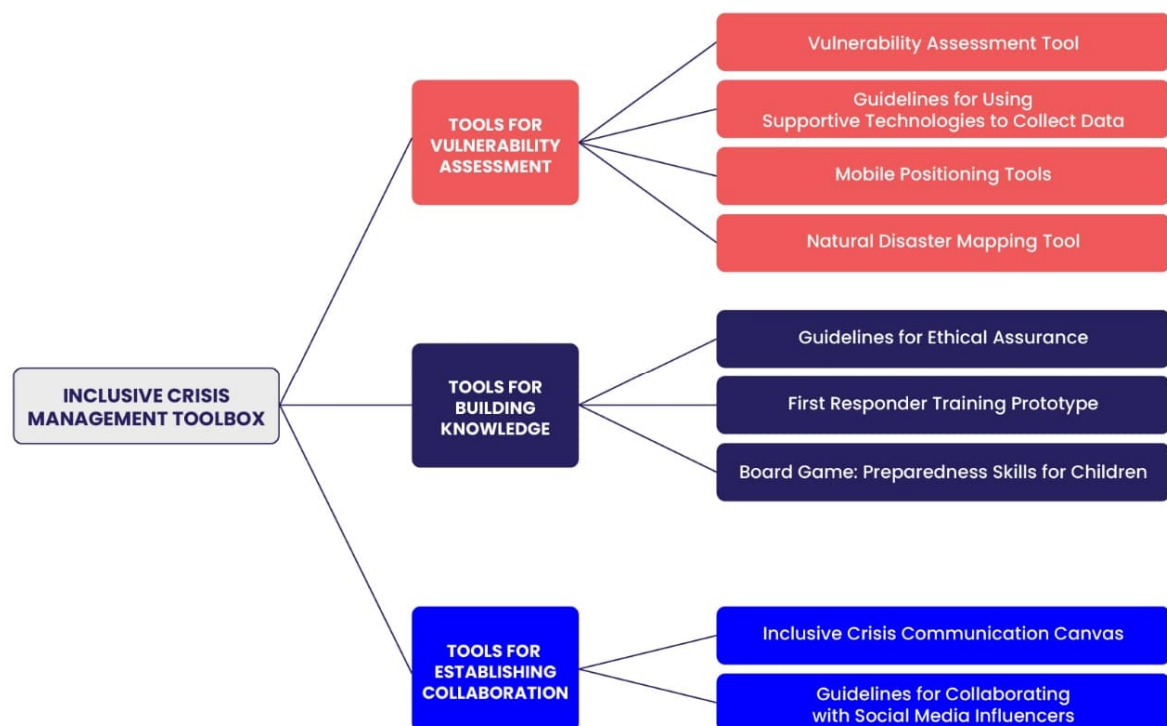


Figure 6. BuildERS Toolbox for inclusive crisis management



## 4. BuildERS Tools for Vulnerability Assessment

BuildERS project WPs 1,2,3 and 4 provided research findings on how to address the question on who is vulnerable in crisis situations and why. The findings from these WPs indicated that the crisis managers' understanding of vulnerability is often rather static: some individuals are in general considered ontologically vulnerable and labelled according to a predominant characteristic (for instance age), which leads to certain vulnerable group-categories (like the elderly). Furthermore, there is a general underestimation of or little focus on the direct and indirect socio-economic reasons behind people's vulnerability, or alternatively various factors that reduce their vulnerability.

In addition, the findings point out that most of the existing vulnerability analysis models seem to be too simple and focused on just individuals' capacities to cope with crises. They may not consider the dynamism related to different crisis scenarios or the cascading effects of multiple societal factors. To overcome these challenges, we have proposed an *intersectional understanding* to guide the assessment on vulnerability in crises (see Kuran et al., 2020).<sup>12</sup> Peoples' ability to prepare for crisis, and act upon crisis-related information is only one – yet important – dimension. However, this needs to be combined with an analysis of official and unofficial support networks, and the accessibility of vital everyday-life services, like electricity, heating, and digital communication.

Furthermore, the crisis managers making a vulnerability assessment need to understand the impacts of their own political and operative choices. In other words, it is important to understand that crisis management practices can reduce as well as increase peoples' vulnerability in crisis.<sup>13</sup> One example: during the COVID-19 pandemic, many European countries initiated measures of physical distancing to protect people from getting sick and to keep the health system functioning. For many elderly, who were dependent on care services, this meant that their mental and physical health got worse. According to the experiences of care takers and family-members, some people even stopped talking and moving (Finnish Broadcasting Company YLE, 2021). Thus, we can say that the crisis management would have benefited of a more holistic view of people's potential vulnerability.

In the context of the complex and cascading nature of disasters, anticipating and preparing for the snowballing multi-hazard risks requires a comprehensive, multi-hazard and multi-vulnerability risk assessment involving complex scenarios (Birkmann et al., 2013). Orru et al. (2021) propose a hazard scenario specific vulnerability model that aims to retain sensitivity to the spatial and situation-specific dynamics of disasters; it elicits the vulnerability factors related to a) human agency and capacity to act, b) functionality of critical infrastructure and availability of vital societal services, technological functionality, and c) social support through private relations and public services.

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<sup>12</sup> See also Morsut et al. (2020; revised 2021) Report on segments of vulnerability country by country basis – inside and outside the official data, BuildERS project report.

<sup>13</sup> This aspect was highlighted in German and Italian case studies: Savadori et al. (2021), BuildERS D4.2 Vulnerability in post-disaster temporary housing, BuildERS project report; Schobert, Windsheimer and Gabel (eds.; 2021) BuildERS D4.5 Impacts of Elbe flooding disasters on socially underprivileged groups and lessons for resilience improvement, BuildERS project report.



The model (Figure 7) suggests that four dimensions of vulnerability factors (individual capacities, societal support networks, critical infrastructure, and public support services) need to be considered as intersecting in unique ways, creating synergistic effects, aggravating, or balancing each other out depending on the spatial and temporal setting of a particular hazard.

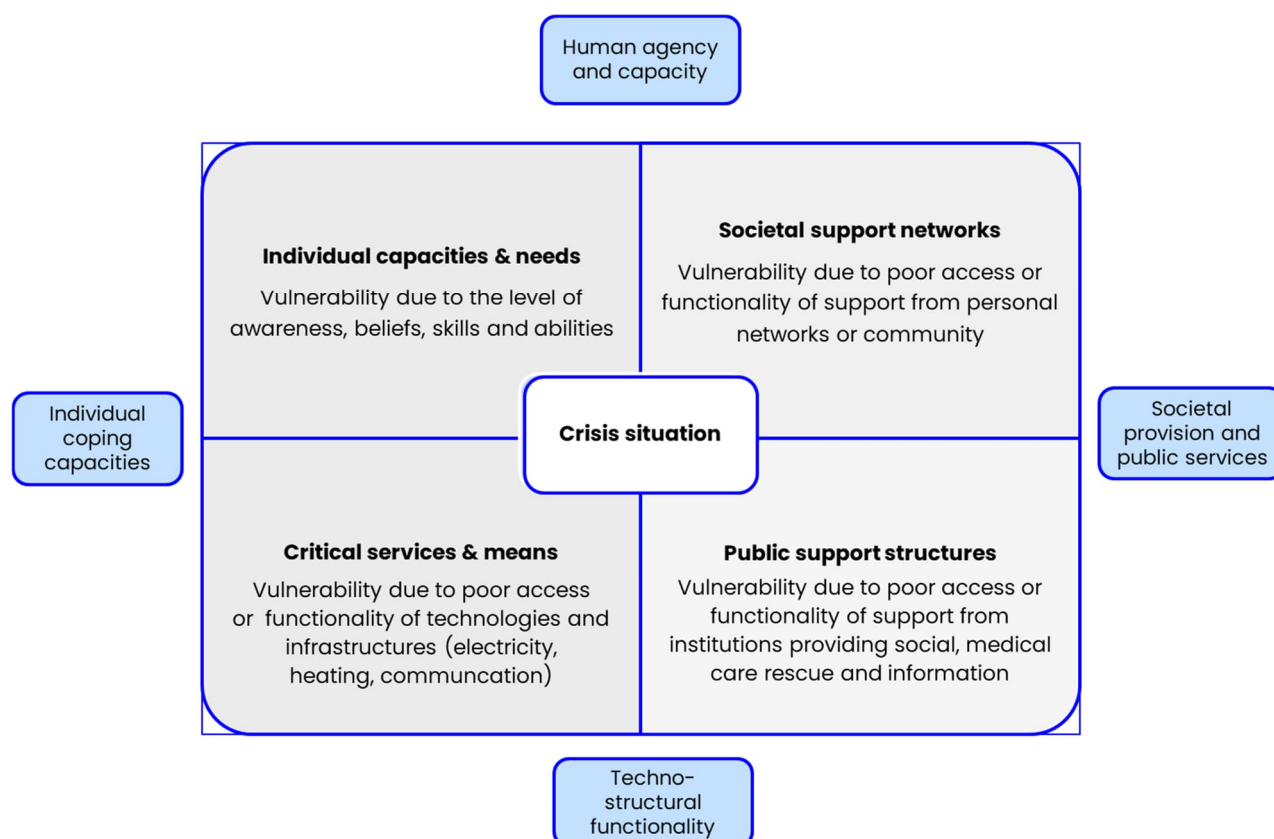


Figure 7. Conceptual dimensions of 'social vulnerability' in disaster management (Orru et al., 2021).

The practical applications of such scenario-specific approach to social vulnerability in the context of imagining and assessing future risks is yet unexplored. In the study, Orru et al. addressed this lacuna by developing a practical tool for vulnerability assessment together with key stakeholders in Estonia.

Furthermore, discussions with our Stakeholder Forum validated the fact brought up by research, that plain exposure and experience of crisis (that is being subjected to hazard) is one important dimension of vulnerability. For instance, first responders are intentionally, and tourists accidentally exposed to crisis; therefore, they can also be vulnerable to some degree, depending on the circumstances. However, these people and their vulnerabilities are rarely, if at all, mentioned in international and national surveys and data bases.<sup>14</sup>

And yet, there are various kinds of secondary factors that intersect with the primary factors, and consequently either increase or decrease individuals' vulnerabilities in crises, including individuals'

<sup>14</sup> Morsut C. et al. (2020; revised 2021) Report on segments of vulnerability country by country basis – inside and outside the official data, BuildERS project report.

personal capacities to cope and recover psychologically. The primary factors are a) being affected by the exposure to risks, b) being subjected to a hazard, c) ability to cope with crisis and respond to it, d) ability to anticipate and resist future risks of crisis. The secondary and underlying factors are for instance gender, age, economic wealth, ethnicity, culture, availability of social contacts, access to information etc. The BuildERS project has elaborated these secondary factors of vulnerability within WP1 (D1.3<sup>15</sup>) and in several case studies of WP4 (D4.1<sup>16</sup>, D4.2<sup>17</sup>, D4.4<sup>18</sup> and D4.5<sup>19</sup>).

However, many crisis managers use crude and broad classifications of ‘the vulnerable’ without delving deeper into what makes one vulnerable and why. When trying to determine who is vulnerable in a specific crisis, it is not sufficient to account for single characteristics. If focusing on single characteristics (e.g., age), there is a risk of classifying broad and heterogeneous groups as vulnerable (e.g., elderly) when they may not be.

Instead, we recommend that vulnerability assessments should approach vulnerability from an *intersectional* perspective. This would acknowledge that vulnerability is determined by the interactions of a complex set of individual characteristics (and societal circumstances). Such characteristics can be for instance age, gender, ethnicity, religious belief, or health conditions. By including additional characteristics in the assessment, it becomes possible to find combinations of factors that might alleviate or worsen vulnerability (e.g., you can be elderly but have excellent health, making you less vulnerable than an elderly person with poor health).

By looking at these interactions, vulnerability assessments may become *more precise, more nuanced, and individual-oriented*. This, in turn, allows for the development of more *tailored* measures to support people at risk of becoming vulnerable. Further, it ensures that supportive resources are allocated more optimally to those that need them the most. Finally, it helps to avoid victimizing and stigmatizing broad and heterogeneous groups.

Furthermore, we emphasise that vulnerability can shift and change over time. This dynamic aspect of vulnerability is further complicating the assessment of vulnerabilities in crisis situations. Human agency is one mediating factor. People make choices like resist evacuation, do not mind stockpiling for an emergency, or deliberately share false information about the potential risk or ongoing crisis. In addition, our research confirmed that the actions of crisis managers (operative personnel of first responders, political decision makers and volunteers) affect drastically how the situation evolves and who may become at risk of becoming more vulnerable than others.

In the next chapter, we will introduce an innovative way to assess and measure people’s potential of being or becoming more vulnerable in crisis situations. Our tool will help crisis managers to prepare better and prioritize actions more efficiently during acute emergencies.

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<sup>15</sup> Morsut et al. (2020; revised 2021) Report on segments of vulnerability country by country basis – inside and outside the official data, BuildERS project report

<sup>16</sup> Jukarainen et al. (2021) Managing chemical spill emergency and mis-/dis- information through simulated responses, BuildERS project report (Finnish case study)

<sup>17</sup> Savadori et al. (2021) Reducing social cost of evacuation from seismic hazard locations to temporary housing in safe areas in Italy, BuildERS project report (Italian case study)

<sup>18</sup> Orru et al. (2021) Reducing social vulnerability by innovative data fusion for more-informed rescue prioritisation, BuildERS project report (Estonian case study)

<sup>19</sup> Schobert, Windsheimer and Gabel (eds.; 2021) Impacts of Elbe flooding disasters on socially underprivileged groups and lessons for resilience improvement, BuildERS project report (German case study)



## 4.1 Vulnerability Assessment Tool for Better-informed Crisis Management Prioritisation

Relying on the overview of the strengths and weaknesses of existing approaches to assess people's vulnerability in disasters, the Estonian case study<sup>20</sup> laid out the foundations of the BuildERS Vulnerability Assessment Tool for crisis managers. The results of the co-creative development and testing of the novel vulnerability assessment tool is described more in-depth in a manuscript "Imagining and assessing future risks: A dynamic scenario-based social vulnerability analysis tool for disaster planning and response" by K. Orru, M. Klaos, K. Nero, F. Gabel, S. Hansson, T.-O. Naevestad under review in *Journal of Contingencies and Crisis Management* (Orru et al., under review).

The cocreation process, which led to this tool, was end-user -centred and participatory, and comprised several stages. The tool was designed together with researchers, authorities, and non-profit sector agencies: at first there was a *knowing stage*, where the participants shared their experiences and expertise, and thus helped to define the main challenges related to vulnerability assessments. This was continued by an analysis and co-design of prototypes for testing. The cocreation process of the Vulnerability Assessment Tool is shown in figure 8.

From May 2020 to February 2021, we carried out 22 semi-structured interviews, two focus groups and a tabletop exercise with 46 participants to test the preliminary versions of the tool including the elicitation of:

- 1) the factors that have made individuals more vulnerable, their intersecting and accumulation in certain individuals
  - a. based on past crises and
  - b. how these may have varied in different scenarios.
- 2) information sources, including datasets used to find out about those in need of support.

We explored three different crises (man-made and natural hazards): The disruption of electrical supply due to a major storm in South-Eastern Estonia in October 2019; the COVID-19 pandemic in Estonia; a cyber-incident on state health information systems in Estonia in November 2020.

The refined tool was presented to the practitioners at a virtual workshop with 35 participants from different levels of crisis governance (Ministries, Agencies, Local governments) in Estonia on 26 May 2021, and further to 6 Ministry of Interior high level crisis managers on 3 September 2021. In addition, 10 academic experts commented on the relevance and applicability of the elaborated tool in virtual workshop on Howspace -platform from July to September 2021.

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<sup>20</sup> See more in the BuildERS project report: Orru et al. (2021) BuildERS D4.4 Reducing Social Vulnerability by Innovative Data Fusion for More-informed Rescue Prioritisation. [BuildERS D4.4 final.pdf \(buildersproject.eu\)](https://buildersproject.eu/BuildERS_D4.4_final.pdf)





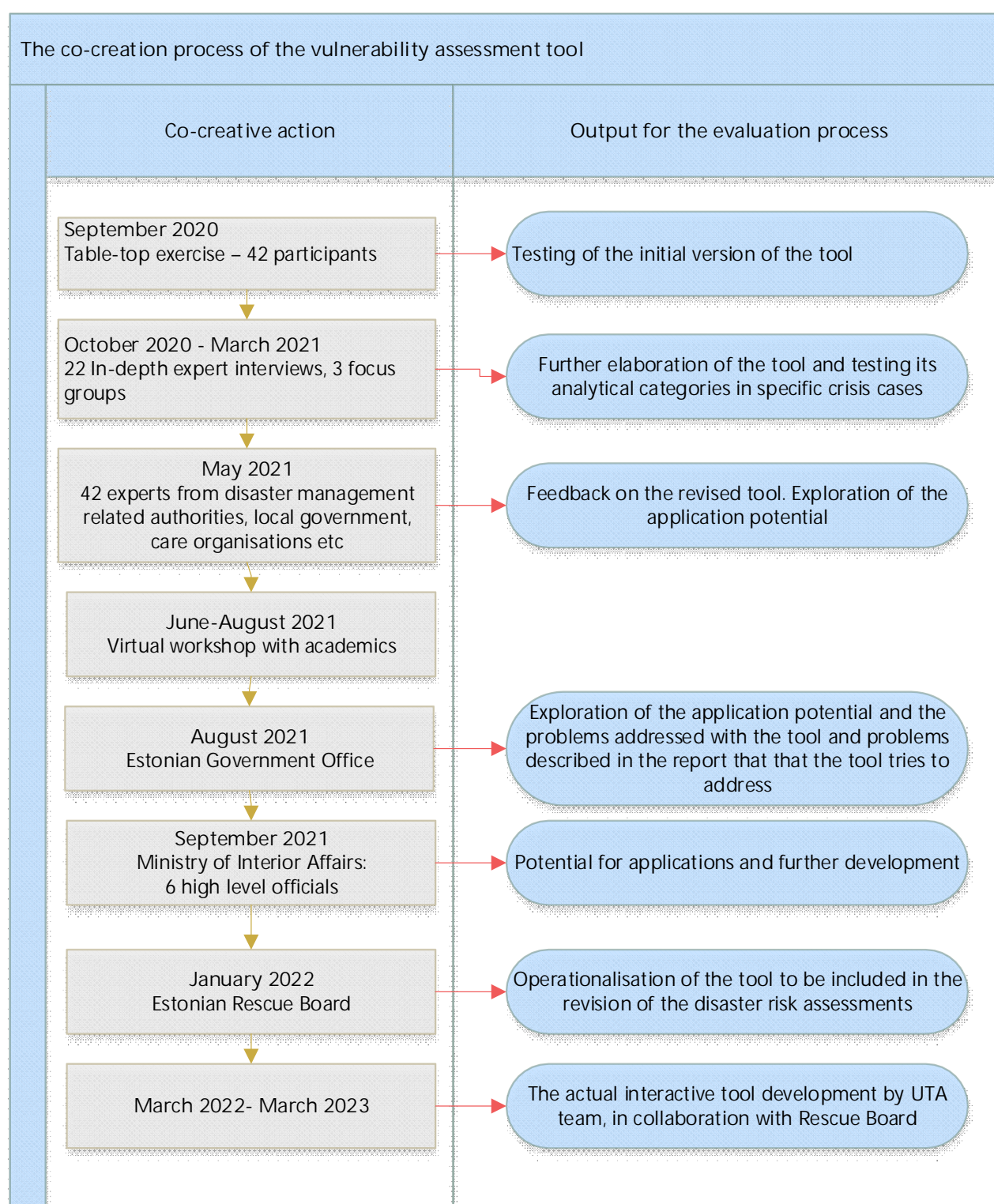


Figure 8. The cocreation process of the Vulnerability Assessment Tool

The main components of the scenario-based vulnerability assessment tool are presented in Figure 9. The key unit of analysis in the tool is people affected by vulnerability factors. Therefore, each row in

the tool depicts one factor of vulnerability and who might be burdened with this vulnerability factor. For example, in case of the disruption of electrical supply (Figure 10), in the “Critical infrastructure and means” dimension, one of the vulnerability factors is the lack of alternatives to electricity-dependent heating. The individuals that may be hampered due to this factor involve the clients of central heating and users of private electricity-dependent heating systems.

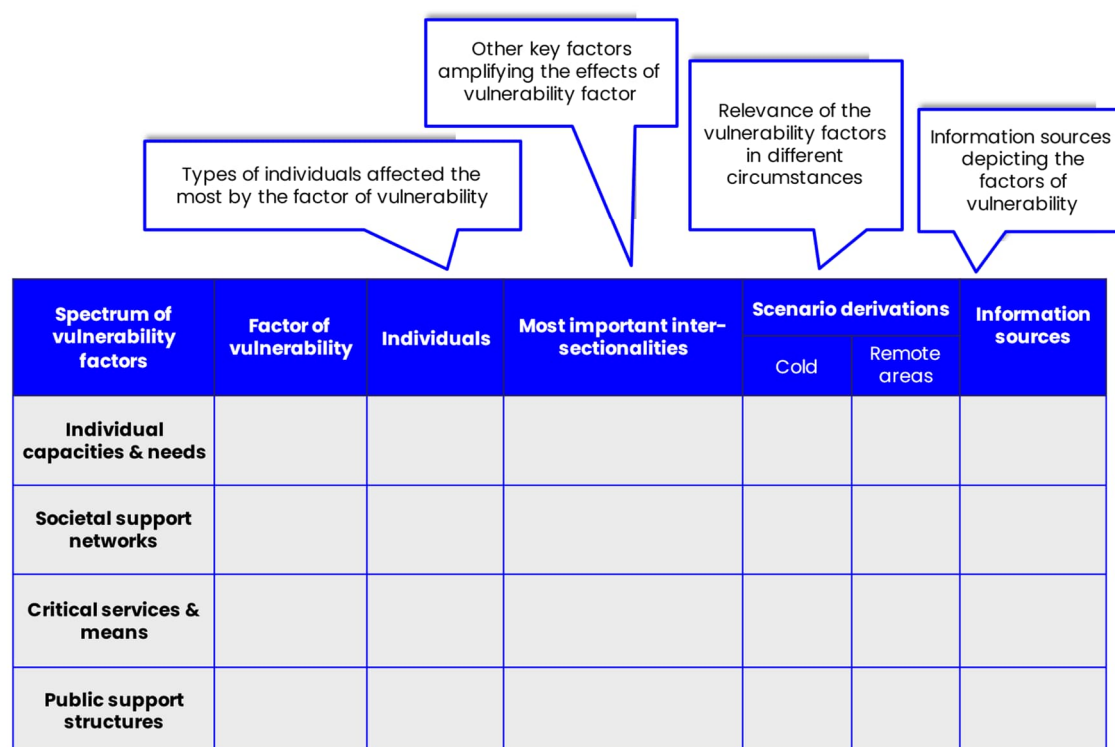


Figure 9. The components in the vulnerability assessment tool.

Spectrum of vulnerability factors	Factor of vulnerability	Individuals	Most important intersectionalities	Scenarios		Datasets
				Cold	Remote areas	
Critical services and means	Electricity-dependent heating	Clients of communal heating	External help needed on everyday basis; families with small children	↑	↓	Client list of service providers
		Private electricity-dependent heating		↑	↑	Register of Construction Works

Figure 10. Example of the operationalisation of the factors of vulnerability under the dimension “Critical infrastructure and means”.

Following the same row concerning affected people, next, most important intersectionalities are brought out to specify other key factors that may aggravate individuals' abilities to cope. Next, these individuals' coping capacities in alternative scenarios are assessed. In the final cell of the row, the possible information sources depicting the vulnerability factor are identified.

The assessment involves five stages:

- 1) *Taking a particular scenario or the crisis at hand as a point of departure*: The scenario circumstances – like the type and degree of emergency, environmental and technological circumstances shape the configurations of hazard exposure, coping and/or adaptive capacities in individuals.
- 2) *Specifying which individuals are burdened with specific factors*: The tool uses the categorisation of factors of vulnerability under four conceptual categories elicited by Orru et al. (2021). The assessment is conducted based on expert assessments, learning from previous experiences, and in exchange with affected persons using Delphi method. This allows to revise their assessments after reflecting on other views. (Figure 11)
- 3) *Determining the vulnerability factors that intersect in unique ways in particular situation and enabling to narrow the circle of individuals that need most attention*: The four categories of vulnerability factors intersect in unique ways, creating synergies, aggravating, or balancing each other out depending on the specific crisis. Figure 12 depicts the intersecting vulnerability factors in the event of a long-term disruption of electricity.
- 4) *Evaluating the dynamics in vulnerability factors in derivations of the initial scenario*: The relevance of the vulnerability factors may change if the base scenario changes and different crisis circumstances come into play. Therefore, the tool helps to assess the dynamics in vulnerability factors in case certain contextual parameters are changed.
- 5) *Connecting the factors of vulnerability with the indicators of vulnerability in specific databases and other information sources and laying out openly which information sources are used in the vulnerability assessment*: The pilot testing revealed that combining several indicators from several datasets enables a cross-sectional and more detailed depiction of vulnerabilities. This brings an essential overview of the potential vulnerability mixes in specific regions in specific situations. However, more direct measures of disaster-vulnerability, like beliefs and preparedness practices need to be retrieved from other data sources like surveys.

The participants in the validation process<sup>21</sup> acknowledged that the proposed vulnerability assessment tool has a high potential to benefit the institutions that are tasked with preparing hazard risk analyses and plans for crisis management, including government authorities (e.g., Rescue Board, Health Board, Environmental Board), providers of vital services like electricity, communications or water, local governments, and non-profit sector agencies supporting rescue and social care. The strategic preparedness-planning phase allows more time for thorough predictions of the situation-specific manifestations of vulnerability factors. Well thought-through vulnerabilities in the hazard planning phase can be further specified in a specific crisis response situation.

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<sup>21</sup> This refers to participants of workshop in May 2021 and July-August 2021.





## Public support structures

1. Which social care services are unavailable due to the event?

- ☐ Consultation with social worker (info, services, applications)
- ☒ Home care visits
- ☒ Long-term care (elderly, impairments)
- ☒ Day care centres (elderly, impairments, materially insecure)
- ☐ Night shelters
- ☐ Soup kitchens
- ☐ Refuges

2. Which groups of people are affected due to the unavailability of home care?

Physically impaired...

Figure 11. Example of the Delphi survey to assess the vulnerability factors in a specific scenario or event.

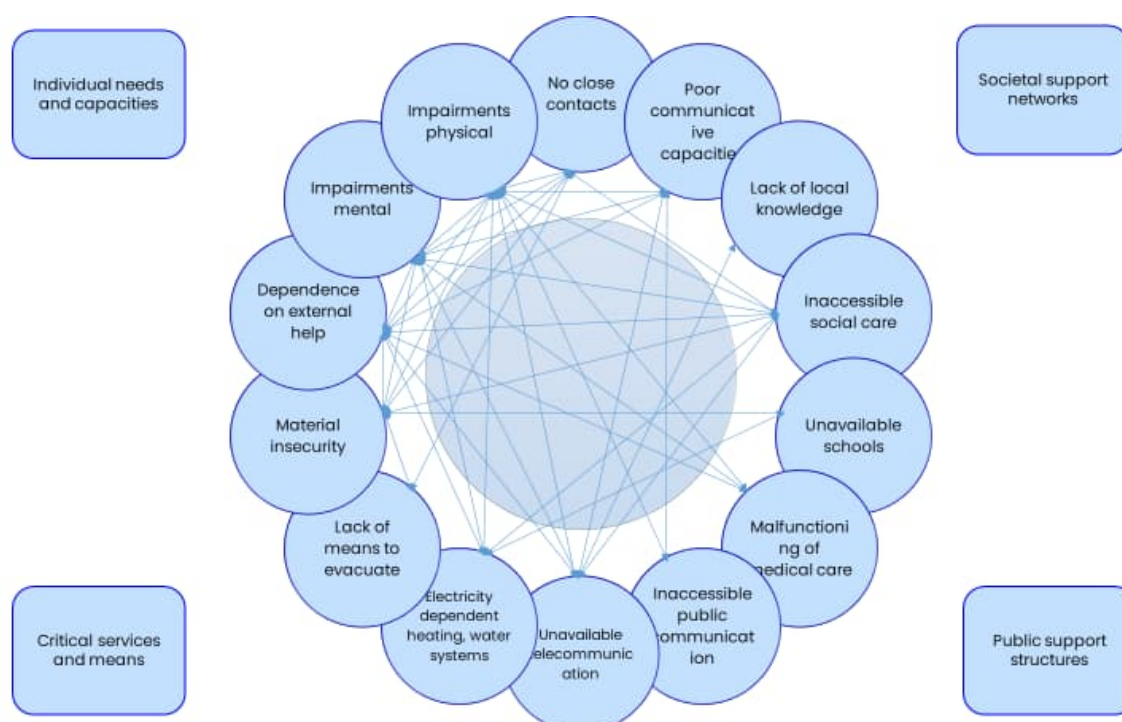


Figure 12. Example of intersecting vulnerability factors in a long-term disruption of electricity.



The devised new assessment tool explicates different manifestations of vulnerability along the dimensions of human agency and technological structures as well as social support through private relations and state actors. The participants commended considering the informal and formal social support networks as factors of vulnerability, and consideration of the synergies and cascading effects of the intersecting vulnerability factors (Ministry of Interior, 3 September 2021). The tool helped them look beyond the pre-determined group-based understanding of vulnerability (26 May 2021 workshop).

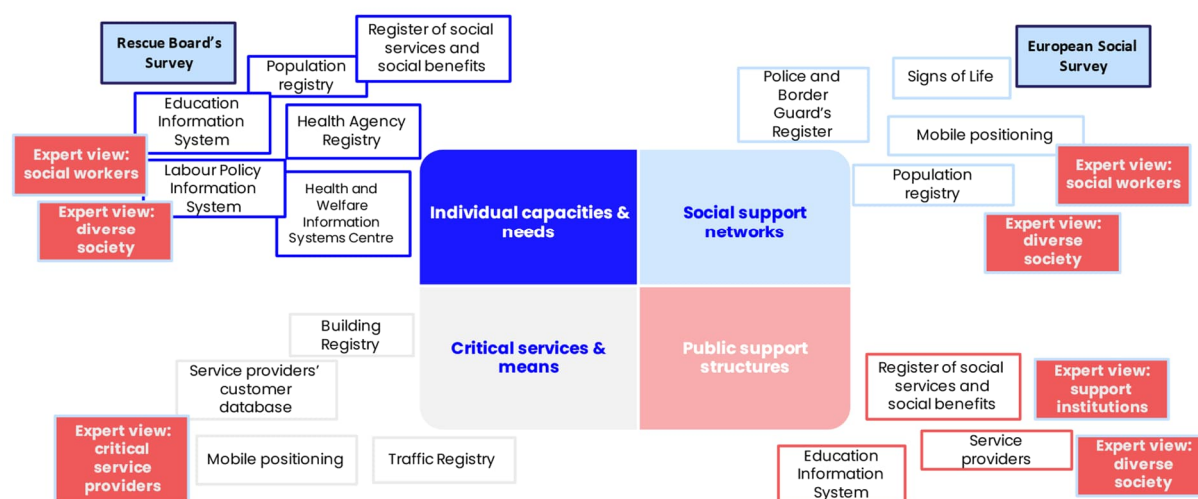


Figure 13. Examples of information sources pertaining to the four categories of vulnerability factors.

By laying open the different sources of information on vulnerability, the transparency of the decision-making can be improved. By engaging the diverse and potentially most affected members of society, the tool can be used to increase the fairness of crisis planning. Opening the process for the representatives of diverse members of society including the Delphi method was commended also for increasing the fairness of the assessment and related decision-making (Howspace, July-September 2021).<sup>22</sup>

University of Tartu will continue to develop further the vulnerability assessment tool with the Ministry of Interior of Estonia and the Estonian Rescue Board. In a new project funded by an innovation grant from the University of Tartu and the Estonian government, the conceptual model is operationalised into an interactive web-based tool. This project will begin in March 2022 and continue till March 2023.

<sup>22</sup> This chapter is based on a manuscript: K. Orru, M. Klaos, K. Nero, F. Gabel, S. Hansson, T.-O. Naevestad (under review) "Imagining and assessing future risks: A dynamic scenario-based social vulnerability analysis tool for disaster planning and response" in Journal of Contingencies and Crisis Management.

## 4.2 BuildERS Guide for Using Supportive technologies to Collect Data on Peoples' Vulnerabilities

In the BuildERS project, we have analysed the potential of technologies that could be of help when collecting data for the abovementioned vulnerability assessment. These could be for instance *location-based services* (LBS) that use mobile positioning data as a source of information. In addition, *satellites*, *drones* and sensors of various appliances and devices (the so-called *Internet of Things*, *IoT*) could provide data of people's vulnerable situations.

Authorities need also technological solutions to share critical information with various stakeholders like non-profit sector care organisations, who provide help for the vulnerable people. For the latter, potential solutions are provided by *blockchain technology*: it enables the maintenance of a shared distributed ledger, called the blockchain, which can be simultaneously read and modified by all involved parties but is not owned by any party. It de-centralizes the data, builds trust in the data, and allows interacting directly with one another and the data.

Vulnerability assessment process should start from the integration of relevant official databases. Then it should continue with adding data that is not yet available in official registries. This can be collected for instance with *inclusive crowdsourcing* methods. Inclusive crowdsourcing means that a large variety of people is engaged in the data production and collection. Some crowdsourcing methods do not require active participation from individuals but are more like the IoT -systems with multiple sensors that send data automatically. Yet, there are also tools like apps for mobile devices that help to engage people as providers of quantitative or qualitative data. As many crowdsourcing methods require that people have (often quite expensive) devices like smart phones or computers, engagement may need intermediaries, who do the actual data collection, coding, and transmission.

Our analysis of potential technologies and tools for the preparedness and disaster management covered altogether 118 tools developed within European research collaboration projects. There were large heterogeneity and wide variance in the maturity of tools. The catalogue of tools and technologies and for disaster management is an open access report and available on the Builders project website.<sup>23</sup>

From a technological perspective, the emergence of smartphones, mobile and satellite access infrastructures, and Internet of Things (IoT) has created an essential basis for new opportunities for disaster management. These technologies and tools can be useful for many stakeholders from vulnerable people to strategic management.

Yet, there is still a *digital divide* that needs to be considered when planning more technically advanced data collection; even though the technologies are becoming more common, and more and more people use them, there are still people who do not use or do not have access or skills to these digital technologies. This may naturally affect how representative, valid, and reliable the data is.

An essential challenge arises from the fact that most of the tools and new technological opportunities in preparedness and disaster management require use of *physical asset or device*, such as, e.g.,

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<sup>23</sup> Latvakoski et al, 2020, BuildERS technical report D2.4 Catalogue of tools, technologies, and media opportunities for disaster management.

smartphone or any IoT device. For example, when a person is located somewhere in the disaster area without such a device or capabilities, it is still a challenge to find them even with the most sophisticated technology or tools.

However, smartphones offer great potential to improve disaster management as around 84% of world's population owns a smartphone. Smartphones can capture the geographic location of the user to help locate people affected by disasters. Furthermore, smartphones enable users to communicate in a richer way than basic mobile devices do, and to use applications such as social media to rapidly exchange information during a crisis. Thus, the role of smartphones in public safety warnings and emergency communications seems to be very essential.

Next, we describe some technological solutions to collect data on peoples' vulnerabilities. The organizational capacities regarding the technological solutions are also shown in the figure 14.

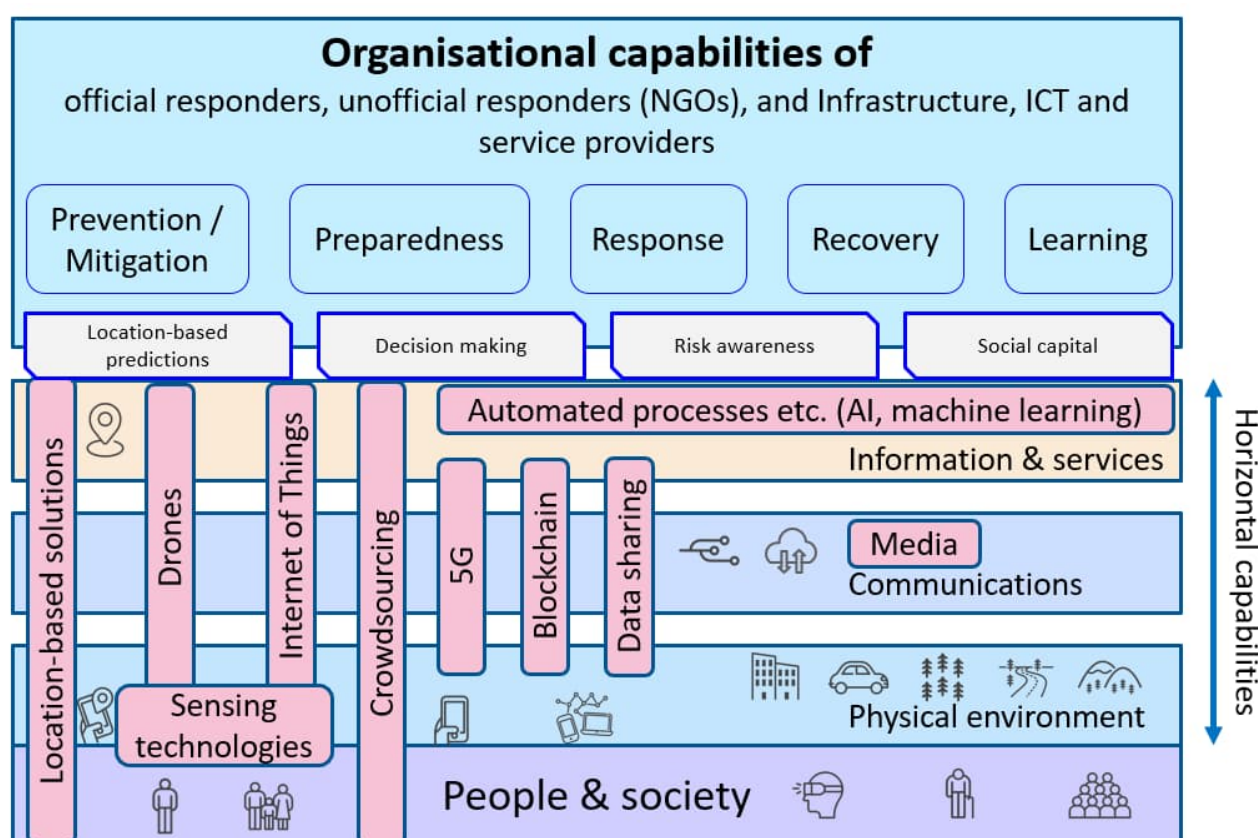


Figure 14. Organisational capabilities of official and unofficial responders, infrastructure, ICT, and service providers<sup>24</sup>

<sup>24</sup> Adapted from Latvakoski et al. 2014, and BuildERS project reports: Morsut C. and Kuran C. (eds.; 2020) BuildERS D1.2, Final report of the unified theoretical framework on the concepts of risk awareness, social capital, vulnerability, resilience, and their interdependencies, and Latvakoski et al, 2020, BuildERS technical report D2.4 Catalogue of tools, technologies, and media opportunities for disaster management.

## Location-based services

Location-Based Services (LBS) are mobile applications that provide information depending on the location of the user. LBS applications differ from other geographic information systems (GIS) and web mapping applications because they "know" the context where their users are and therefore can adapt the contents and presentation accordingly.

LBS are mainly used in a dynamic and mobile environment. Possible devices include smartphones, wearable devices like smartwatches and digital glasses, haptic devices, public displays, built-in devices (e.g., built-in car navigation systems), and so on. The two main types of location-based services operate as follows:

- 1) Information is sent from disaster managers and responders to the people in need of help. One of the simplest examples is a Location Based Alert System used to send SMS to alert people about an upcoming natural hazard.
- 2) Information from people in a dangerous situation is sent to disaster managers. In this case, LBS is used to gather mobile positioning data for decision-making in disaster planning and emergency situations, often combining it with other data. In the active gathering of mobile positioning data, the system operator is always tracking the phone. In the passive gathering of mobile positioning data, it usually must be acquired from mobile phone operators.

There are challenges regarding situations with power outages, disruption of internet connection possibilities or cellular networks not working. This is a substantial methodological gap, because this means that in major disasters the LBS may not be working. One solution would be to use historical data prior to the crises to estimate the numbers of people in potential danger. In any case, it is highly important that the collection of information is done in an ethical acceptable way and that privacy and data protection needs are ensured.

## Satellite imaging

Satellites provide a way to monitor large areas of the Earth. Earth-orbiting remote-sensing satellites and meteorological satellites provide information both for hazard risk mapping and for hazard detection, monitoring, and mapping. Typically, floods and wildfires can be mapped accurately from optical images, landslides and earthquakes from SAR images, and heatwaves and storms from meteorological satellites.

Copernicus is the European Union's Earth observation programme, which looks at our planet and its environment to benefit all European citizens. It offers information services that draw from satellite Earth Observation and in-situ (non-space) data. Based on satellite and in-situ observations, the Copernicus services deliver near-real-time data on the global level that can be used for local and regional level disaster management. The Copernicus Emergency Management Service (Copernicus EMS) provides all actors involved in the management of natural disasters, man-made emergency situations, and humanitarian crises with timely and accurate geo-spatial information derived from satellite remote sensing and completed by available in-situ or open data sources.



The mapping component of the service (Copernicus EMS Mapping) has worldwide coverage and provides maps based on satellite imagery. The early warning component of the Copernicus EMS consists of three different systems: The European Flood Awareness System (provides overviews of ongoing and forecasted floods in Europe up to 10 days in advance), The European Forest Fire Information System (provides near-real-time and historical information on forest fires and forest fire regimes in the European, Middle Eastern, and North African regions), and The European Drought Observatory (provides drought-relevant information and early warnings for Europe).

## Internet of Things (IoT) and 5G

Disaster management is an ideal place for IoT applications since sensors can send alerts about potentially dangerous situations. The IoT solutions enable gathering information from different kinds of sensors, attached e.g., into people, vehicles, buildings, infrastructures, environment, on the ground etc. Tree sensors can detect if a fire has broken out by testing temperature, moisture, and carbon dioxide levels. Ground sensors can detect earth movements that might signal earthquakes. River levels can be monitored by sensors for possible flooding. From an implementation point of view, IoT is utilised by establishing a system that connects and feeds data to a main server or centres. The collected data in that aspect is then transformed and easily accessible by first responders and government officials. As timing is a crucial component in disaster response, utilizing IoT data provides real-time information for the crisis on the ground.

From the technological capabilities' perspective, 5G technology has higher capacity, is faster and has lower latency compared with previous generations. It is an essential enabler for the more real-time communications with mobile assets such as vehicles, robots, drones, cameras, and other sensors that produce big amount of data and require low latencies in interaction with infrastructures.

## Use of drones

The drones are basically unmanned vehicles that usually have no human occupants on board. Usually, the word “drone” refers to unmanned aerial vehicles (UAVs), but the drones can also be applied to underwater or on-ground vehicles. The drones can also be classified as robots, which can be autonomous, semi-autonomous, and/or remote controllable cyber-physical entities.

UAVs have been used for aerial photography and package delivery. UAVs can fly in places where manned aircraft cannot. In addition, they can also fly at low altitudes, and therefore the images from drones are of higher resolution than satellite images. Unmanned underwater vehicles (UUV) can measure storm intensity and direction. UUVs that carry sensors to measure ocean heat, salinity, and density have been applied to hurricane status detection.

Examples of UAV use for different disaster phases include:

- ✓ Preparedness: Monitoring volcanic activity to determine when warnings should be created can improve preparedness for volcanic disasters. The drones also have the potential to collect information on locations that would be unsafe for a human user due to hazardous chemicals (e.g., gas), radiation, risk of fire or explosion, imminent threat of violence, etc.





- ✓ **Response:** UAVs can also be applied to the delivery of goods to locations where ground-based transportation has been disrupted, which can improve rapid response actions. For example, drones have been used for delivering mobile gear to affected areas and as a virtual tower functioning as a base station. Drones are already used to deliver blood in several countries, and this could be expanded to include other medical supplies and equipment needed during a disaster.
- ✓ **Recovery:** Drones can assist with recovery efforts by photographing disaster areas for damage assessments. They can also be applied to record video/picture material depicting damage in disaster areas, which can help in planning recovery actions.

## Artificial intelligence (AI)

Software algorithms are increasingly generating new insights about a variety of phenomena, which allows computers to imitate human intelligence, called Artificial Intelligence (AI). Examples of AI are already operational, such as voice and facial recognition, and commercialized by-products such as the IBM Watson computer system, which integrates AI into the analysis of Big Data.

Research effort is currently being devoted to the use of AI for detecting and maybe one day predicting earthquakes to quicken recovery and response times. Humanitarian groups are hoping to speed up map creation by using machine learning in computer software to extract objects such as buildings and roads from aerial images. AI is used for image recognition of satellite photos to identify damaged buildings, flooding, impassable roads, etc.

Potential use-cases:

- ✓ **Emergency calls:** During a crisis, call centres are often overwhelmed. In addition to voice calls, emergencies are increasingly reported by text messages and social media.
- ✓ **Social media analysis:** Real-time information from social media sources, such as Twitter and discussion boards, can be analysed and validated by AI to filter and classify information and make predictive analyses.
- ✓ **Predictive analytics:** AI is being used to analyse past data to predict what is likely to happen in the event of a disaster.

Yet even the various technologies that use AI are potentially useful for the crisis management, there are several ethical issues that may limit their use. For example, in relation to the analysis of emergency calls, due to the datasets used to train AI, AI is often not able to understand people who have an accent or who do not speak in their native language. Similarly, due to the datasets that are used to train AI to analyse social media discussions, AI often stigmatizes people and treats them in discriminative ways. All of this can get very dangerous for crisis management.



## Blockchain technology

An essential challenge in crisis management is related to the quality and reliability of the information exposed from a disaster area. Organisations need to plan how to co-ordinate and verify the information shared by other stakeholders. Particularly authorities need to find solutions for quick and reliable information sharing between different stakeholders. Information must be of high enough quality to be useful in crisis management and decision-making. A potential solution approach is provided by blockchain technology.

Blockchain is a decentralized transaction and data management technology. Blockchain technology enables the maintenance of a shared distributed ledger, called the blockchain, which can be simultaneously read and modified by all involved parties but is not owned by any party. Blockchain technology offers essential factors for information sharing among different stakeholders. It decentralizes the data, builds trust in the data, and allow interacting directly with one another and the data.

## Crowdsourcing

Crowdsourcing means giving tasks to a large group of people. Crowdsourcing is typically used when the data to be collected or processed is too vast or heterogeneous to be handled by automatic methods or automating would be too expensive. Examples of such tasks are identifying specific objects in photographs or reading texts from images.

A common case for crowdsourcing is producing location-specific data. This is often done during or after a disaster to quickly get information about the damages. Data collection can also take place during preparation to get information on the status of the infrastructure to estimate the need for improvements. Another common case for crowdsourcing is analysing and improving the usability of existing data. Particularly image data is often such that it is not possible to analyse it automatically or human input is needed to confirm the results of automatic analysis.

Examples of crowdsourcing applications:

- ✓ When the COVID-19 pandemic started, there was a need to quickly get reliable information on how many people were ill and what kind of symptoms they had. Several technological solutions were created in various countries to predict patterns and locate hotspots of potential new coronavirus outbreaks. These were mostly apps for mobile devices, which assisted in collecting data. This big data was then presented on a platform or the app itself.
- ✓ OpenStreetMap can be improved by adding information about missing or incorrect building and roads. A satellite image helps in placing the buildings and roads into correct positions. Buildings and roads can be described in detail by giving information about their type and other relevant information.
- ✓ Mapswipe is used to mark squares with buildings. This is needed in an area where new clusters of buildings may have been built by internally displaced people or informal refugees. Another MapSwipe example is finding buildings that have been damaged by an earthquake. This is done by comparing images taken before and after the earthquake.



## End-user evaluations of technologies and tools – recommendations regarding technologies

The end-user evaluation of technologies and tools was carried out in three phases. First, a preliminary evaluation of the end-users of the BuildERS project was realised. Second, technological tools tested in three BuildERS case studies were evaluated through questionnaire-based surveys. Third, co-creative workshops with technology partners, first responders and service providers, officials of cities and local communities, supportive NGOs, and other stakeholders were carried out, where several technological themes were the subject of an evaluation. The evaluation process (see figure 15 on page 39) and the results are presented in the public deliverable of the BuildERS project.<sup>25</sup>

Emergence of the social media applications has opened possibilities for new ways for information exposure and sharing between communities of people and organizations. Smartphones have enabled people to use social media and contribute their own opinions and observations as well as photos, videos, and audio clips even in mobile conditions. However, digital division between people related to unequal distribution of skills, access to technological means and tools will be an essential future challenge especially with vulnerable people in crisis. For example, old people, children, homeless people, and people with limited economical resources, can be such vulnerable people. Widely available and usable (e.g., cost-efficient, easy to use, and suitable for different devices) technological solutions improve information sharing and communication in disasters. Fairness and inclusivity need to be considered in the application of these technologies in crisis in order not to oversee the vulnerable people.

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<sup>25</sup> Bäck et al. 2021, D6.4 End-user assessment of the new tools and technologies for disaster management, BuildERS project report.





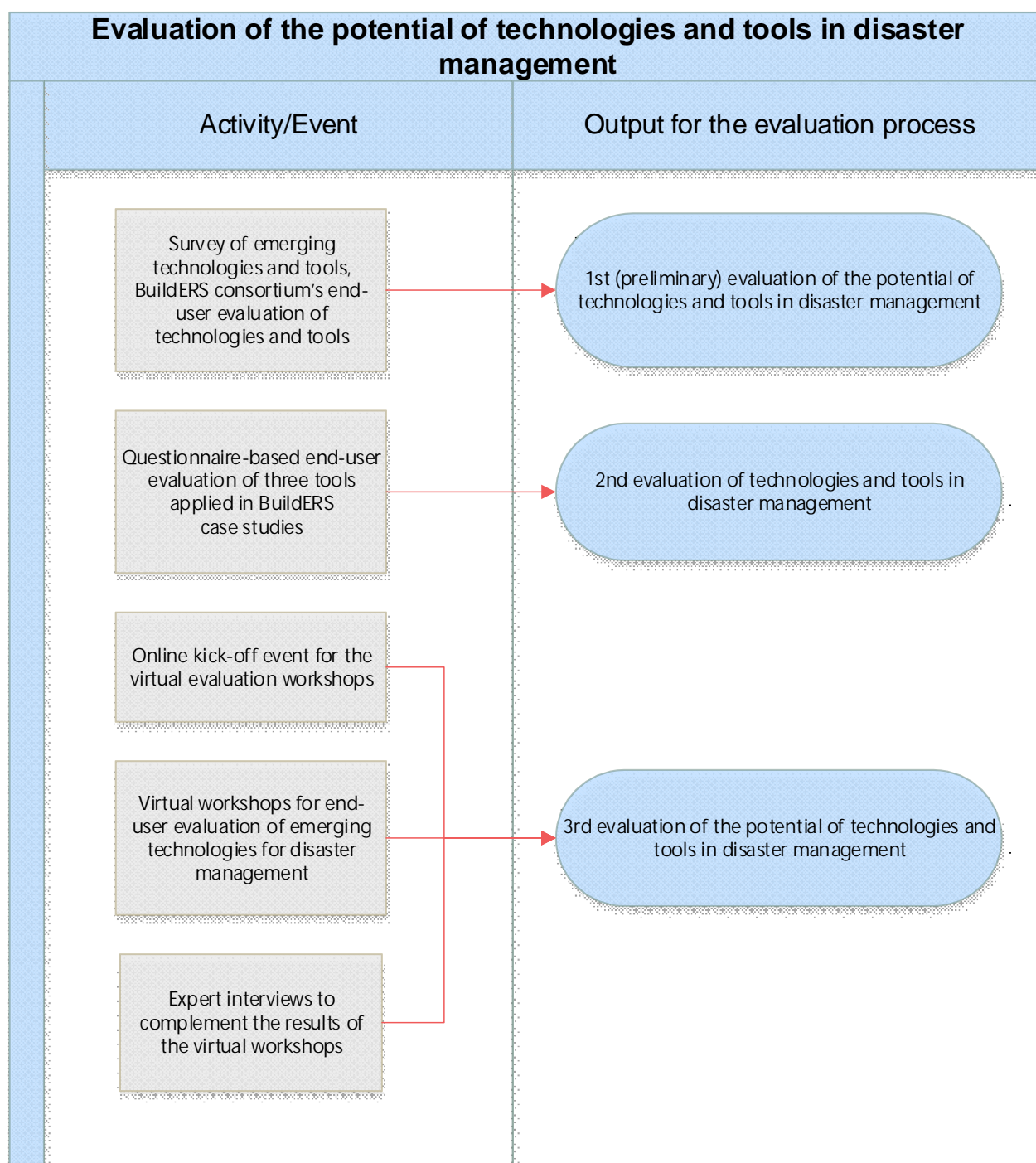


Figure 15. Evaluation process of novel technologies and tools in disaster management

### 4.3 BuildERS Mobile Positioning Tools for Rescue Planning and Emergency Management

Based on technological gaps and opportunities for disaster management identified in the larger *Catalogue of Tools and Technologies and Media Opportunities for Disaster Management*<sup>26</sup>, we developed two tools that use mobile phone positioning data to locate people in a (potentially) vulnerable situation. They enable to assess where, when, how and how much people move and stay – of wide ranges of population more dynamically and in greater detail than traditional census-based approaches.

Previous methodologies created by Ahas et al. 2010 and Saluveer et al. 2020 were elaborated and developed into two map applications – the first one was co-created with the Estonian stakeholders and another one with the Indonesian stakeholders. The development of the map applications was led by Positium Ltd. in both contexts, with the main partners being University of Tartu and Estonian Rescue Board and University of Indonesia. The co-creation and validation process for the Mobile Positioning Tools, both for the Estonian and Indonesian case study, is illustrated in figure 16.

The first tool created by Positium Ltd. uses *historical MPD*. It shows visually the number of people living in a particular area, those commuting or regularly visiting the area, and people having secondary homes. The dashboard can give daily, weekly, and seasonal volume changes and movement patterns those other databases cannot do. Estimations of the amount of different population groups are made in a more precise time step than before. The second tool developed also by Positium Ltd. uses *near real-time MPD* to analyse tourist's movement. The tool's dashboard presents how many tourists were in the crisis area, where they are from and if and where they are moving to.<sup>27</sup>

Mobile phone positioning data is gathered by mobile network operators for billing purposes and consists of timestamped call records, which include the location of the cell tower that the phone was connected to while the phone was used. The data, in a pseudonymized format to protect the privacy of phone users, were shared to consortium members Positium, University of Indonesia and University of Tartu.

In the following chapters we will explain in more detail the tools' features, and their potential end users and using contexts.

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<sup>26</sup> Latvakoski, J. (2020) D2.4 Catalogue of tools, technologies, and media opportunities for disaster management. BuildERS project report.

<sup>27</sup> More about the dashboard tool: Võik, E.-J., M. Sari, U. A.V. Salim, M. A. Berawi, T. Lusikka (2021) BuildERS D 4.7 Indonesian Case "Using Mobile Operators' Data to Locate, Protect and Evacuate Tourists and Other Vulnerable Groups in Disasters, BuildERS project report.



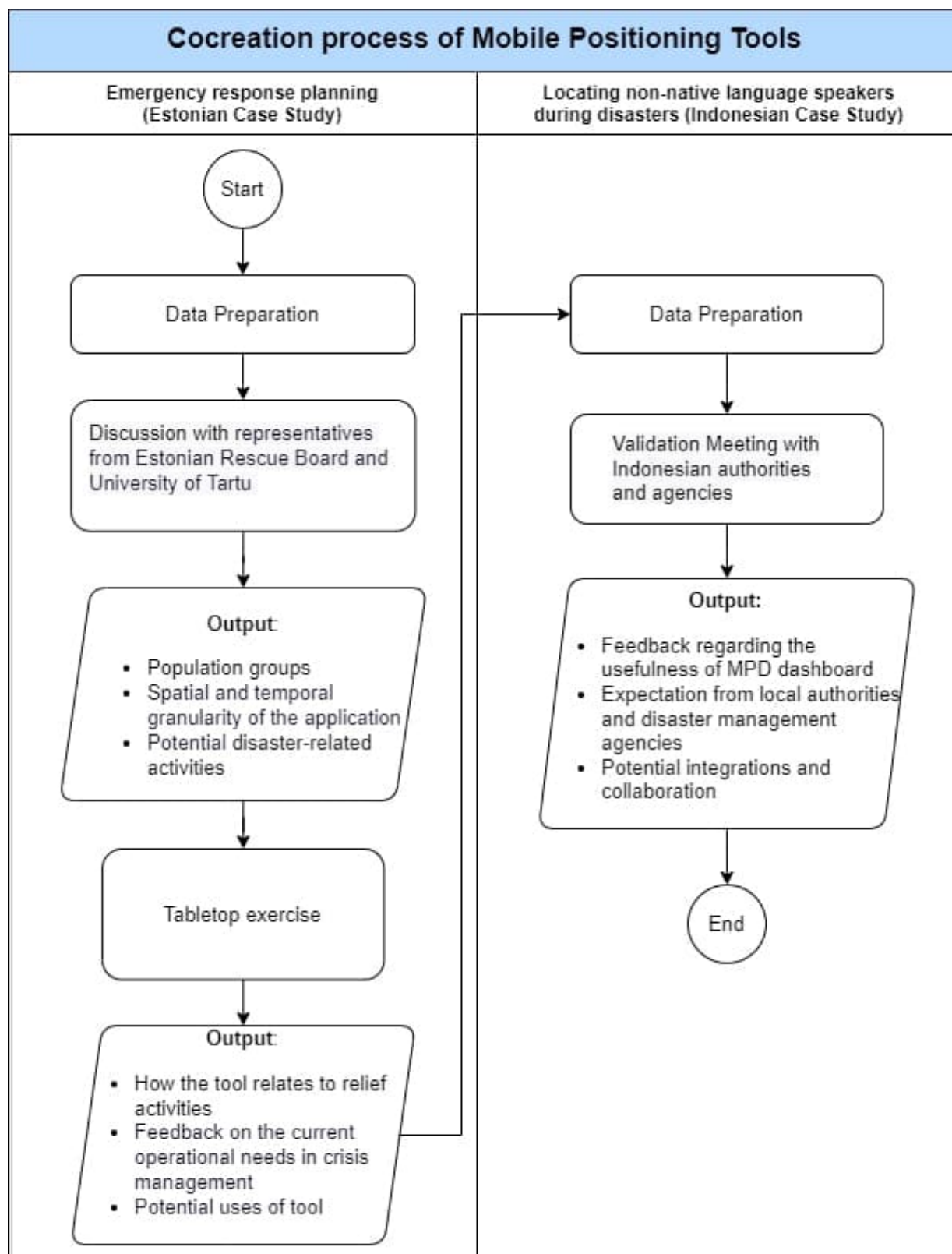


Figure 16. Co-Creation Process of Mobile Positioning Tools

### 4.3.1 Emergency response planning with the help of historical mobile positioning data

The first tool improves crisis managers' risk and situation awareness by showing the total number of people and specific sub-groups – like residents, workers, temporary residents, tourists, and people on the move – in different areas. Furthermore, the tool shows the geographical mobility flows and helps to map the central nodes of movement, like the locations of secondary homes. Crisis managers can get a holistic view at the national level and compare the situation at different times. The data can be viewed in detail with an accuracy of up to an hour (see figures 17 and 18). The population statistics are based on *historical* mobile phone positioning data.

Estimations of potential populations in danger in a crisis are usually made using census data, which does not consider dynamic population changes caused by work-related migration or tourism, or on-the-ground observations, which are very labour-demanding to make and can be quite imprecise. Thus, the tool gives the first responders fast and reliable information on population distributions via an interactive map application. The figures 17 and 18 below illustrate how the analysis results are shown for the end-users. Figure 17 shows the population statistics layer, based on mobile positioning data collected in Estonia. Figure 18 shows how the number of population changes in time, hour-by-hour.

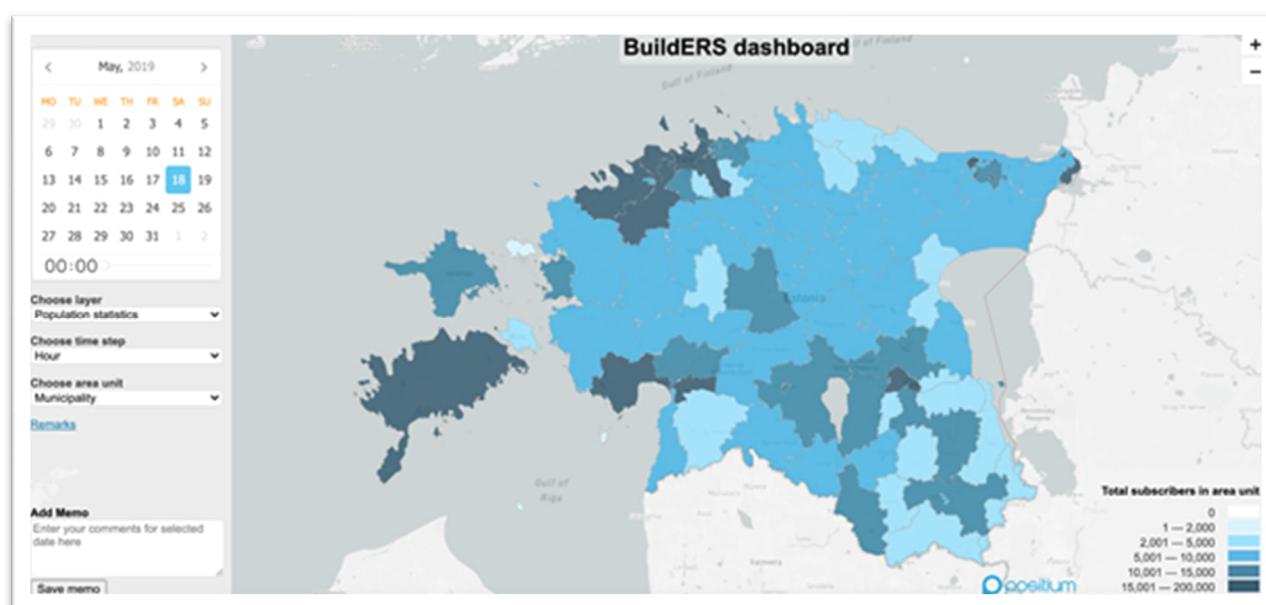


Figure 17. Population statistics layer on 18th of May 2019 midnight with hourly view on municipality level.<sup>28</sup>

<sup>28</sup> Exemplary data is from Estonia. Figure is retrieved Võik, E.-J. et al. (2021) BuildERS D4.3 Practice & product innovation “Applying mobile positioning data for more precise rescue planning and emergency management under cyber-hazard in Estonia”, BuildERS project report., page 22.



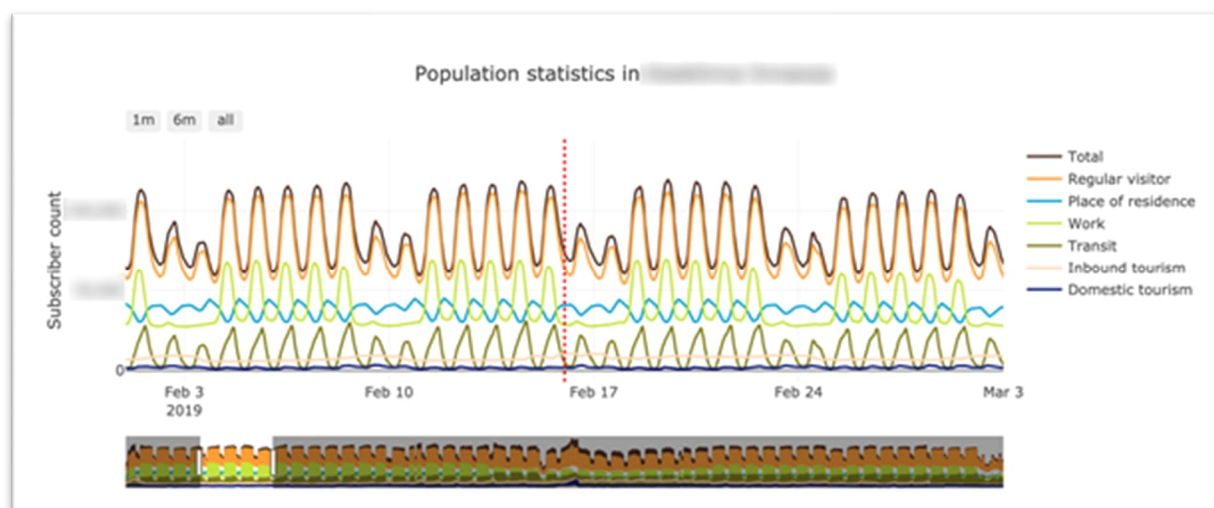


Figure 18. Hourly changes in population counts per subscriber groups in one area. Higher total value is during weekdays and lower values during weekend. Higher values during daytime, lower values during night-time.<sup>29</sup>

Throughout the tool cocreation process, several meetings with representatives from Estonian Rescue Board and University of Tartu took place to further discuss:

- ✓ Which are the population groups that should be put on the interactive map application?
- ✓ What is the spatial and temporal granularity of the application (or, how big should be spatial units and what is the temporal step of presenting the data)?
- ✓ Which disaster-related activities the tool could be used in?

In March 2021, in the final phase of the elaboration of the tool, a tabletop exercise took place with altogether 18 participants from 8 organizations located in Estonia. External Estonian stakeholders (Police and Border Guard Board, Defence League, Ministry of Economic Affairs and Communication, City Council, First Aid Unit) were reached to through Estonian Rescue Board, thanks to which the most important official institutions in Estonian disaster management were involved. During the exercise, the emphasize was on testing how does the tool relate to relief activities that the aforementioned organizations have responsibilities in during disaster situations. The tabletop exercise showed that the tool helps relief workers to understand the composition of population distributions during disaster situations with greater precision than before.

<sup>29</sup> Exemplary data is from Estonia. Figure is retrieved Võik, E.-J. et al. (2021) BuildERS D4.3 Practice & product innovation “Applying mobile positioning data for more precise rescue planning and emergency management under cyber-hazard in Estonia”, BuildERS project report., page 23.

Our overview of current technological solutions developed for disaster management showed that there are serious gaps in transferring the tools from development to use.<sup>30</sup> Thus, we saw that it is important to develop more than just concept and co-create the tool in close cooperation with the potential end users. This included everything from pre-processing raw data to discussions about situations and activities where the tool could be used in practice. The involvement of external stakeholders was especially beneficial as they gave input and feedback on the current operational needs in crisis management.

During the process of creating the dashboard we discussed with the stakeholders about the various technical specifications. One example of joint decisions was to make the tool accessible both online and offline. This ensures that the tool can be used also during power outages or in places where there is no access to internet. Thus, first responders can use the tool from their work laptops wherever it is needed – even during emergencies that have affected the critical infrastructures.

Cocreation activities have been beneficial to stakeholders themselves, as they have gained experience with the mobile positioning data and know better how they could implement the tool within their organizations. Close cocreation has also ensured that the designers of the tool have resolved necessary data ethics and privacy concerns regarding the use of mobile phone positioning data; this early engagement in the tool design further simplifies the process of taking the tool into use.

Here, we list the potential uses of tool, based on the feedback of Estonian first responders and other stakeholders.

- 1) *Strategic planning of logistics and traffic of dangerous goods:* Information on the tool showed big geographical discrepancies in population changes in different areas. In some metropolitan areas, such as Tallinn city centre, the population is on average 60 000 during night-time and 110 000 during daytime. Near coastal areas, populations are often two or more times higher during summertime than during winters. Thus, the tool shows that there is a need to address daily, weekly, and seasonal changes in potentially vulnerable populations and offers analytics to rely on in making such analyses. External stakeholders also brought out that in addition to better knowledge on population distributions the commuter flows are also very beneficial, because they enable to better plan the logistics and transportation of dangerous goods (the tool enables to analyse, where and when there are smaller numbers of commuters).
- 2) *Evacuation planning:* The potential for evacuation planning was emphasized very strongly by Estonian Rescue Board in the preliminary phase of creating the tool. This inspired Positium to add additional data layers for evacuation planning purposes. Mobile phone positioning data enables to find longitudinal areas of interest of people, such as secondary homes. In the tool that information was aggregated into a map layer that showed the number of people who have a secondary home in distance zones in districts. This information was appointed of very high value by stakeholders because it enables to estimate actual evacuation demand in areas. Rescue workers could look from the tool how many people already have a place to go to and how many people likely need housing during evacuation.

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<sup>30</sup> See more in Latvakoski, J. (2020) D2.4 Catalogue of tools, technologies, and media opportunities for disaster management. BuildERS project report, page 59.



- 3) *Resource allocation and crisis communication:* Increased situational awareness can help relief workers better allocate aid and workforce, because they are now the actual number of people in geographical areas at different times. During a crisis different population group (residents, tourists, commuters) may have different needs of help and the tool enables relief workers to consider both stationary and temporary populations within crisis plans. In addition, recommended communication depends on targeted population group, as tourists may need quite different information compared to residents.

During our meetings with the stakeholders, they pointed out that mastering a new technology takes time and introducing it as an everyday practice within their organization should be a stepwise process. In the preliminary phases relief workers should get familiar with using the tool and see, how to combine it with already existing practices of disaster management. After this is done, the tool can be included into disaster management programmes.

## 4.3.2 Using real-time mobile positioning data in locating non-native language speakers during disasters

The Indonesian case study focused on presence and mobility of foreign tourists – who – considering their potential lack of language skills are one of the groups that may be in a greater risk during some disaster situations. Data preparation was based on the same principles as was discussed under the Estonian case study with one difference: in the Indonesian case study, only tourists (people using a foreign country SIM-card) were covered in the analyses. Thus, the functionality of the interactive map application was also a little bit different. The tool showed tourist numbers in different areas (figure 19) and movement between areas (figure 20).

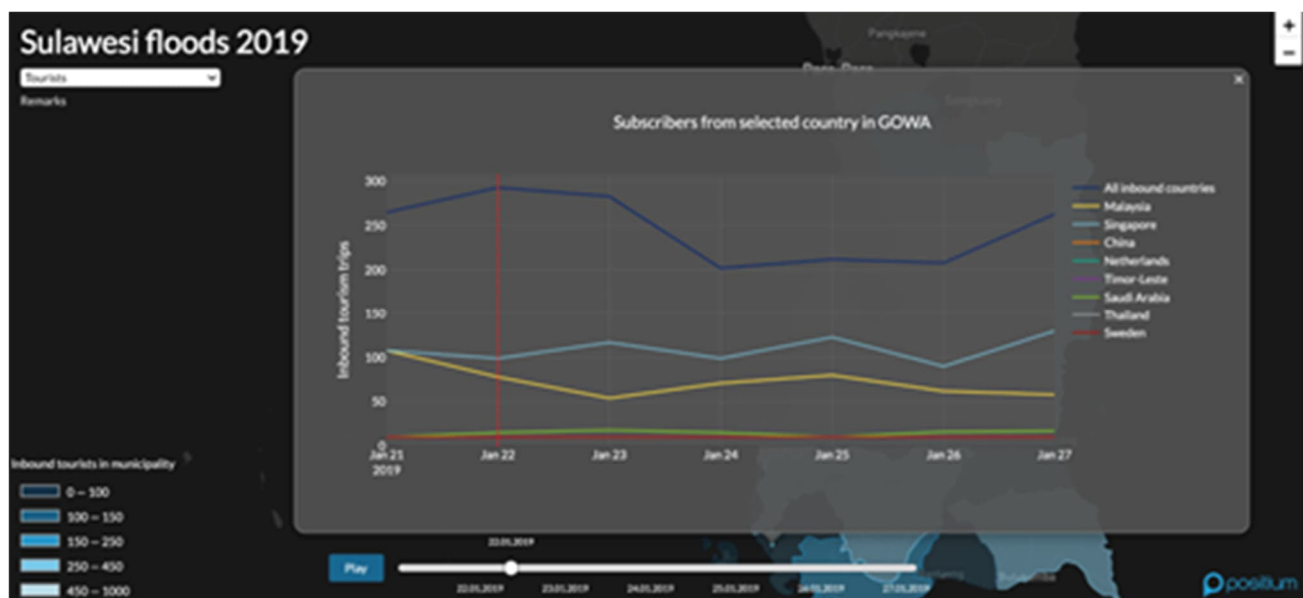


Figure 19. Dashboard showing number of tourists per country on the 22nd of January 2019 if the mouse is hovered over the area.



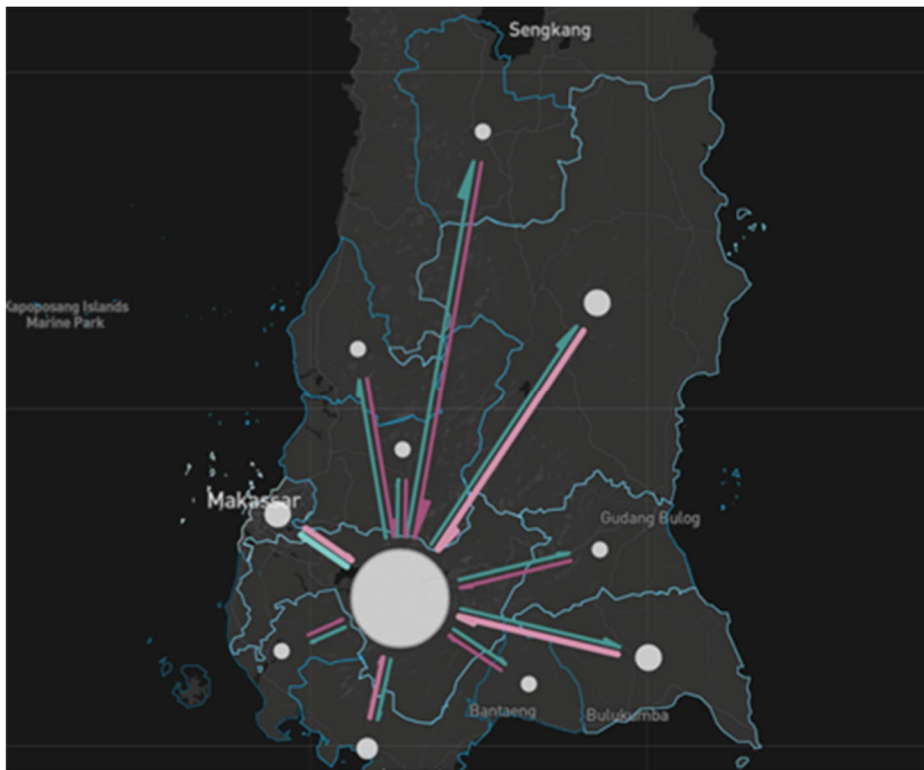


Figure 20. Starting page of the movement's layer showing movements' directions from crisis area (Gowa) to nearby areas.

### Identified potential the innovations have in emergency management

On the 21<sup>st</sup> of April 2021, a focus group discussion was held with end-users to validate the usefulness of the MPD dashboard. Participants were from different agencies to cover more parts of the emergency processes. There were the Indonesian Ministry of Foreign Affairs, Ministry of Tourism and Creative Economy, Ministry of Development Planning, National Disaster Management Agency (BNPB), National Statistical Office, Ministry of Social Affairs, Provincial Government, and representatives from the Non-Government Organizations, and Civic-Tech organizations.

Here are some of the key takeaways from the Focus Group Discussion. The MPD dashboard is helpful during the crisis because end-users, in this case the disaster management authorities, can see almost real-time updates on how many tourists are potentially affected and who might need help. Besides, local authorities can also monitor if and where these tourists are moving to.

The MPD dashboard is helpful after the crisis as it helps analyse previous disasters to assess whether the response should have been different. Moreover, the dashboard can also be used to examine if notification systems are efficient in reaching vulnerable people on time and in an easy-to-understand way. Therefore, planning of resources and processes for future crises can be adjusted to reduce further the costs of aid and relief for emergency proliferation.

The whole process could be improved by integrating the Positium dashboard with the ones currently implemented by local institutions. For example, the Positium dashboard could complement the existing dashboard managed by the Ministry of Foreign Affairs by adding additional sources of information showing all tourists in the area, not only the ones found healthy, injured, or dead.

During the discussion, the end-users also put forward several interesting ideas. For instance, they suggested that the MPD-based Positium dashboard, could also be integrated with other disaster management dashboards that have been developed using various technologies. The recently developed mobile application by the University of Indonesia called SaveMyLife, and PetaBencana, a tool combining data from hydraulic sensors with citizen reports on disasters, are good examples. These integrations could guide people to move out of the crisis area and escape danger.

### Scientific innovations

Due to the unpredictable nature of disasters, emergency resource allocation and response planning becomes a challenging task that must be addressed accordingly to maximize the survival rate. To address this challenge, scientific innovations have been developed by utilizing an integrated analytical approach combining a fuzzy inferential system and a decision tree method. (Berawi et al. 2019; Berawi et al. 2020.) The results of the scientific studies enable the local authority to:

- ✓ Determine the prioritized victims based on several indicators (i.e., age, distance to assembly points, regional risk, and medical condition)
- ✓ Determine the number of personnel that are required, based on the area, population density, equipment, and the number of high buildings

### Technological innovations

Building on the result of a scientific study, a mobile application called SaveMyLife has been developed. The application has three main features: preloaded content, a panic button, and an early warning system. These three features in the proposed mobile application act as preventive and corrective actions in the pre-disaster and disaster stages. The preloaded content provides users with information related to the nearest safety points from the user's location, the estimated time required to reach the safety points (e.g., police station, local hospital, mosque, community centre etc.), and real-time information about disasters given by official authorities.

The panic button feature provided by the system enables the user to notify the rescue team about their condition during an emergency. When the victims tap the “Panic Button”, the rescue team can accurately determine their location, enabling them to prepare appropriate aid or treatment plans for the victims effectively. Based on the user information, such as age, special needs, and health status, provided upon registration, the algorithm automatically categorizes the users into groups, thereby allowing vulnerable groups (e.g., people with disabilities, pregnant women, children, the elderly, people with underlying medical conditions) to be identified accurately. This application (figure 21) could contribute to Mobile Positioning Data, as it enables the authority to prioritize the victims and accurately plan how many and what kind of personnel and resources to deploy.



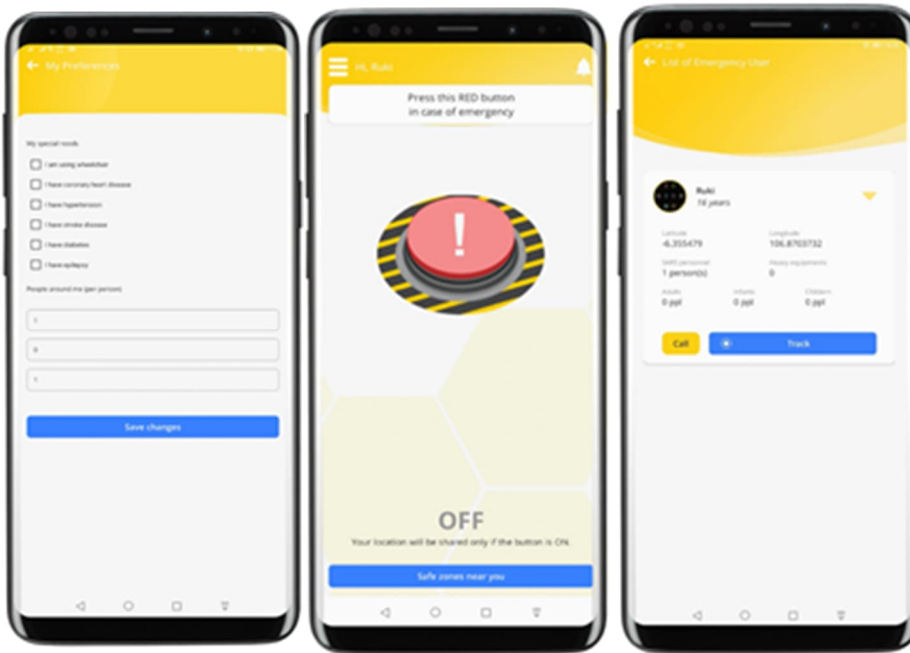


Figure 21. User Interface of SaveMyLife Application

The co-creation process of SaveMyLife Application can be seen in figure 22, which illustrate the process from the pre-development, development, and post-development phase. The scientific innovation was generated during the pre-development phase, whereas the technological innovation was developed during the development phase. During the post-development phase, user testing and validation were carried out, involving both disaster management authorities and civilians. The purpose of the user testing and validation was to identify gaps between the developed application and the real use cases. The identified gaps were then used to make further improvements on the application.

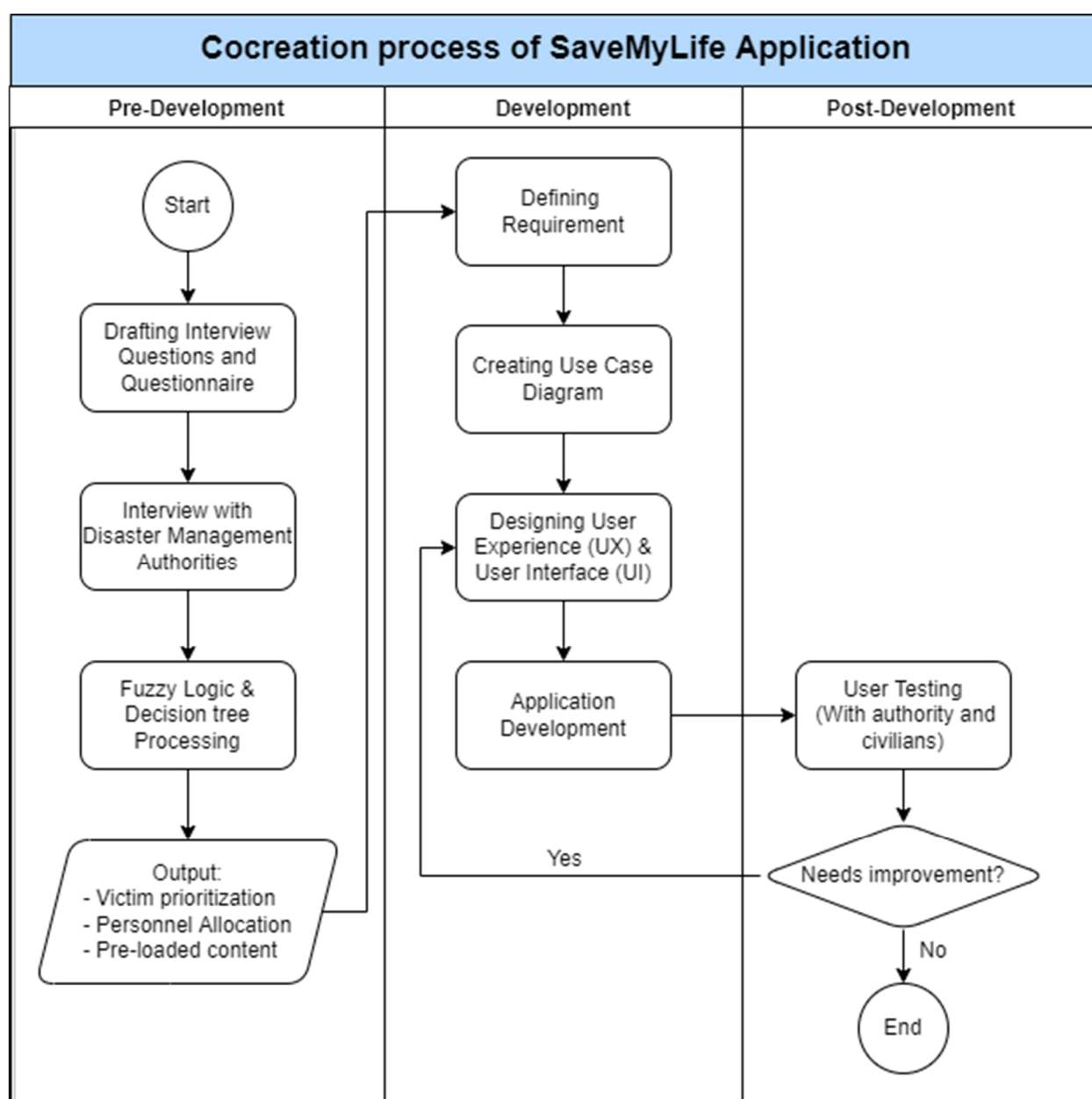


Figure 22. Co-creation and Validation Process of SaveMyLife Application

## 4.4 BuildERS Natural Disaster Mapping Tool

Different kind of data derived from public sources can be collected and used to provide a broader situation picture about the state of natural disasters, people's welfare, and other variables such as age in a specific region. *Natural Disaster Mapping Tool* developed in the BuildERS project gathers hazard information from public registers automatically with user defined query parameters and at user defined moment and combines the data into one visualization. This data was visually presented on a map and information about demographics, economic circumstances, and operational locations of non-governmental humanitarian relief agencies was also combined to this map.

This kind of information can help, especially non-profit sector organizations, to plan their crisis response activities before and during natural disasters. Secondary emergency response actors, such as social care organizations (often) do not have access to the security-sensitive or otherwise classified data. These organizations may not use for instance any client registers of health or social services – neither the ones maintained by public agencies (for example municipalities) nor private sector companies. While the Natural Disaster Mapping Tool uses public open access data it could help non-profit organizations to identify people with a high risk of becoming vulnerable and plan their preparedness measures accordingly.

From the practitioners' viewpoint, the problem is not the lack of hazard data since there are a lot of systems and information available in several data sources, e.g., websites. It is more about a need for integration of data from different sources to form a holistic situational picture and to increase the usefulness of available information.

The prototype of the Disaster Mapping Tool was demonstrated in the form of a video "*Maps of the Severely Vulnerable Populations*" for the external reviewers of BuildERS project in Spring 2020. This video recording is publicly available in the [BuildERS website](#) for further development until the end of year 2024. This demonstration showed how data from public registers can be utilized in practice. The case country of this demonstration is Italy, which is a partner country in the BuildERS project and one of the European countries most affected by natural disasters. The demonstration of the tool includes the data collected from the hazards that took place in 2015-2019.

The technical features of the tool have been described in more detail in the public report *Maps of the severely vulnerable populations*.<sup>31</sup> The technological demonstrator will be also available in the [Horizon Results Platform](#) and in the [CORDIS](#) EU Research results portal of the European Commission.

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<sup>31</sup> See more of the tool in BuildERS project report: Parmes et al. 2021 D3.4 Maps of the severely vulnerable populations.





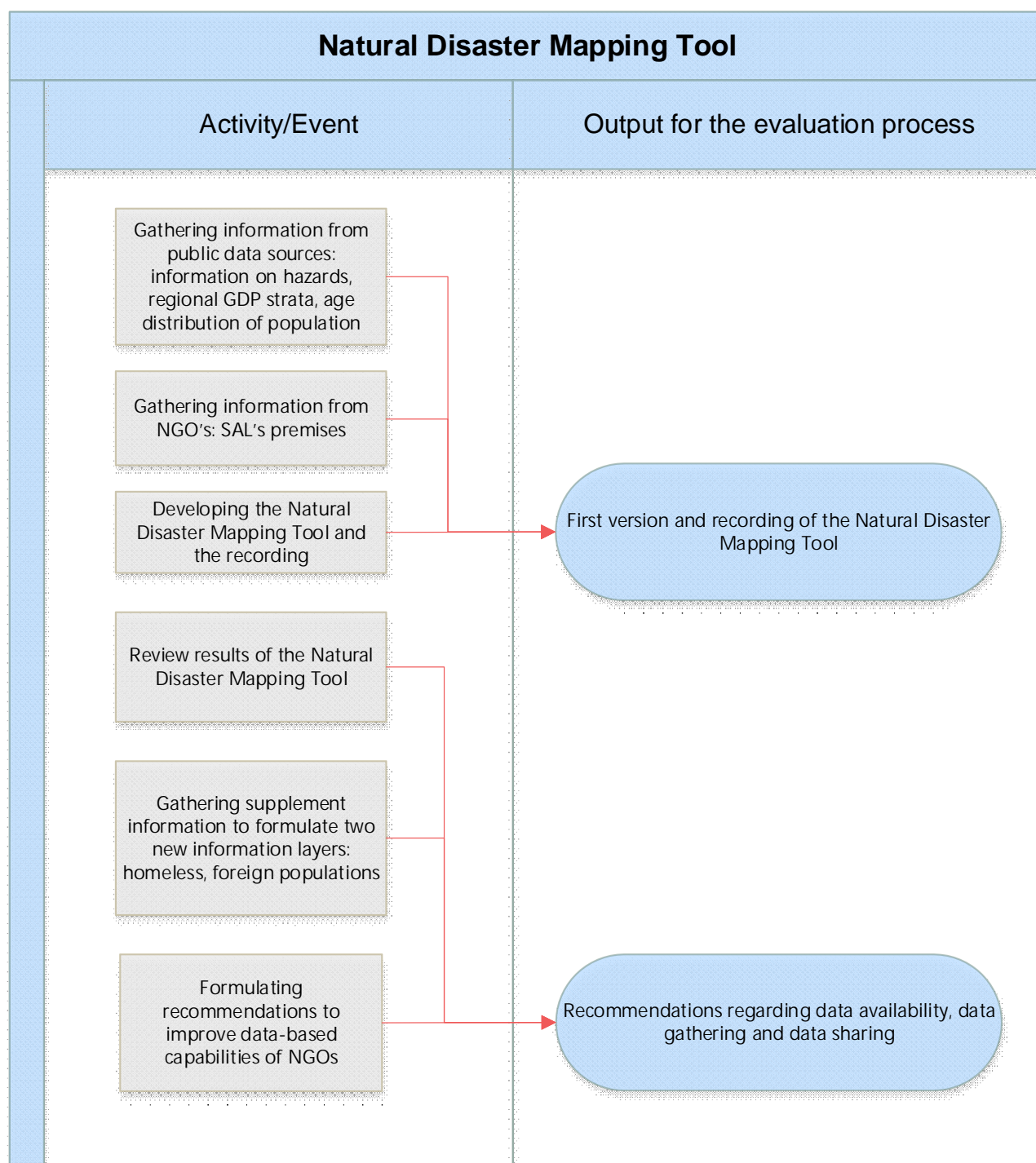


Figure 23: Development of the Natural Disaster Mapping Tool



## Data used in the technology demonstration (tech demo)

The technology demonstration of Disaster Mapping Tool presented different information layers from different public databases or registries. Information about natural disasters has been derived from satellite images (ArcGis platforms) of sites of hazard occurrences. Disasters that met pre-defined criteria have been selected in the demonstrator.

The disasters represented in the demonstrator were those that caused human fatalities, injuries and/or large-scale displacement, affected many people, or inflicted extensive and immediate damage to buildings, roads, telecommunication, health-care facilities, or water supply network. These included heat waves and other meteorological anomalies, hydrological disasters like flooding and storms, forest fires, and earthquakes and volcanic activities.

The data about natural disasters for the demonstrator was received from two main databases: the Copernicus Emergency Management Service's Rapid Mapping Activations feed of European Space Agency (ESA) and EU, and the Earthquake database from the United States Geology Survey (USGS). The Copernicus Emergency Management service provides geospatial data and images on impending or happening disasters, and the USGS website on earthquakes. Copernicus bases on satellite and in situ observations, and it delivers near-real-time data on a global level that can also be used for local and regional needs. Regarding the natural hazards in Europe, these two databases cover most of the European natural hazards.

There are many other data sources to pick seismic data, such as Database of Individual Seismogenic Sources (INVG), International Seismic Centre (ISC) and Seismic portal EMSC from European Plate Observing System EPOS, which could be connectable for this kind of use. It should be considered that magnitude estimates for a given earthquake data may differ from the data received from other earthquake data reporting agencies due to differences in methodology, data availability, and inherent uncertainties in seismic data.

The next layer, the location of the operation positions of non-governmental humanitarian relief agencies, included information about the Salvation Army's operational positions. This agency is usually among the first ones after the official rescue organisations to arrive to help victims following a natural disaster and it is a partner organisation in the BuildERS project. The operational positions were shown as a certain symbol in the map. Population density maps and socio-economic maps were the next two layers added to the hazard maps to identify regions with high intensity of hazards, and simultaneously with high density of socio-economically disadvantaged residents, with a higher risk of becoming vulnerable in hazard situation.

The age distribution of the population affected by natural hazards influences the need for disaster relief. People are vulnerable to natural disasters for many reasons. For example, elderly people (defined as those more than 65 years old) have a higher risk of perceiving bushfires as a significant threat due to limitations on mobility, small children without swimming skills are vulnerable to floods, and people without sufficient language skills may not understand guidelines related to emergency actions when disasters occur. The GDP (gross domestic product) layer included data retrieved from ArcGIS online datasets, showing GDP in units of €/Year, and presented at the level of small territorial units. The GDP layer indicates the socio-economic strata of people affected by disaster impacts and partially informs the level of disaster relief required.



The next layer (figure 24) indicated the relative values of homeless people in Italy and showed the situation in different regions. Data has been gathered from the Statistics report and webpages of Istat Statistics and covered the year 2014. According to recent studies, middle-aged people and migrants are most at risk for homelessness in Italy. The next layer (figure 25) presented the resident foreign population in different regions. Data has been collected from the web pages of Istat Statistics and it described the situation in the beginning of year 2021.

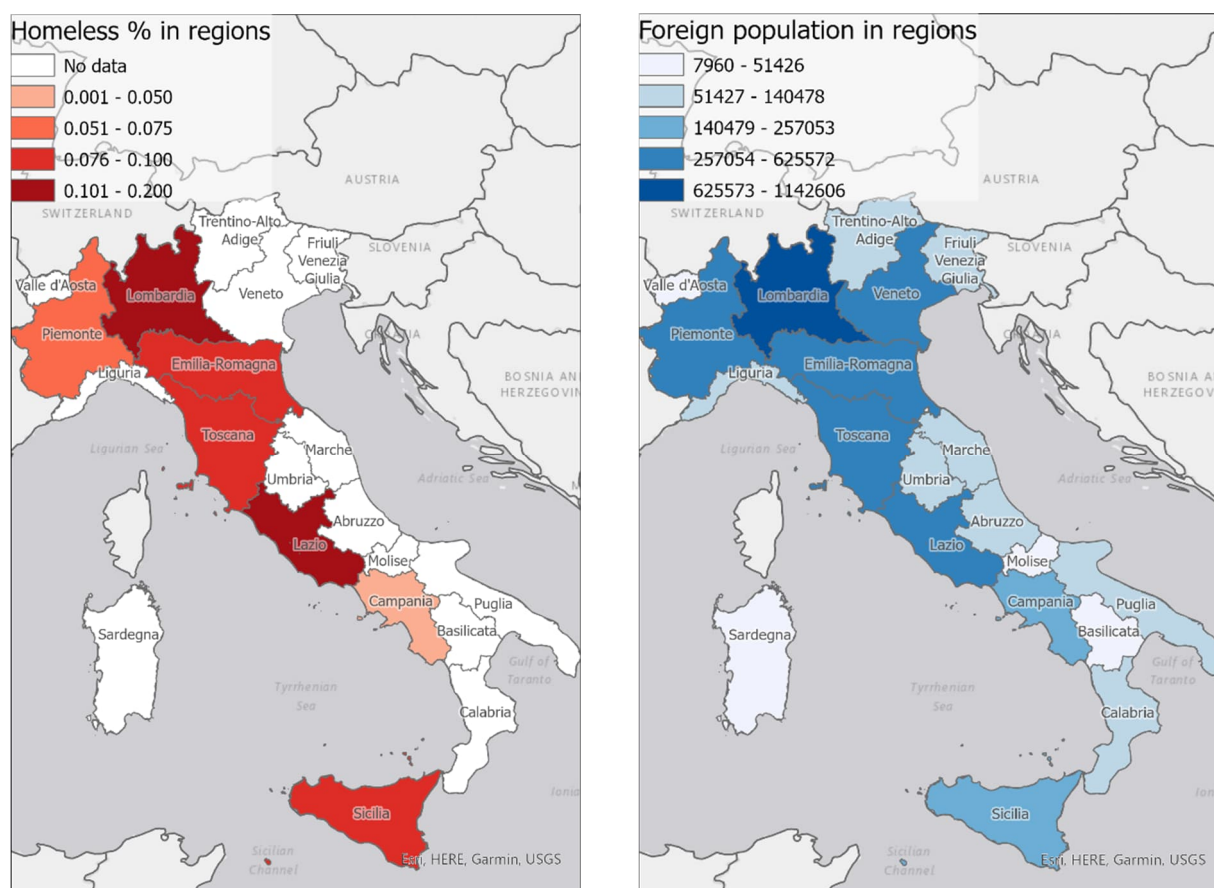


Figure 24 and Figure 25. Layers of the map representing homeless people and foreign populations in region

Foreign population should be considered when planning activities of preparedness and disaster management, especially when the number of foreigners in a region is high. Foreigners may not be familiar with typical hazards in a region, cannot observe signs of danger, or they may not know how to act or get help. They may not understand public warnings or guidance from authorities or other organisations offering help. This may be due to language issue, information may only be available in limited languages, and they might not understand the language sufficiently, or they might not know where to find information.

### **Suggestions for the further development of the mapping tool**

Based on the study in the BuildERS project, we suggest that information on the primary support needs of homeless people and the most important source of information for homeless people in disasters should be further studied and statistics collected. The information should also be kept up to date. This information could form a new layer to be combined to the maps that are used in disaster management. Information could be collected locally, for instance, from large cities.

It is important that the collection of information is done in an ethically acceptable way and that privacy and data protection needs are ensured. Such information will enable regional and local level actors to better provide the necessary help to the individuals in vulnerable situations and to provide them with easily accessible sources of information and communication in hazards.

It is currently difficult to compare statistics from different countries, as measurement methods and criteria vary. The results may also vary widely depending on which actor collects the data. In the Nordic countries, for instance, the definition of homelessness is broad, including those living temporarily with relatives or friends. If a narrower definition is used, only persons staying outside such as rough sleepers, are included. The results also vary greatly depending on whether, for example, refugees or immigrants are included in statistics.



## 5. BuildERS Tools for Building Knowledge

During our co-creation activities with stakeholders, it became evident that crisis managers need to build partnerships with the intermediaries of persons who have it difficult to communicate or interact, so that the understanding of risk and crisis related information is better reached, understood, and acted upon. For instance, the participants of the BuildERS WP3 research results validation workshops noted that non-profit sector agencies are important intermediaries of vulnerable people; workshop participants were working in care organisations and have often a role of “translating” to their clients the authorities’ instructions and guidelines.

Stakeholders had noticed that especially individuals with psychological diagnoses may have a hard time comprehending all the information related to crisis, because it might trigger anxiety, etc. Also, people with alcohol addiction are often affected by it psychologically and have difficulties to understand adequately what is happening. Substance abusers were also prone to believe false information (i.e., alcohol can kill coronavirus or certain drugs would boost their immune system). Some clients in a vulnerable situation felt as if they had nothing to lose, saying: ‘I am going to die anyway’, so they did not attach a lot of importance to the information given by the authorities.

It was also noted that language barriers made it difficult for some individuals to receive information. Intermediaries are needed also to reach migrant communities, which may have lower levels of trust towards authorities. Some communities have also been sometimes sceptical to official information and the hidden purposes behind it (i.e., the idea that someone is earning money because of the COVID-19 pandemic, or that it was a way of controlling movement). During the COVID-19 pandemic there has been plenty of false and harmful information spreading, and various conspiracy theories have made people more vulnerable. Hansson et al. (2020) suggest that during the pandemic, exposure to harmful information may have made people more vulnerable in several ways:

- ✓ discouraging appropriate protective actions and tricking people into buying fake protection
- ✓ promoting the use of false (or harmful) remedies
- ✓ misrepresenting the transmission mechanisms of the virus and victimising the alleged spreaders of the virus by harassment/hate speech
- ✓ downplaying the risks related to the pandemic,
- ✓ tricking people to reveal their confidential information.<sup>32</sup>

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<sup>32</sup> Researchers compiled a set of 98 small case studies based on news media stories, scientific and official reports, and other relevant documents that dealt with various forms of false and/or harmful information and their effects during the first three months of the COVID-19 pandemic (between 1 March and 30 May 2020) in six European countries: France, Italy, Norway, Finland, Lithuania, and Estonia. See more in Hansson et al. (2021).

Some of the difficulties in communication and/or interaction derive from memory loss, language problems, reduced thinking, and reasoning skills. Therefore, persons may have less capacities as the so called neurotypical persons to express themselves and are at risk of being either misunderstood or side-lined. Common for these individuals is that their challenges in terms of communication and/or interaction may remain unnoticed, as they are not always “visible”. Furthermore, because of their difficulties in self-expression, they may be completely ignored as conversation partners.

On the other hand, people may become vulnerable due to the crisis managers’ practices. Official information is not designed to be understood by a diverse population and information campaigns are often not designed in a way that makes sure that everyone receives the information. In other words, situational factors like accessibility of information may also create vulnerability. The way information is presented or communicated may either increase or reduce people’s vulnerability.

This has both practical and ethical implications. First, if the interaction and communication fail, persons’ needs in crisis may be “side-lined” and/or they may not be able to ask for help or tell that they are injured or in pain. Second, individuals may receive misleading and/or false information (misinformation) or become targets of harmful information (malinformation) that makes their vulnerable situation even more severe.

In the BuildERS project we have promoted the principles of accessible and inclusive crisis management, stated in the Sendai Framework for Disaster Risk Reduction 2015-2030 (UNISDR 2015). Consultations to develop crisis preparedness plans need to ensure that the discussions and associated materials are accessible to people with various impairments. In addition, communication with first responders needs to be accessible to persons with impairments, and persons with impairments need to have the devices they require to communicate with first responders. (GFDRR 2018.)

In addition, many neurodivergent persons have exceptional skills like absorbing large amounts of information or excellent memory of details. In the chaotic and complex crisis situations, these types of skills can be potentially very beneficial for coping with crisis but also overwhelming for the individuals. For the first responders, however, detailed eyewitnesses’ observations of incidents, and/or identified characteristics of suspected perpetrators (in man-made crisis), are very valuable information.



## 5.1 BuildERS Prototype of the First Responder Training on Accessible and Interactive Risk and Crisis Communication

In this chapter we will introduce our educational tool that uses innovative pedagogical methods: including gamification and scenario-based simulation. Our prototype has been designed especially for the police and the rescue services, to improve their risk and crisis communication. The training is built on an idea of *competence-based learning* of communication and interaction skills, collaboration skills, and accessibility requirements for crisis-related information. It is based on the Finnish case study and research on various communication-related vulnerabilities in crisis carried in Work Packages 1 and 2.<sup>33</sup>

It comprises of two modules for two different target groups. *The first module* is a simulation-based preparedness training for external communication and collaboration. *The second module* is an e-learning program to improve the everyday social interaction skills of first responders and thus, build their competencies in terms of risk and crisis communication while working in the field operations. Below is a more detailed description of the training modules:

- 1) *External communication and interagency collaboration* -module is designed for the communication specialists and duty commanding officers, who are responsible for communication. It consists of a half-day preparedness drill, which uses an online platform to simulate external communication via digital communication channels. In the pilot training we tested a platform called *Trasim* developed by Insta Digital Ltd. The aim is to learn accessible risk and crisis communication skills, and ways to collaborate with relevant intermediaries of vulnerable people. An important aspect of the training is a simulation of the vulnerabilities that are created by exchanging information via social media and other digital communication channels. Preparedness drill participants also learn the logic of information disorder: how false and harmful information is spread, and how it can be – at least partially – tackled.
- 2) *Social interaction and communication with people who have special needs in terms of communication* - module is targeted for the field operations officers, who respond to emergency situations and interact with citizens, and students of basic first responder training. It is an e-learning environment, where the learning materials are interactive. Learners are shown videos, which simulate face-to-face interactions and explain the better and not so good ways to communicate. Learning materials also provide knowledge of common neuropsychiatric disorders, cognitive disabilities and mental health conditions that affect one's ability to understand and act upon information. Furthermore, the training deals with the first responders' own psychological resilience and gives them tools to strengthen it.

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<sup>33</sup> See BuildERS project reports: Jukarainen et al. (2021) D4.1 Managing chemical spill emergency and mis-/disinformation through simulated responses; Hansson S. et al. (2019). D1.4 report on communication behaviour and use of social media in Europe; Jukarainen et al. (2021) D6.3 Report of the challenges related to mis-, dis-, and malinformation, BuildERS project.





Both modules increase first responders' knowledge on *accessible communication*, including the alternative communication means (plain language and easy-to-read language). They also go through different types of vulnerability factors related to communication, such as comorbid symptoms related to mental health conditions, brain disorders/neuropsychiatric disorders, and intellectual disabilities.

In both modules pedagogical approach is learning by doing. In the first module learning method is a tabletop exercise, which is enlivened by simulation technology. In the second module e-learning platform has different types of interactive learning materials. There are for example branching scenario exercises where students navigate through fictional stories and make operative choices.

Specific sub-themes of training contents are responding to false and harmful information and finding strategic partnerships with other agencies. Students will also learn to use the potential of an individuals' social network including their connections to the different service providers. In practice, this would mean that first responders (like police or rescue services) engage in multiagency and multi-professional work to reduce individuals' vulnerabilities.

### Testing of the simulation training tool

The prototype of the first module was piloted in winter 2020 with the Finnish communication specialists and duty commanding officers working in police and rescue services. During the pilot, we tested the applicability of Insta Digital's *Trasim* platform – a simulation tool in the training of inclusive crisis communication. Based on a fictional CBRNE incident scenario we planned a series of half-day preparedness drills for local police departments and regional rescue services. The drills were a combination of tabletop exercises and a use of the above-mentioned simulation training technology.

The drills were organized in different operational contexts in northern, central, eastern, and southern Finland. Six police units (out of eleven) and rescue services of five different regions volunteered to take part in the pilot training. This allowed us to use the drills also for the assessment of authorities' collaboration skills and capacities in terms of joint crisis communication. The drills allowed us to compare the first responders' competencies and capacities in densely and sparsely populated regions.

During the preparedness drills, participants were expected to communicate risk and safety instructions to people with challenges in accessing and understanding conventional messages. Among the fictional characters there were people with such cognitive and mental impairments that may impact also trust towards authorities, and overall risk awareness. Furthermore, there was plenty of false information spreading that the participants were supposed to tackle. They also needed to protect people in vulnerable situations from being stigmatised or blamed for causing the crisis and thus becoming targets of hate crimes.

Trasim -platform provided training participants a fictional, but close-to-reality digital working environment with social media channels, official websites, and TV broadcasts. In addition, we used conventional phone connections to simulate journalists' and other stakeholders', like NGOs' and citizens' enquiries related to fictional crisis. Trasim has been developed for interactive testing of the effectiveness of the crisis management procedures and operating models, including risk and crisis communication. Its technology readiness level is 9: an actual system proven in an operational environment. This means that it is already available on the market and offered as premises software or as software as a service (SaaS); therefore, in principle the platform can be accessed from any



device with an internet connection and a web browser. The main idea behind the platform is that the end user (that is trainer or exercise instructor) creates their own exercise objectives and instructions, and manages their user account and access, and creates exercise specific workbook content.

For BuildERS testing, Trasim was finetuned to support a better user experience (easier navigation). The languages used are Finnish or English. However, the platform's user interface language can be translated to other languages (it currently exists in Finnish, Swedish and English). Trasim can be used independently or to support facilitation of tabletop exercises as was the case in our BuildERS test events (the preparedness drills). It has also been used amply to support cyber security related functional exercises and major incident management, including testing of operating models between top management, communications units, service business management and Security Operations Centres (SOC).

### Piloting an e-learning course on risk and crisis communication

For the field operations officers, who respond to emergency situations and interact with citizens, we designed a pilot course on risk and crisis communication titled *Challenging Interactions*. This pilot training course was thus developed for the operational, on-the-ground practitioners: field operations officers and managers, and vocational students. Although the pilot training materials were designed especially for law enforcement, they can be easily modified for the other first responders like paramedics and fire-fighters.

We created an e-learning course on Moodle LMS -platform, which is an open-source learning management system used by many educational institutions worldwide. We created the course first in Finnish on the Moodle platform maintained by the Finnish Police University College, and then built an almost identical copy in English on the LEEEd -platform of the European Union Agency for Law Enforcement Training (CEPOL). Later we will make courses in different languages: we have started to prepare learning materials already in Swedish and French.

The course is estimated to correspond to two ECTS credits.<sup>34</sup> E-learning method enables the students to take the course autonomously and independently without the involvement of a teacher. The training course consists of six sections. The first five build competencies to communicate and interact with:

- ✓ intellectually disabled individuals
- ✓ self-destructive and suicidal individuals
- ✓ individuals with memory disorders
- ✓ neurodiverse individuals (individuals with autism spectrum disorders and attention deficit hyperactivity disorders, ADHD)
- ✓ victims of domestic violence, who have challenges in social interaction and communication.

The sixth training section aims at improving the resilience of the first responders themselves. It deals with the mental health issues that may arise due to this kind of work, as well as how to cope with long-term stress and post-traumatic disorders. The learning materials explain how the factors that burden

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<sup>34</sup> ECTS credits refer to the estimated workload of studies. ECTS is an acronym for the European Credit Transfer and Accumulation System, which is a used by European higher education institutions to make international education more easily comparable across borders.



our own ability to think, memorise and solve problems also affect our encounters with others – like clients. During the course, students learn methods for strengthening their ability to function and increase their personal resilience, ability to recover and move on from mentally stressful situations.

The modules consist of several interactive learning contents and scenario-based exercises. The shortest module is the one regarding the domestic violence (No 5), and the largest the module regarding the resilience (No 6). As a final part of the course, the students are requested to write a short essay of each training module and for the pilot purposes, feedback of the whole course implementation.

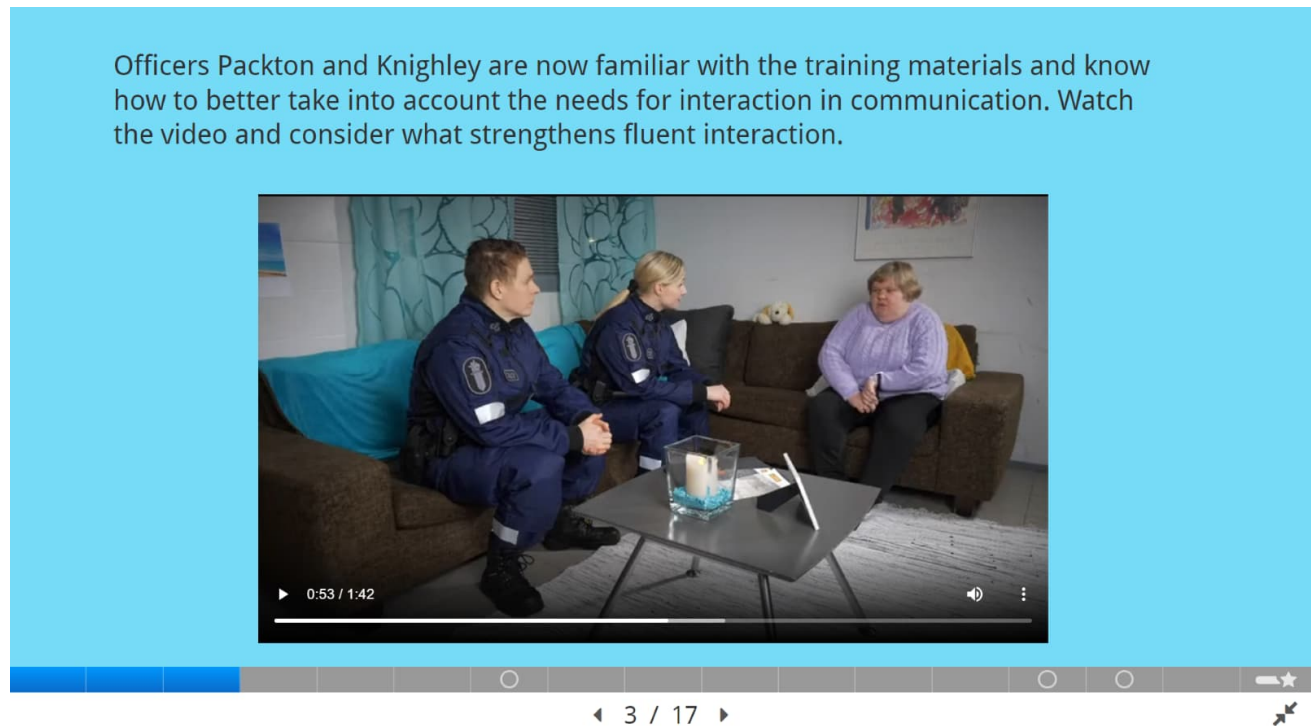


Figure 26. Screenshot of training materials

### Feedback from the pilot

The course was first available in Finnish for the bachelor's degree level students at Police University College in Finland from mid-November 2021 until the end of January 2022. We invited students with different background to participate in the course, including students with previous knowledge of challenging interactions, and students who themselves had challenges in social interaction and/or communication – for example due to neurodevelopmental disorders like e.g., Asperger syndrome (AS).

Altogether 80 students attended the course; some of them reported of their own communication-related vulnerabilities and reflected how it impacted their lives.

As a mandatory part of the course, the students participated in the anonymous evaluation survey where they were asked to give their feedback and suggestions for improvements regarding the structure, content, and teaching methods of the course. Most of the students agreed that the course

was very interesting and useful and 98.8 per cent of the students indicated that they would recommend the course to the other students, too.

Moreover, the students evaluated each course module in the survey, where they were asked to give suggestions for improvements with their own words. In addition, many students gave feedback also in their essays. Thus, we were provided with versatile feedback. We analysed the feedback and will use it to improve the course materials. Overall, the students were content with the course materials. However, we considered following suggested improvements necessary:

- ✓ Adding more interactive features and visualisations in the training modules
- ✓ Adding more challenging material for students who want to deepen their knowledge
- ✓ Adding more challenging branching scenario exercises for the students
- ✓ Adding more videos to illustrate the learning contents



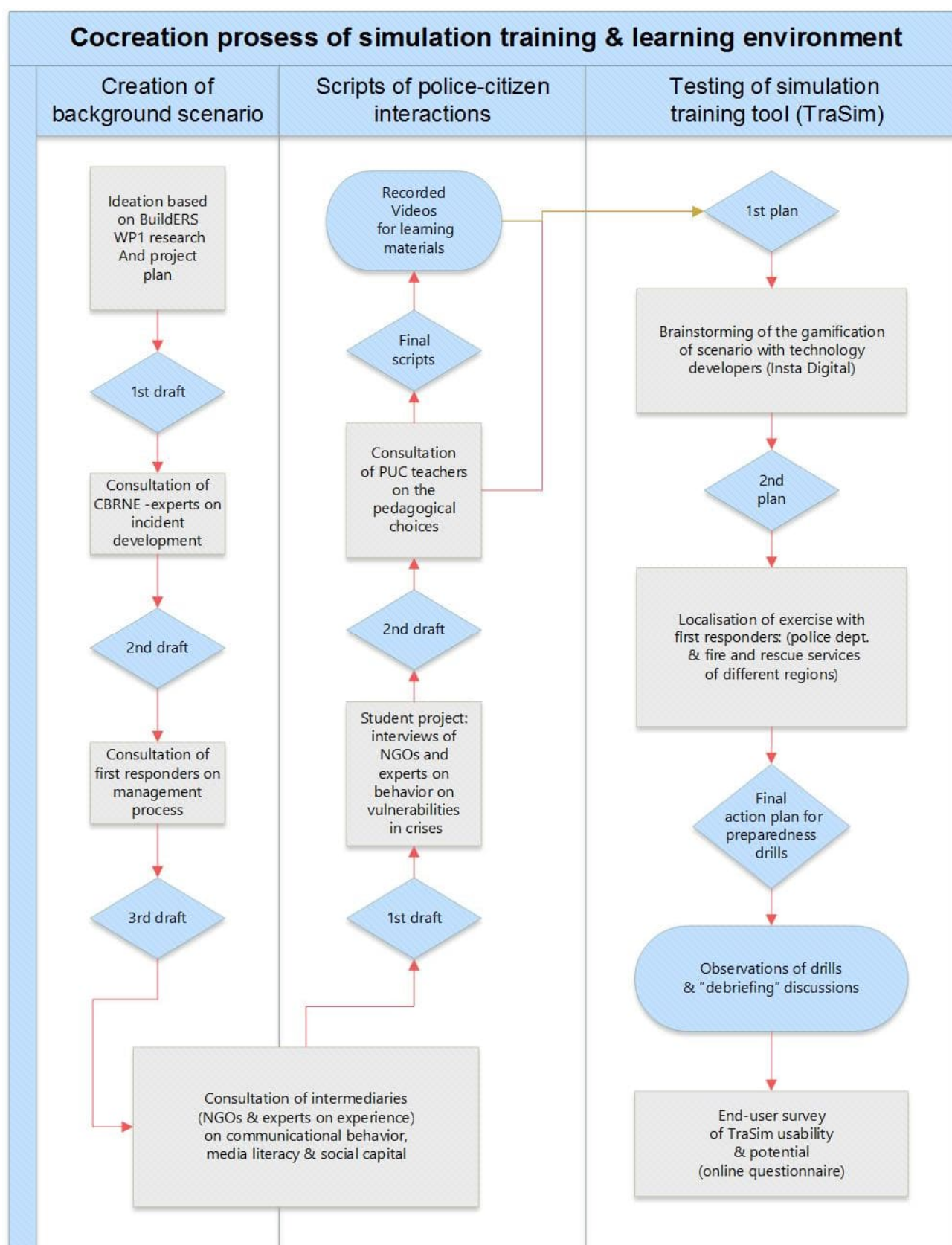


Figure 27. Cocreation process of simulation training & learning environment



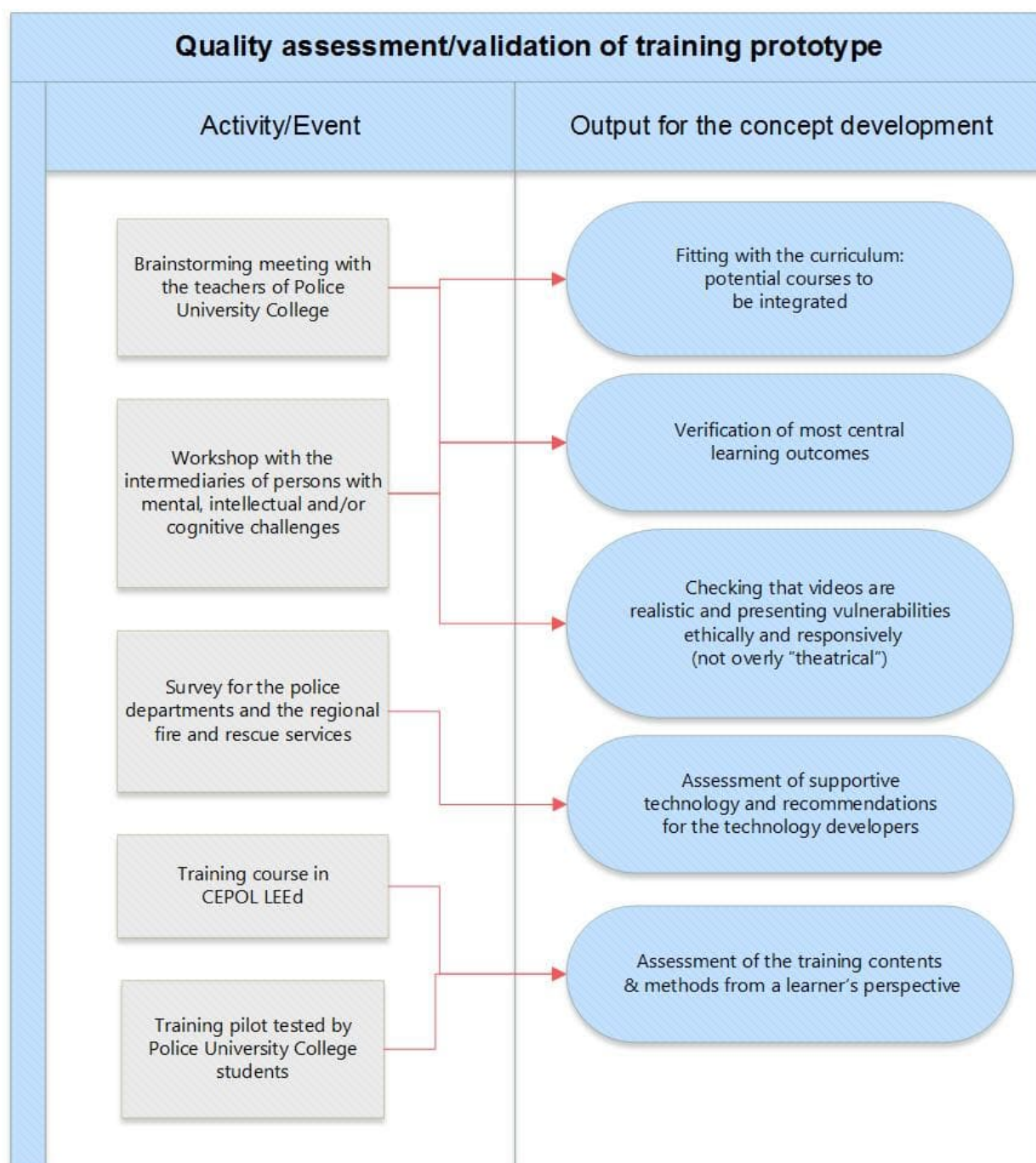


Figure 28. Validation process of the training prototype



## Dissemination of training

After the BuildERS project has ended, this training course will be available for self-learning in two different e-learning environments. The English course will be open for self-registering on the LEEd-platform of the European Union Agency for Law Enforcement Training CEPOL. This platform has around 30 000 online training users, which are registered officials across the EU Member States and several other countries and partner organisations. In addition to being accessible by computer, LEEd can also be accessed via mobile devices with an app.

Furthermore, in the Moodle -platform maintained by Police University College there will be courses in Finnish and Swedish annually for an approximate 2000 field operations officers and commanders, and around 500 Bachelor's degree level students. It is also a plan to make a course in English for students participating in the Nordcop exchange program of Nordic police academies or the European Erasmus+ exchange program, who are visiting Police University College.

As the training is a prototype, it serves also as a “starter kit” type of repository for teachers and trainers, who may find inspiration to design even more developed forms of training. It would be useful to continue the cocreation together with the experts on the accessibility of communication, including easy-to-read (E2R) and plain languages. We will also find synergies with the results achieved in the Erasmus+ project called *MEET – Inclusive Emergency*, which has developed multilingual e-learning contents for the rescue services. The e-learning content of MEET -project will be published in May 2022 under a Creative Commons license. With an additional external or in-house funding, we aim to combine our training materials and methods and build an even larger e-learning environment for the first responders (rescue services, paramedics, and law enforcement agencies).



## 5.2 BuildERS Board Game: Teaching Preparedness Skills to Children

This chapter shows our tool designed for teaching preparedness skills for the children in an entertaining way. The BuildERS board game explains elementary school children the steps to be taken in case of emergency situations focusing on natural disasters or other events. The game uses different crisis scenarios that simulate real-life events: fire, earthquake, flood, and pandemic.

Relying on the main concepts of the BuildERS project – risk awareness, social capital, and vulnerability – the BuildERS Board Game focuses on teaching children aged 5 to 10, who are likely to be vulnerable in case of disasters, how to react and how to spread information to their peers. According to BuildERS research, elderly, children, and people with disabilities are recurring groups impacted by the crisis in all the eight countries that were subject to analysis.<sup>35</sup> This game is focused on explaining to children in lower grades of elementary school the steps to be taken in case of emergency situations focusing on natural disasters or other events. Four different scenarios have been developed, based on the disasters described by the case studies within BuildERS and most likely scenarios to happen in countries covered by the project – fire, earthquake, flood, and pandemic.

Based on an extensive literature review of the pedagogical and didactical approaches in game-based learning, it was decided that the game should include questions with different levels of difficulty. Questions for younger groups of pupils (5 to 7 years of age) are based on visual card pairing (e.g., fire extinguisher – fire; face – mask; mobile with 112 – building on fire, etc.), whereas questions for the group 8 to 10 years of age are more complex and can also be in the form of challenges (either on paper or physical demonstration).

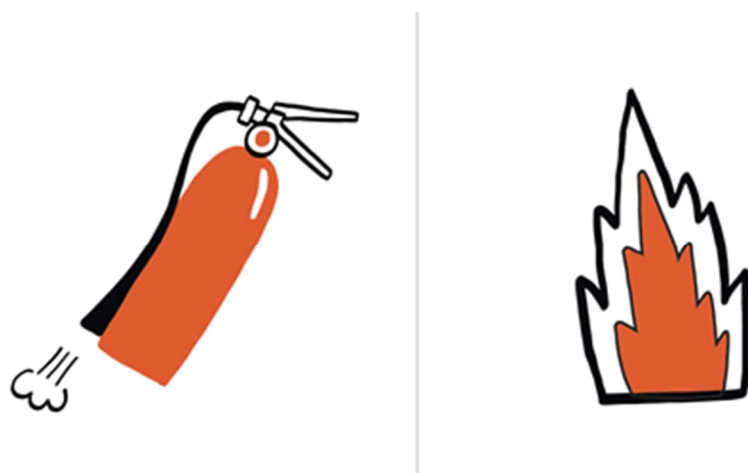


Figure 29. Pair card example of the BuildERS Board Game

<sup>35</sup> Morsut C. et al. (2020; revised 2021) Report on segments of vulnerability country by country basis – inside and outside the official data, BuildERS project report.

This categorization of questions came because of co-creation after the game was distributed to one elementary school and one children's camp in Hungary to be tested. The first scenario that was developed – the fire scenario – was translated to Hungarian with instructions for teachers and all the levels of questions for pupils. The feedback received was mostly positive – the game was engaging; the visuals were interesting and the level of knowledge on the topic among the children increased.

However, there have been in both cases two important negative remarks. Namely, this first version of the game was confusing with regards to the level of questions and challenges and age groups they belong to. Educators/teachers could not differentiate in the instructions which questions to use for younger groups and which ones for older as it was left to their judgement to assess what the level of knowledge about issues at hand among pupils was.

The second remark concerned the difficulty of original questions for the younger age group (5 to 7 years). Initially, it was planned for pairing images and questions to be for younger pupils, while challenges would be added for the older group (8 to 10 years). The feedback was that the questions were too complex on this level and that children best responded and understood image pairing at this age, and this was enough to keep their attention for the duration of the game.

The game was thus adjusted according to these comments and the instructions got a clearer form, while the image pairings are a starting point for younger players and the teachers are instructed to add on the questions and challenges as the knowledge of the pupils increases. The new version of the game was then tested in a new school and an additional camp for disadvantaged children, which was intentionally done to check applicability for this target group. The feedback received was positive, without any issues with understanding of either educators or children.

Additionally, the game was reviewed internally by the University of Tübingen for ethics and by the University of Tartu for content and synchronicity with BuildERS. All these remarks were taken into consideration before finalizing the game and designing the last elements.

Moreover, the game was designed with co-creation in mind in another way – the visual elements. Each of the four boards is only partially coloured, so that the children playing can firstly connect to the game while colouring the town and investing a joint effort to make it “their own”. With this step, especially for the younger age group, it will be easier to engage and potentially make the board look like their own town, city, school, playground, etc.

In figure 30, one of the boards is presented (flood) and it is only partially coloured. Four different characters move down 4 different paths (children from school and the boy and grandma all go towards the evacuation centre, volunteers go towards the flood to build a dam and the flood going towards the town). The testing of the game showed that the game is interesting enough for children this age, as they are “competing” against the flood (or fire, virus, earthquake in other scenarios) while responding to the questions.





Figure 30. Game board of flooding scenario

The game was produced in five languages (English, Finnish, German, Italian and Hungarian) to ensure the widest use possible. It will be distributed across the schools in the countries where these languages are spoken, while it is also planned to reach out to organizations dealing with non-formal and informal education of children 5 to 10 years of age. The idea is to target organizations that focus on those, who have a higher risk of becoming vulnerable (migrants, disadvantaged children, children with development difficulties) and local NGOs and community centres.

The game will be available primarily on the BuildERS website, but it is going to be distributed to specific platforms, namely Horizon Results Platform and School Education Gateway to specifically target teachers, as this is a popular platform for teaching materials and a hub for motivated educators. In addition, eTwinning National Support Services (NSS) of these countries will be contacted to distribute news about the game. eTwinning is the largest network for school staff in Europe, with over 450 000 registered teachers. The NSS social media channels are extremely popular, and especially among teachers who are used to using innovative teaching methods and tools, which the BuildERS game represents.

The game will also be distributed to Salvation Army centers in Germany, Italy, the United Kingdom, Finland, and Hungary who provide services to families and children. Contact information will be provided along with the board game to receive feedback from users if they so wish. These outreach activities will put the game on the map with the relevant organizations and platforms that can remain a source of information even after the project is done.

## 5.3 BuildERS Guidelines for Ethical Assurance in Inclusive RDI-projects

Every technological and social innovation promotes a formulated answer to the question “What kind of society do we want to live in?” (Ammicht Quinn 2014, 28). In this vein, as the European Group on Ethics in Science and New Technologies puts it, Research, Development, and Innovation -projects (RDI) are aimed at “responsible research and innovation” (European Group on Ethics in Science and New Technologies to the European Commission, 2014). Not only should they perform research in sound and ethically appropriate ways, which first requires standards of research that involve human participants in line with human dignity, human rights, and European values. This also means that potential issues or unwanted consequences should be considered and discussed as part of the research activities themselves, rather than during the implementation phase only.

In line with these aims and even more, due to its specific focus on those persons who find themselves in the most vulnerable situations, the BuildERS project involved ethics into research activities right from the beginning, both as a counselling as well as a research perspective, in order take into consideration the (purposely) inscribed values of technological and social innovations right from the beginning. Furthermore, the ethical perspective was involved on three (of four) different levels of ethical research (s. Table X). The following description of these three levels of involving ethics (a) formal ethics of research, (b) ethical monitoring of research activities and (c) specific research on ethical questions provide not only valuable for the BuildERS project but also for the other projects of the DRS01 cluster and there might serve as a blueprint for future RDI activities.

		Exclusivity of the question for the project	Operationalisation	Level of ethical reflection
Ethics of Research	Formal Ethics / Tick-Box Ethics	high	high	low
	Ethical monitoring of research activities			
Research on Ethics	Research on questions of applied ethics			
	Research on questions of philosophical ethics	low	low	high

Figure 31. Levels of ethics involvement in research activities (by the University of Tübingen)

On the lowest level of ethical reflection, ethics is considered in regard of fixed and conscribed *standards of good empirical research*. For BuildERS key component here was the development of information sheets and data protection procedures. These should not only allow for a voluntary and



well-informed choice for participation but should also ensure that personal data was only collected if necessary for the research activities and that data storage provided a restricted and safe environment for the given information. Further, it encompassed the consideration of precaution measures for the involvement of participants in vulnerable situations, who were likely to suffer from re-traumatisation or exploitation due to the specific situations they are in.

**2.1 Ethics issues checklist**

Section 2: HUMANS		YES/ NO		Page	Information to be provided	Documents to be provided/kept on file
Does your research involve human participants?		<input type="checkbox"/>	<input type="checkbox"/>		1) Confirm that <b>informed consent</b> has been obtained.	1) Informed Consent Forms + Information Sheets.
If YES:	- Are they volunteers for social or human sciences research?	<input type="checkbox"/>	<input type="checkbox"/>		1) Details of the recruitment, inclusion and exclusion criteria and informed consent procedures.	1) Copies of ethics approvals (if required).
	- Are they persons unable to give informed consent (including children/minors)?	<input type="checkbox"/>	<input type="checkbox"/>		1) Details of the procedures for obtaining approval from the guardian/legal representative and the agreement of the children or other minors. 2) What steps will you take to ensure that participants are not subjected to any form of coercion?	1) Copies of ethics approvals.

Figure 32. Excerpt from report: Horizon 2020 Programme - Guidance on How to Complete your Ethics Self-Assessment<sup>36</sup>

In addition to this an *ethical monitoring* on all tasks and activities performed took place over the whole project lifetime. This process was structured in a three step. First, before they began, all tasks and planned activities were screened on potential ethical issues and/or ethically relevant topics, which are important to be discussed during the project. This was done against the backdrop of six value related dimensions, which can be described as key dimensions for the planned BuildERS innovations<sup>37</sup>: (a) justice and participation, (b) responsibility and accountability, (c) freedom of choice and autonomy, (d) trust and transparency, (e) non-maleficence and beneficence as well as (f) privacy and data protection.

<sup>36</sup> See more in European Commission (2019) Horizon 2020 Programme - Guidance How to complete your ethics self-assessment, European Commission, Directorate-General for Research & Innovation, [https://ec.europa.eu/research/participants/data/ref/h2020/grants\\_manual/hi/ethics/h2020\\_hi\\_ethics-self-assess\\_en.pdf](https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf)

<sup>37</sup> These ethical dimensions might differ for a different project.





If this screening suggested an ethically relevant topic, it was advised to the responsible partners to start a discussion on how to deal with this question. For instance, this was done for the topic of “accessibility” of innovations and developed innovations. Here it was advised to decide within the consortium, if accessibility should be a criterion or requirement for a certain technology or social innovation and if so, what it would encompass. On the other hand, if the screening found an ethical issue, this was understood as a pressing challenge that had to be discussed and mitigated regarding the ethical desirability of the project results. In this vein, mitigation measures were given.

<b>T X.X – NAME</b>	
<b>Involved Partners</b>	
<b>Month</b>	
<b>Description</b>	
<b>Ethical Topics and Issues</b>	
<b>Justice/ Participation</b>	
<b>Responsibility/ Accountability</b>	(T.1): ... .. (T.2): ... ..
<b>Freedom of Choice/ Autonomy</b>	(I.1): ... .. Mitigation Advise: ...
<b>Trust/ Transparency</b>	
<b>Non-Maleficence/ Beneficence</b>	
<b>Privacy/ Data Protection</b>	

Figure 33. Checkbox for the screening on ethical issues and topics developed and used in BuildERS (by ECU)

In a second step, all partners had the chance to once again comment or adjust the results of the screening to provide a sound as well as shared basis for the upcoming execution of research activities. As a third step, the ethics partner provided an ethics counselling throughout the whole project lifetime to allow for the most appropriate solutions for identified issues as well as meaningful decisions on ethically relevant topics.

Finally, in the BuildERS project ethics was involved in the research and innovation process in a content-wise way by *raising and discussing specific ethical questions*. This ethical reflection took place around the concepts of acceptability and acceptance of social-/artificial technologies developed within the project as well as the implications these might have.

Ethical review of acceptability can refer to the following kind of questions:

- ✓ Is this tool morally accepted by its users?
- ✓ Do users use the technology, or does it conflict with their beliefs?
- ✓ What should be the limitations of a technology or innovation for collecting, storing, or managing information of individual vulnerabilities?

This kind of questions were raised for instance in the co-creation process in the form of a living questionnaire which raised reflective questions on specific innovations or recommendations which were developed by the BuildERS consortium. These questions were formulated in connection to the six ethical dimensions, which also served as the basis for the ethical monitoring. Rather than solving issues, these questions were designed to identify them and start a process on adjusting innovations and technologies to be in line with the BuildERS aim to improve the situation of those in the most vulnerable situations. Therefore, not all questions had to be discussed for every innovation or recommendation but allowed to find the most pressing challenges to deal with.

<b>Creation process</b>	
<b>Justice and Participation</b>	
PROCESS-RELATED: Who was not included in the co-creation process and on what reasons?	e.g., Did the co-creation process only include representatives of XYZ from one specific national context?
Who could be excluded by the co-creation process?	e.g., Who is not included in the co-creation process?
How is ensured that every relevant stakeholder can participate or are represented in decisions on or about them?	e.g., Does the co-creation process make sure that it is accessible for all relevant stakeholders?
<b>Responsibility and Accountability</b>	
Through which measures are people informed about the co-creation process?	e.g., Does the co-creation process include measures about ensuring that affected people or their representatives can participate?
<b>Freedom of Choice and Autonomy</b>	
How does the co-creation process ensure a certain freedom from external (including structural, systemic, peer) pressures?	e.g., Does the co-creation process consider that structural pressures might hinder people from acting in their own interest?
<b>Trustworthiness and Transparency</b>	
How are rules of processes and power hierarchies made transparent?	e.g., How does the co-creation process consider that strategies and actions are made transparent and open for criticism?
How does the co-creation process support that mistakes or shortcoming are made transparent?	e.g., How does the co-creation process support self-reflection of the taken actions and a public involvement in the adjustment? If it doesn't why?
How does the co-creation process support the development of trustworthy actions?	e.g., Are there any supervision strategies or corrective mechanisms included in the processes and actions that stem from the co-creation process?
<b>Privacy and Data Protection</b>	
How is personal data protected?	e.g., Which standards and limitations are provided for their use?
<b>Beneficence and Non-Maleficence</b>	
Does the co-creation process ensure that it benefits the situation of the most vulnerable?	e.g., Under which conditions might the co-creation process not lead to an improvement to existing measures/procedures/strategies

Table 1: Guiding questionnaire for identifying potential underlying ethical implications (by EKU)

The final level of ethical research which deals with the *discussion of fundamental ethical questions* such as “Can social diversity or security be considered ethical values?” was not touched in BuildERS. The reason is the more practical approach of the project which started from the conviction that disaster risk reduction or more specific the reduction of vulnerability is an aim and topic that relates not only to the “broad” society but especially to those in the most vulnerability situation. The reduction of vulnerability is therefore a key aspect of social justice and BuildERS tried to find out new and innovative ways to achieve this aim for those who are usually overlooked.

Based on this threefold approach of involving ethics in BuildERS a complex and – even more important – ongoing discussion on ethics could take place throughout the whole research and innovation process and therefore inspired every step of developing appropriate technological and social innovations.





## 6. BuildERS Tools for Establishing Collaboration

Throughout the project we have discussed with our Stakeholder Forum, how the new forms of collaboration would be of help in reducing vulnerabilities in crises. As people's vulnerabilities are context specific, also the collaborative relationships will vary depending on the crisis. Especially large-scale crisis typically demands resources and capabilities beyond those of any individual organizations. Effective cooperation of various agencies and individuals is then crucial. (Noran 2014.) However, collaboration cannot be forced, or trust networks built in a short timeframe.

In general, our Stakeholders have oftentimes stated that there is still work to be done in the collaboration between different sectors and organisational segments. For instance, the need to improve collaboration between crisis management organisations and journalists was mentioned several times during the co-creative workshops. Furthermore, all kinds of spontaneous volunteering initiatives have become commonplace in disasters; this includes the so called virtual or digital volunteering, which uses internet as a channel for providing support and relief. Some Stakeholders saw these "leaderless" networks as difficult to collaborate with, as they may exist only for a short time.

In this chapter we present Tools that can assist in the design of an inclusive risk and crisis communication strategy and implement this strategy with the intermediaries of people in a vulnerable situation. Our tools assist crisis managers in the following:

- 1) to map intermediary agencies and individuals, who could potentially reach the most vulnerable people and communicate with them
- 2) to plan and manage collaborative partnerships with the intermediaries to incorporate the perspectives of people in vulnerable situations into disaster management plans,
- 3) to raise vulnerable people's awareness of risks and means to mitigate the impacts (in other words, raise awareness of potential disasters and of protective measures)
- 4) to combat false, misleading, or otherwise harmful information that is spreading among the people in vulnerable situations, and finally,
- 5) to collect information about vulnerable people's safety and needs of protection.

Intermediaries can be of help especially in situations, where there is a need to reach marginalized groups or individuals with a low level of trust towards official crisis management institutions. Intermediaries can help to "translate" the messages of these difficult-to-reach individuals and groups and help to incorporate their perspectives and insights into the crisis management strategies and practises. Often these intermediaries are affiliated organisations that provide professional care, psychological support, and social services. However, there are also more and more informal actors that can be of help in reaching people, such as social media influencers and unaffiliated volunteers, who work on an ad-hoc basis.



## 6.1 Tool for Crisis Communication Strategy Design: Inclusive Crisis Communication Canvas

A communication strategy should be based on an up-to-date situational awareness: knowledge of the various information needs of citizens and communities. Situational awareness includes a strategic analysis of the available resources, capabilities, and collaborative partnerships. The Police University College (PUC) had previously utilised the Business Model Canvas<sup>38</sup> as a reference in the EU Horizon 2020 project called [Unity](#). In the Unity project (2015–2018), the Business Model Canvas was used as an inspiration in the design of a tool for community policing. The tool developed called Service Design Canvas for Community Policing (SDCCP) helps local police units to address and prioritise the needs of communities and citizens. By using the Service Design Canvas local police can better identify the key customers of policing (stakeholders). Which (virtual) communities, minority groups, individuals, or localities will be beneficiaries of the services? For whom are the police creating value, for instance with their presence in social media?

We decided to avail the previous good experiences of the above mentioned SDCCP in creating a corresponding tool for the first responders for inclusive crisis communication. The aim was to create a practical and user-friendly tool that would connect the several outcomes of the BuildERS project in a digestible and understandable way. Contents for the tool can be identified with the assistance of SWOT, PESTEL or other working environment analysis methods.

The aim was to create a practical and user-friendly tool that would connect the several outcomes of the BuildERS project in a digestible and understandable way. It helps to address the needs of vulnerable people in terms of accessible and understandable communication. It will also assist in the building of collaborative relationships with the intermediaries of vulnerable people, like linguistic minorities, people without access to digital communication channels or visually impaired.

The tool was named *Inclusive Crisis Communication Canvas*. It consists of the following elements:

- 1) the Guidelines and the supportive questions
- 2) the Inclusive Crisis Communication Canvas worksheet
- 3) the Stakeholder Mapping Chart

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<sup>38</sup> The canvas template is based on the Business Model Canvas that is distributed under a Creative Commons license from StrategyzerAG and it can be used without any restrictions for modelling businesses. See more of Business Model Canvas on Strategyzer AG - website: <https://www.strategyzer.com/canvas>



The benefit of utilising the Crisis Communication Canvas in the crisis communication strategy is in its inclusive nature. Among other things, the Canvas encourages the authorities to contemplate following issues.

- ✓ Which communities, minority groups or localities will be beneficiaries of our communication services? For whom are we creating value, for instance with our presence in social media?
- ✓ What are the main communication and contacting channels with our stakeholders? (These may be for instance ICT tools, traditional arenas such as community meetings or using the trusted intermediaries, social media influencers.)
- ✓ How are the various communication and contacting channels integrated together?
- ✓ Which channels have worked well so far and will most likely work well in the future?
- ✓ How good are the target audience and stakeholder relationships: what is the level of trust?
- ✓ How much collaboration and communication there are between the parties?
- ✓ Which stakeholders have connections with individuals, who are difficult to reach. Do we know why some individuals or audiences are difficult to reach?

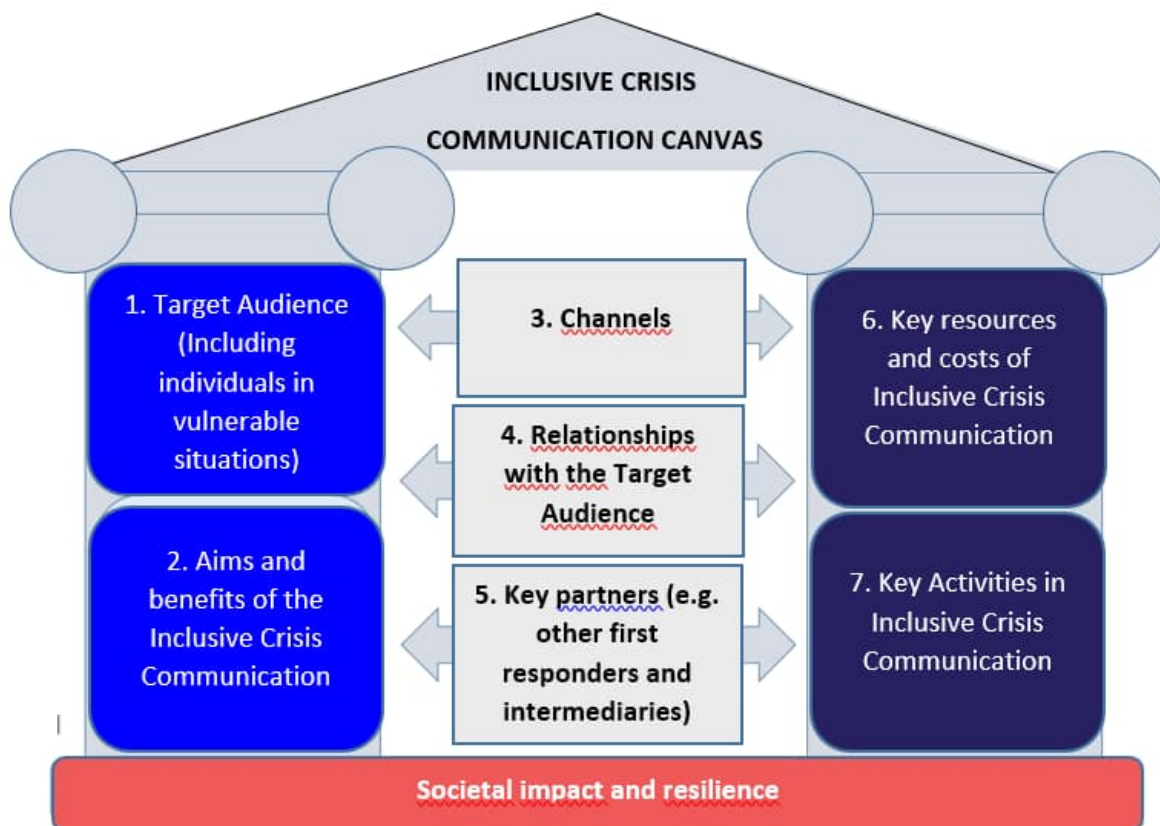


Figure 34. The Inclusive Crisis Communication Canvas

Four of the BuildERS projects' first responder partners piloted the Inclusive Crisis Communication Canvas tool and its guidelines during October and November 2021. The pilot took place in Germany, Italy, Estonia, and the UK. The partners evaluated the Canvas tool by participating in an anonymous online survey. In general, the participants strongly agreed that Crisis Communication Canvas had the potential to improve the communication performance of their organisation in a crisis. On average, the participants agreed that the Canvas would be useful for their organisation and has the potential to improve the ability of their organisation to communicate inclusively with vulnerable people in a crisis.

On average, the participants agreed that the Canvas is easy to fill in. Nevertheless, the large standard deviation showed that filling in the Canvas was difficult for some of the participants. The explanation may be that some of the pilot participants were familiar with the BuildERS project's aspects, while some of the participants had no previous experience with the project. For us, this implied that the Guidelines and the Canvas needed to be revised to be more intuitive and clearer.

In the feedback, the participants mentioned that some of the questions of the Canvas template were somewhat difficult to answer, as the questions required, for instance, knowledge of the budget of the organisation. The original Business Model Canvas that has served as an inspiration for this Inclusive Crisis Communication Canvas (naturally) emphasises economic value and financial gain. Although cost-efficiency is an important aspect, the current version of Canvas -tool is missing the analysis of preferred cost structure. Thus, it would be essential to ideate, how the assessment of economic costs would be best included in the Canvas -tool.

The Guidelines and the supportive questions help the first responders to fill in the Canvas in creative ways. Each building block of the Canvas has a corresponding question block in the Guidelines. The strong point of the Inclusive Crisis Communication Canvas is that it can be outlined on one worksheet page, which provides an overview of the target audiences, stakeholders, and communication channels. The questions ask the first responder to analyse the operational environment, e.g., the stakeholders' ability to identify individuals who are in acute danger, without social networks or lacking trust towards authorities. Once the first responder has answered the questions of the Guidelines, filling in the Canvas should be easy.

Based on the feedback, we complemented the Canvas with the *Stakeholder Mapping Chart*, whose purpose is to strengthen the authorities' capacity in identifying potential stakeholders and several communication channels. The Stakeholder Mapping Chart reminds the authorities to map all the potential stakeholders and communication channels in creative ways. It aims to encourage the authorities to acknowledge that the different phases of the crisis require dynamic communication strategy that should be revised if needed. Thus, the Stakeholder Mapping Chart aims to strengthen and complement the current stakeholder maps that are used in organisations so that the filling in of the Inclusive Crisis Communication Canvas is easier for the authorities.



Area of operation	Stakeholders and intermediaries who work in the field of...															
	Mental health and substance abuse issues	Physical/ mental disabilities	Elderly and people with memory disorder	Neurodiversity	Domestic violence	Children and youth work	Media and information literacy	LGBTQ	Cultural or lingual minorities	Rescue services	Social services	Health care services	Police	Infrastructure service providers (providing data about e.g., critical infrastructure services, analyses of wastewater)	Neighbourhoods' communities	Tourism
International																
National																
Regional																
Grassroots																

Figure 35. The prototype of Stakeholder Mapping Chart (shown partly)

<b>PARTNERS' ABILITY IN IDENTIFICATION</b>  Which partners can identify individuals a) in acute danger (e.g., surrounded by flood) b) in need of psychosocial support c) without social networks (socially marginalised) d) lacking trust towards authorities e) suffering from negative social relationships (e.g., victims of domestic violence, <b>NEET</b> youth: not in education, employment, or training) f) who are not registered by service providers (e.g., homeless, irregular migrants, people living in sparsely populated areas)	Summary for the Canvas
<b>PARTNERS' ABILITY TO INCREASE TRUST</b>  Which partners can increase trust among the vulnerable individuals?	Summary for the Canvas
<b>PARTNERS' KEY ACTIVITIES</b>  Which key activities do partners perform? (E.g., how do the key partners describe their role and responsibilities in crisis communication, what channels they use and what channels they need?)	Summary for the Canvas

Figure 36. The supportive questions (shown partly)



The cocreation and validation process of the Inclusive Crisis Communication Canvas is shown in the figure 37 below.

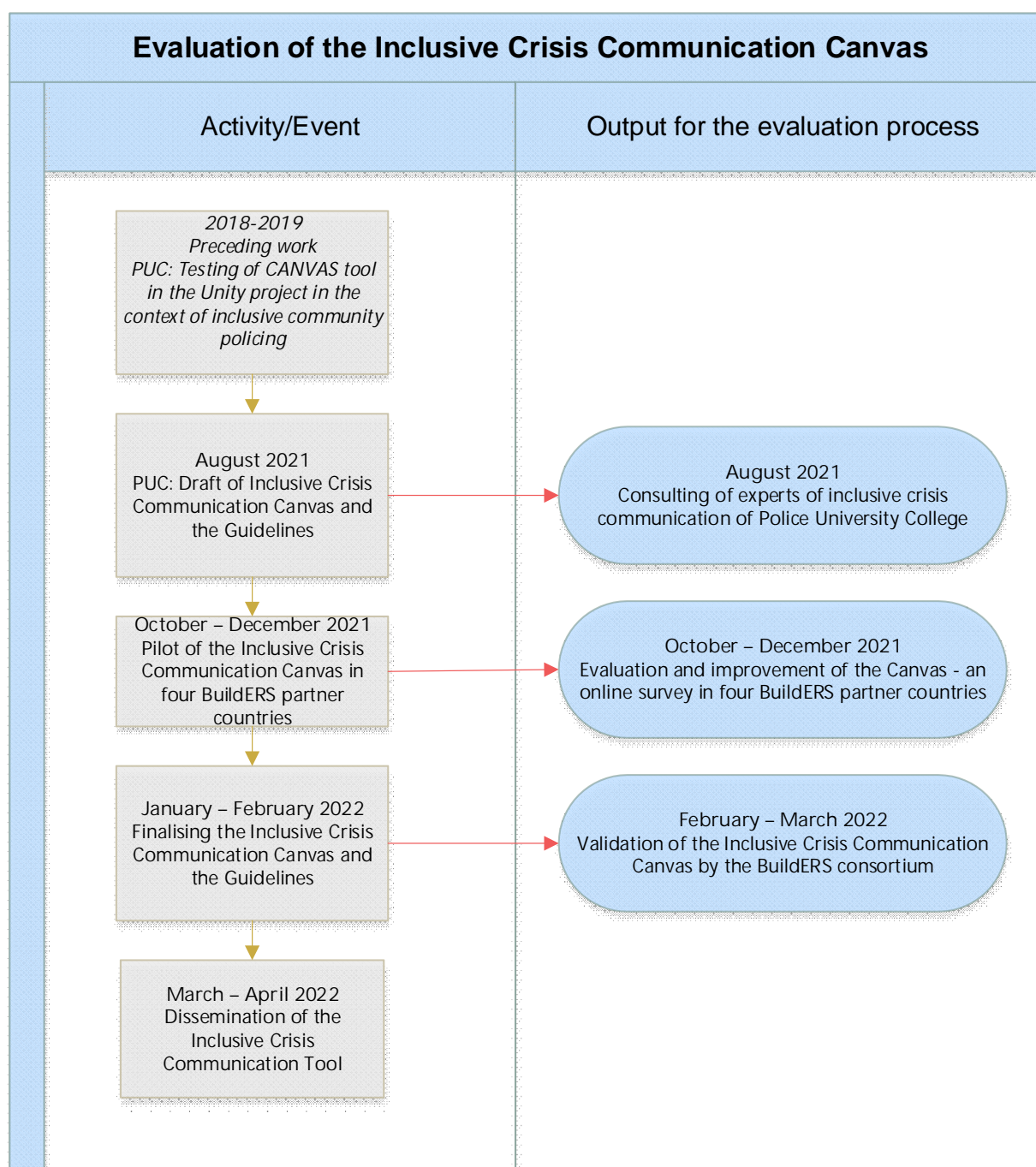


Figure 37. The cocreation and validation process of the Inclusive Crisis Communication Canvas

The potential users of the Inclusive Crisis Communication Canvas are strategic management level actors who are responsible for crisis communication. However, the effective use of the Canvas requires also operational understanding of the crisis communication. The Stakeholder Mapping Chart supports building of strategic partnerships and trust networks before the crisis. The Canvas

worksheets should be completed during the preparedness planning stage but updated if needed during an acute crisis.

In sum, the Inclusive Crisis Communication Canvas works like its predecessor Business Model Canvas as a tool to make a holistic, strategic view of risk and crisis communication. In the future, it would be beneficial to create digital applications that would guide end-users and assist them in the analysis and documentation of stakeholders and in measuring the efficiency of risk and crisis communication actions.

The Stakeholder Mapping Chart also needs computer-assisted instructions on how to use it, how to store information in compliance with data protection protocols and how to utilise it in acute crisis. Worksheets only in paper form are neither sophisticated enough to serve the purpose of effective crisis management. In future, there may be a need for a computer software that would allow and facilitate the stakeholder collaboration and information exchange, strengthening the identification of weak signals, and guiding the authorities towards inclusive communication.

The dissemination level of the deliverable that describes the tool and its pilot in more detail is classified and shared only within the project consortium and with the EU Commission services. The reason is that the report contained worksheets completed by the pilot organisations. However, the Inclusive Crisis Communication Canvas tool itself is public domain, and not protected by intellectual property laws. We only require that the EU Horizon 2020 funding and BuildERS project is mentioned as a reference but encourage practitioners to test and develop the tool further. The practitioners' guidelines with relevant worksheets for the Canvas tool will be available in the [BuildERS project website](#), [Horizon Results Platform](#) and in the [CORDIS](#) EU Research results portal of the European Commission.



## 6.2 Guidelines for Collaborating with Social Media Influencers in Risk and Crisis Communication

Although there are citizens who do not search information from digital online sources (social media, websites, podcasts etc.) these have become important communication forums for the crisis managers. The role of social media as a source of information is controversial. At best social media channels and communities can serve as distributors of verified official information and spread it fast for large audiences. At the same time, there are producers of content that is misleading, irrelevant, harmful, or even dangerous.

*Social media influencers* are central actors in social media communities with a specific quality to and influence on organizational stakeholders through content production, content distribution, interaction, and personal appearance on the social network. (Enke 2019). To reach their citizens public actors could use the help of social media influencers who often have thousands or even hundreds of thousands or millions of followers.

Social media influencers have the power to influence how people prepare for, respond to and act in crisis situations. Influencers are thus, important messengers in the fabric of social media. They know their followers, including what people like and how to reach them. As experts of social media, they can potentially help authorities in the design of an effective preparedness campaign. Social media influencers can narrate crisis related information in an entertaining way (thus providing infotainment or edutainment), and thus raise attention for instance to official instructions, orders, and warnings. Influencers are very good storytellers and able to touch people's emotions.

The European Union has recognized that false information is a significant challenge for Europe and that inclusive solutions are necessary. Furthermore, in December 2020, the Council of the European Union noted that the current COVID-19 pandemic makes the EU and its Member States more vulnerable to intensified and more sophisticated spread of disinformation and manipulative interference. The Council called for a multidisciplinary and multi-stakeholder approach to tackle the increased spread of disinformation. (Council of the European Union 2020.) Impactful long-term solutions require awareness-raising, media and information literacy, stakeholder involvement and cooperation between public authorities, online platforms, advertisers, trusted flaggers, journalists, and media groups. (European Commission 2018a).

If the social media influencers would have access to the “best available” information during crisis situations, they can debunk myths, rumours and misunderstandings and help to fight against harmful conspiracy theories that often emerge during crises.<sup>39</sup> This would require collaboration with those crisis management agencies oversee the policy making and/or defining crisis management strategies based on the up-to-date knowledge and situation awareness.

Social media influencers can also serve as role models and advocates for risk awareness, promote preparedness actions and safety measures. They can share their experiences of doing their daily

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<sup>39</sup> For example, scientifically oriented, German social media influencer Mai Thi Nguyen-Kim with 1,24 million subscribers, Swedish lifestyle influencer Angelica Blick and Estonian medical student and social media influencer oreo.kypsis (Orina Jakovleva) have all shared information about the COVID-19 pandemic, provided tips on prevention and debunked various myths related to the disease.

chores during (an earlier) crisis, tell narratives of being (once) a victim or survivor or providing support for others. In other words, they would be the bonding social capital of the individuals in a vulnerable situation.

Social media influencers have already been active in working together with public organizations in raising awareness and sharing information on different topics. For instance, Swedish lifestyle influencer Angelica Blick interviewed the Minister for Social Security about the COVID-19 pandemic based on the questions raised by her followers. Social media has also been used in organizing help during crises; German local community coordinated their civilian relief efforts through Facebook during the Elbe flood of 2013 in Dresden; in Greece, during the wildfires in 2018 singer Sakis Rouvas used his Instagram account with 900 000 followers to inform of the needs of local health authorities and first responders for people who could donate blood, to mention a few examples.

As collaborating with the influencers in risk and crisis communication is a rather new practice, we decided to develop guidelines for the practitioners. We hope that our guidelines help public actors navigate the world of social media influencing and harness the field for risk and crisis communication. The goal was to create practical, concrete guidelines on how to collaborate with influencers and what to consider before, during and after a collaboration. However, being funded by taxpayers, serving all citizens, and having to build and maintain public trust, public actors must take various additional aspects into consideration when collaborating with individuals instead of companies. That is why we wanted to include a section focusing on ethical considerations and risks.

The guidelines were created iteratively based on several sequential steps, as shown in figure 38:





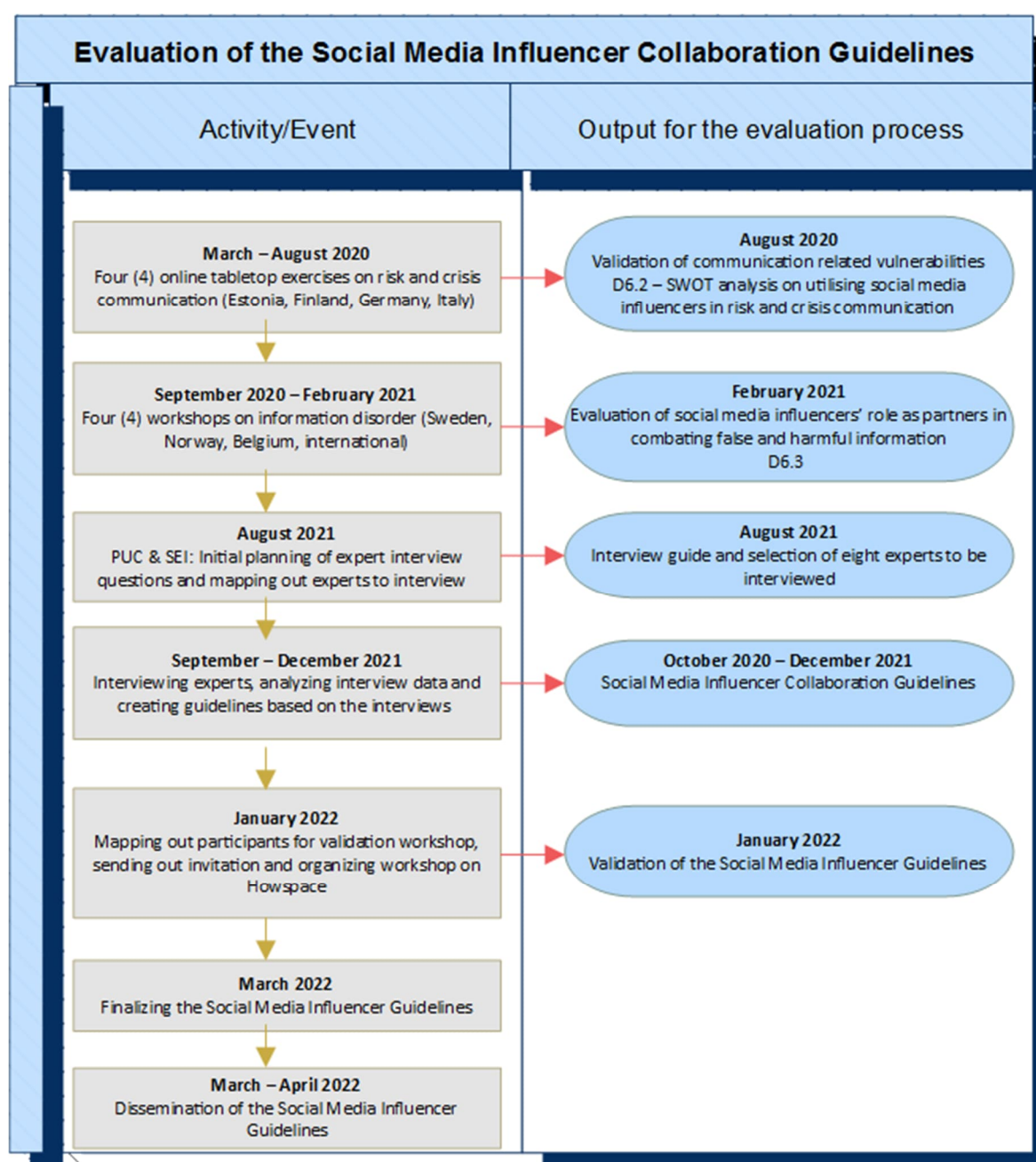


Figure 38. The cocreation and validation process of the Social Media Influencer Collaboration Guidelines

Crisis-scenario-based tabletop exercises held in spring 2020 in Estonia, Finland, Germany and Italy confirmed that authorities and other responsible organizations do not manage alone in sharing crisis-related information.<sup>40</sup> New type of collaborative relationships, like the involvement of virtual volunteers or social media influencers were welcomed; yet, tabletop exercise participants emphasized that these supportive non-official actors should be trained, kept constantly informed of the legitimate information

<sup>40</sup> Altogether 45 experts took part in the exercises: 10 from Finland, 10 from Germany, 8 from Estonia and 17 from Italy. Most participants worked in the public sector, either in the field of rescue and crisis management or security/law enforcement, or represented a state level, regional or local authority. A few participants represented non-profit sector, being their communication specialists or scientific communities.



and their actions should be coordinated. Collaboration with social media influencers in raising awareness on crises was considered to be a double-edged sword: responsibly-acting influencers can be of great help, but they may also accidentally spread false information. Participants also suggested that adding humour in the awareness raising activities may help, even if the issues are serious.

In autumn 2020 and early in 2021, we organized a series of online workshops on information disorder with risk and crisis communication experts from Estonia, Belgium, Italy, Portugal, and Sweden. These workshops went deeper into the challenges of mis-, dis- and malinformation.<sup>41</sup> Workshops' participants saw that due to their popularity, influencers have the potential to reach out to wide audiences, and especially those individuals, who do not necessarily follow "traditional" media. For example, the youth who regularly follow certain video bloggers, could be reached via these influencers. Furthermore, participants stated that influencers could support authorities in gaining acceptance of the restrictions and changing the unwanted behaviours, attitudes, and values of masses in crises – like keeping the distance and refraining from socializing in the case of the protracted pandemic. Influencers could for example share infographics and other awareness-raising material provided by the authorities and other responsible agencies. They could also share their personal experiences and everyday examples of the impacts of crises. With their face and voice, they could provide a necessary push in the right direction.

Workshops' participants also mentioned several challenges that need to be considered. Most participants saw that the influencers' information sharing is rather difficult to manage. Most of the influencers are entrepreneurs and carefully design their personal brands. Experts were also concerned by their motives: besides commercial motives, they could have other self-serving motivations. Influencers depend on attention and aim to affirm themselves. This might result in the spread of inappropriate information. Their political opinions and positions on other issues than preparedness may be problematic for their collaborative partners. If people lose confidence in an influencer, the collaborative authorities and other agencies who aim to remain neutral in the issue, may also suffer in terms of credibility.

When we talk about reaching people in a vulnerable situation, communication ethics become crucial. Our stakeholders saw that influencers should adhere to a charter of good practices and values, a kind of moral contract to which they commit. This would not mean restricting their artistic creativity or freedom of expression but could ensure that their contribution will reduce, rather than increase, people's vulnerability in crisis situations.

The contents for the guidelines were derived from eight interviews with risk and crisis communication experts. The Police University College conducted interviews with four social media marketing experts from Finland and Stockholm Environment Institute interviewed four communication experts and academic scholars from Sweden. The interview questions were divided into four themes: background questions about the interviewee's organisation, general questions related to social media influencing, questions related to risk and crisis communications and questions dealing with compensation and ethics.

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<sup>41</sup> Misinformation is confusing, false, or misleading information without the intent to mislead whereas disinformation is taken to refer to deliberately misleading information. Malinformation is not (totally) false, but still harmful and making individuals' situations more vulnerable in crisis (Torpan et al. 2021).



The results were then consolidated into the guidelines which consist of four sections:

- 1) What is social media influencing?
- 2) Why collaborate?
- 3) Getting started
- 4) Ethical considerations and risks

The first section (What is social media influencing?) provides an introduction into the subject. What is social media influencing? What types of influencers are there and how to choose the right influencer to work with? Influencer marketing is generally based on a strong sense of authenticity and people's trust towards the influencer's opinions and perceptions. The idea is that an influencer's followers are committed to the content, although there exists a trade-off between the follower count and engagement. As a rule, the larger the audience, the less engaged are the followers. As the followers count increases, influencer shares less focused content in the social media.

Influencers are often categorised globally into four different categories based on their follower count: mega-, macro-, micro-, and nano -level influencers. How we categorise influencers varies by country. Smaller countries like Finland have very few influencers with a following over 1 million. It is important to understand the benefits and shortcomings of each category because it will guide the planning of collaborative partnerships.

- 1) *Mega influencers* – These are usually globally or at least regionally famous movie stars, professional athletes, and other celebrities. Mega influencers have follower count ranging from one million to tens or even hundreds of millions of followers. This category of influencers provides a higher reach and exposure. However, they also cost more for the companies that engage them, and their audience is less committed. Due to their huge following, mega influencers are increasingly becoming more like traditional media.
- 2) *Macro influencers* – They tend to have around 100 000-1 million followers. They might have gained their following through the internet by vlogging or by posting funny or inspiring content. Macro influencers have less reach than mega influencers, but their followers can be easier to target because they tend to produce more focused content. Both mega and macro influencers can be useful if the goal is to disseminate information to many people.
- 3) *Micro influencers* – They have stronger relationships with their followers who tend to be more committed. Their following ranges from 10 000 to 100 000. Micro influencers are more focused on a specific area or topic and are seen as experts in a specific subject matter. Engaging micro influencers is less costly and offers an easier access to a specific target audience than using macro or mega influencers.
- 4) *Nano influencers* - These are people with a few hundred to 10 000 followers. They also have the highest level of engagement among their followers due to their authenticity and approachability. Nano influencers often cater to a very specific niche market.

In the second section (Why collaborate?) the guidelines make the case for why public actors should collaborate with influencers to improve risk and crisis communication. The third section of the guidelines provides concrete steps for how to get started. The section discusses the importance of having a clear strategy, building a long-lasting relationship with the influencer, and finding the right



influencer. The section also helps with selecting a social media platform, creating content for the campaign together with the influencer and organising the division of labour. Finally, the section discusses compensation policy, laws regulating collaboration, and how to measure impact of a campaign.

The fourth section discusses various ethical considerations and risks that come with engaging with influencers. Public actors should think carefully about the ethical dimensions of their actions. Influencers should not be used to bolster one's image. Compensation arrangements need to be assessed case by case basis. If a campaign is focusing on awareness raising, crisis management agencies need to consider the nature of the issue itself: how sensitive it is, is there a risk of stigmatisation of vulnerable people etc. Depending on the issue, it might be possible to use more fun edutainment content, or it might be more appropriate to do a cooperation that is more serious. There is a growing number of influencers, who are interested in social responsibility, and work voluntarily for the good of a society. Thus, influencers' collaboration with the crisis management agencies can be based on a different working model than the social media marketing with businesses.

Before the finalisation of the guidelines, a validation workshop was held on the digital facilitation platform called *Howspace*. We sent out invitations by email to about 200 individuals and organisations. The contact list was based on information received from partners as well as research done on social media experts, mainly in Finland due to PUC's location. There were 22 external participants and one advisory board member. Invitees included academics working on social media related themes, influencer marketing and communications agencies, influencers, and government agencies. The guidelines received some very useful comments, but the overall participation remained low. After the final day of the workshop (31.1.2022), the guidelines were modified to reflect the comments received and finalised.

The participants' feedback was extremely useful for the improvement of the guidelines. The participants helped to refine descriptions and expand the extent to which the issue was discussed. In the first section, one participant commented that focusing on measuring influencer campaigns' true impact is becoming more and more central, and that the field is attempting to move away from strictly engagement metrics. Another participant noted that using the word influencer marketing should be avoided because it does not describe the collaboration with authorities in a correct way. Emphasis should rather be put on collaboration. Another participant pointed out that as influencers are disseminating official information, they should also be offered trainings of how to do it in a best way. An example of this would be the Influencer Handbook (<https://influencerhandbook.fi>) that offers advice for influencers about misinformation and how to post responsibly.

In the second section, participants stressed the need to build long-standing relationships and network with influencers well before a crisis escalates. The networks need to be ready to be mobilised in a crisis. One participant pointed out the importance of the crisis management organisation's own social media presence. There must be a strong presence and continuous updating of social channels and the institution's website as a point of reference for citizens. It is pointless to focus on influencers if the institution's communication is poor and lacking in care; the objective, in addition to the dissemination of vital information, must be to educate the citizen, who will find all the information he needs clearly and immediately on the institution's channels. In this way, it is confirmed as an authoritative and priority source for the press as well. Other participant noted that the collaboration with influencers can vary. They might be engaged as messengers but also consultants offering their advice on the content



and communication strategy. Another participant reminded that influencers can also be scientists. They are not strictly from the entertainment industry.

Before the project end, we will finalise the visual outlook of guidelines and publish them in the [BuildERS project website](#), [Horizon Results Platform](#) and in the [CORDIS](#) EU Research results portal of the European Commission.



## 7. Final Remarks on the BuildERS Project's Innovations – Steps Forward

During the three-year BuildERS project, we have engaged nearly 480 disaster management experts, academic scholars, and other stakeholders in co-creative activities. As a result, we have designed an *Inclusive Crisis Management Toolbox* for the practitioners with worksheets and instructions.

The first cluster of tools enable more nuanced vulnerability assessments and better-informed resource allocation for disaster management. Tools belonging to the second and third cluster help improve the accessibility and effectiveness of risk and crisis communication. In addition, we have developed tools that assist crisis managers in preparedness planning and building strategic partnerships.

These innovations are supported by policy recommendations, in the report on Innovation Policy Recommendations (D5.2). The report gives recommendations for policies that can encourage the effective use of each of the BuildERS innovations on the local, national, and EU-level. The policy recommendations are meant for the direct target audience of policymakers on these different governance levels, but the policies are intended to help the indirect target groups of:

- ✓ People in vulnerable situations and socially marginalized people,
- ✓ Practitioners responsible of disaster risk assessment, preparedness, and contingency planning,
- ✓ First responders,
- ✓ Intermediaries of people in vulnerable situations and care organizations,
- ✓ Experts in the fields of crisis communication, disaster management and civil protection,
- ✓ Teachers and trainers of safety and security,
- ✓ Technology developers (of data analytics, mobile positioning, crowdsourcing, unmanned aerial vehicles, satellite imaging, mobile applications), and
- ✓ Academic communities and RDI-networks.

In sum, we can say that the BuildERS project toolkit promotes inclusive crisis management that builds the resilience of society including those who may lack capacities to cope with crisis due to different everyday challenges. We have emphasised the role of various intermediaries: both the affiliated non-profit sector organisations, and the informal, spontaneous volunteers and networks. We have also highlighted the significance of new opinion leaders of the digital age: social media influencers. We recommend that crisis managers build collaborative relationships and trust networks with all these intermediaries to reduce people's vulnerabilities in crisis.

As many of our tools are prototypes and blueprints, it is important to continue to co-design with disaster management agencies, technology developers and representatives of people in vulnerable situations. We will present the Toolbox on our [project website](#) and on the EU platforms: [Horizon Results](#) and [CORDIS](#), and search for new funding and collaborative partnerships.



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