BuildERS

BUILDERS D5.2: INNOVATION POLICY RECOMMENDATIONS

Project acronym: BuildERS

Project title: Building European Communities' Resilience and Social Capital

Call: H2020-SU-SEC-2018-2019-2020/H2020-SU-SEC-2018

Disclaimer

The content of the publication herein is the sole responsibility of the publishers and it does not necessarily represent the views expressed by the European Commission or its services.

While the information contained in the documents is believed to be accurate, the authors(s) or any other participant in the BuildERS consortium make no warranty of any kind with regard to this material including, but not limited to the implied warranties of merchantability and fitness for a particular purpose.

Neither the BuildERS Consortium nor any of its members, their officers, employees or agents shall be responsible or liable in negligence or otherwise howsoever in respect of any inaccuracy or omission herein.

Without derogating from the generality of the foregoing neither the BuildERS Consortium nor any of its members, their officers, employees or agents shall be liable for any direct or indirect or consequential loss or damage caused by or arising from any information advice or inaccuracy or omission herein.

Name	Organization
Mark Rhinard (MR)	Stockholm University (SU)
Jennifer Hinton (JH)	Stockholm University (SU)
Friedrich Gabel (FG - Ethical review)	University of Tübingen (EKU)
Maira Schobert (MS - Ethical review)	University of Tübingen (EKU)
Alexandra Olson (AO - Quality review)	Salvation Army – EU Affairs Office (SAL)
Abdi Mehvar (AM - Quality review)	Stockholm Environment Institute (SEI)
Tommaso Piseddu (TP - Quality review)	Stockholm Environment Institute (SEI)
Claudia Morsut (CM)	Stavanger University (UiS)
Kati Orru (KO)	University of Tartu (UTA)
Pirjo Jukarainen (PJ)	Police University College of Finland (PUC)
Marianne Mela (MM)	Police University College of Finland (PUC)
Jelena Kajganovic (JK)	Geonardo Environmental Technologies Ltd. (GEO)
Gerttu Pilsas (GP)	Positium Ltd. (POS)
Ago Tominga (AT)	Positium Ltd. (POS)
Jaana Keränen (JKE)	VTT Technical Research Centre of Finland Ltd

Dissemination level

PU	Public		info

History

Version	Date	Reason	Revised by
01	06/12/2021	Structure drafted and agreed upon	MR, JH
02	17/12/2021	Compiled list of innovations and added relevant innovations from D5.1	JH
03	18/01/2022	Structure and content of innovations edited	MR
04	11/02/2022	Brought together innovation descriptions and policy recommendations in one draft	JH
05	16/02/2022	Internal review (content, ethics and quality)	FG, MS, AO, AM, TP, CM, KO, PJ, MM, GP, AT, JK, JKE
06	28/02/2022	Incorporated comments and edits from internal reviewers, added Ethics section	JH
07	14/03/2022	Added conclusion, references, and final edits from other authors	JH
08	15/03/2022	Final draft approved and submitted to BuildERS coordinator	MR, JH
		Technical check-up and some modifications	VTT
Final	04.04.2022	Submission	VTT

Executive Summary

As a key deliverable of Work Package 5 and in line with the third theme of the BuildERS Common Vision ("Recommending and Innovating"), this report aims to offer an overview of the many innovations that have come out of the BuildERS project and to recommend policies that can enable and encourage the use of those innovations. Thus, this report presents innovations that can help increase the resilience of European communities in the face of natural and human-made disasters, as well as recommendations for how to put these tools to use. It offers tangible outputs in the form of practical policy strategies and tools to improve risk awareness, decrease vulnerabilities, and build social capital.

Building on other project reports, this document offers policy recommendations to encourage the effective use of key BuildERS innovations. In Sections 4, 5 and 6, we focus on three different types of innovation: 1) process, 2) market, and 3) research innovations. *Process innovations* are those that were developed to help non-market actors in the process of disaster management (through the pre-crisis, crisis, and post-crisis phases). There are seven process innovations: the Vulnerability Assessment Tool, the Inclusive Crisis Communication Canvas, Guidelines for Collaborating with Social Media Influencers, a Prototype of a First Responder Training Program, the BuildERS Board Game for teaching children preparedness skills, a Cost-Benefit Analysis Framework for Using Technologies in Disaster Management, and Ethical Guidelines for Policy Formulation. *Market innovations* are those that can be used and/or further developed by market actors. There are three market innovations: a Natural Disaster Mapping Tool, a Mobile Positioning Dashboard, and the SaveMyLife mobile application. Lastly, we present one *research innovation*, the Guidelines for Ethical Assurance in RDI-Projects, which can be used by those involved in research projects similar to BuildERS. Most BuildERS innovations were co-created in several iterative stages with stakeholders and are part of the Inclusive Crisis Management Toolbox, which helps practitioners to assess peoples' vulnerabilities during crises and adjust their crisis management response accordingly. A description of each innovation is given, followed by specific suggestions for policies that can support the effective use of the innovation. In the final section of the report, we offer general guidance for ensuring that national- and EU-level innovation policy contributes to enhancing, rather than eroding, societal resilience.

This report brings together the key innovation-related findings and outcomes of the entire BuildERS project (see Appendix A). In particular, the report builds on D4.8 (The policy and practice innovations reducing vulnerability of European population to natural and man-made hazards), D6.5 (Concept for Disaster Communication Design), and D6.6 (Stakeholder Validation of Research Findings and Co-creation of Innovations), which describe how BuildERS innovations were developed. Innovations explored in D6.4 (End-user assessment of the new tools and technologies for disaster management) and relevant policy recommendations from D5.1 (Resilience Policy Recommendations - First Report) are also included. The present report suggests how these innovations can be taken forward in policy and practice. Therefore, there is some overlap between the reports, in terms of describing BuildERS innovations, but the overall aim and scope of the reports are distinct. It is also worth noting that the reports mentioned above build on BuildERS research findings, published in scientific articles as well as other deliverables. The present report is part of Task 5.1 (policy recommendations) and Task 5.3 (technical tools to improve resilience and innovation prospects) in the BuildERS DoA.

Table of Contents

6

List of Acronyms

AB	Advisory Board
BuildERS	Building European Communities Resilience and Social Capital project
CEPOL	European Union Agency for Law Enforcement Training
CPN	Civil Protection Network
D	Deliverable
DG ECHO	Directorate-General for European Civil Protection and Humanitarian Aid Operations
DoA	Description of Action
GDPR	General Data Protection Regulation
JRC	Joint Research Centre of the European Commission
RDI	Research, Development, and Innovation
T	Task
WP	Work Package

List of Figures

1. Introduction: BuildERS innovation aims

One of the three main themes of the BuildERS Common Vision is "Recommending and innovating on how to increase capacities" (Common Vision report). Building on the other two themes of analyzing who is vulnerable and understanding why some are more vulnerable than others, in the Recommending and Innovating step, we ask:

"What recommendations can be given in order to build resilience?", and

"What kinds of new technologies could support the building of resilience?".

One of the central aims of the BuildERS project is to facilitate innovation in crisis management. In response to needs identified by BuildERS research, innovations were co-created and validated with practitioners, as described in D6.6 (Stakeholder Validation of Research Findings and Co-creation of Innovations). Altogether, we organized 25 co-creative events (including tabletop exercises, virtual and face-to-face workshops, simulations and pilot tests, polls, and surveys) that engaged 476 people from 22 countries and more than 150 different organizations from the public, private and non-profit sectors (D6.6). The BuildERS innovations in this report are primarily meant for use by: first responders (including 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 for disaster management and relief. In addition, these innovations benefit their strategic partners, like the non-profit and civil society organizations, active in inclusive and participatory resilience building.

The main purpose of the present report is to give policy recommendations that can promote the effective use of these innovations in order to build the resilience of European communities in the face of natural and human-made disasters. These recommendations are meant for decision-makers and policymaking officials at all levels, who are responsible for the strategic planning and drafting of laws. We have designed these recommendations for all three stages of the crisis management cycle (pre-, during and post-crisis), as well as for three different levels of governance (local, national, and EU-level).

After presenting policy recommendations that pertain to specific BuildERS innovations, we offer guidance for crafting innovation policy in a way that builds resilience, rather than inadvertently creating more vulnerabilities.

1.1. Innovation in the context of BuildERS

BuildERS uses a broad definition of "innovation" that considers something an innovation if it has three characteristics as outlined by Jordan and Huitema (2014):

"1) *Invention*: Exploration, novelty, experimentation, tinkering, discovery, recombination, new to the world;

2) *Diffusion*: Learning, transfer, adoption, exploitation, new to a particular jurisdiction or agent; and

3) *Effects*: Impacts, outcomes, substantial or radical change, disruption." (D4.8, p. 21)

Specifically, innovation reflects radically improved technology, products, business models, or ways of working (Vinnova, n.d.). We used these definitions as guidance to ensure that the BuildERS innovations presented here are actionable and require little further development.

1.1.1. Policies for three key types of innovations: process, market, and research innovations

Overall, BuildERS has generated four types of innovation: scientific innovations, social innovations, process innovations, and product/market innovations (see BuildERS innovation definitions in D4.8). *Scientific innovations* include conceptually connecting social capital, risk awareness, vulnerability and resilience. This includes Morsut et al.'s (2021) work on linking resilience, vulnerability, social capital, and risk awareness for crisis and disaster research; as well as Kuran et al.'s (2020) intersectionality approach to identifying and understanding vulnerability as a dynamic attribute. It also includes Orru et al.'s (2022) novel framework of situation- and location-specific sources of vulnerability, and Hansson et al.'s (2020) conceptualization of communication-related vulnerabilities including situations where individuals become more vulnerable due to an impeded ability to access, understand or react to disaster information. The project generated *social and process innovations*, by generating new decision-making processes and procedures that encourage more effective collaboration and stakeholder learning. Finally, the project resulted in *product and market innovations*, stemming from the development and evaluation of new technologies and tools (e.g., new algorithms, methods and products to utilize mobile positioning data in crisis prevention and response).

For the current deliverable, we recategorize BuildERS innovations slightly. We fold social innovations into process innovations because these types overlap so much. Furthermore, we have decided to exclude, for the purpose of this report, the category of scientific innovations. This is because the process and market innovations presented below are, in fact, based on the scientific findings and scientific innovations of the BuilDERS project. Therefore, while it was worth mentioning scientific innovations as a separate category in previous BuildERS reports, there is no reason to feature the scientific innovations here because they underpin the innovations described below. Moreover, BuildERS' scientific innovations are well-showcased elsewhere (e.g., in the project's scientific publications, as well as WP1, WP2, and WP4 deliverables). Lastly, we have decided to create the new category here of "research innovation" to highlight a unique innovation that was developed specially for research projects like BuildERS to undertake their transdisciplinary research with non-academic partners in an ethical way. This innovation is not a scientific finding nor an innovation to help directly with disaster management, so for clarity we created a separate category. Hence the three innovation categories described in this report are: process, market, and research innovations.

We define **process innovations** as: "Processes and procedures for decision-making, particularly pointing out best or at least workable practices learned from others" (DoA, Annex 1, part B, p. 22). Process innovations include new planning methods, decision-making mechanisms and procedures for mobilizing action in the public sector as well as for unofficial first-responders. Process innovations thus relate to improving practices, procedures, and protocols to better meet the needs of vulnerable populations in all phases of a crisis. They include efforts to improve the capacities of civil society, especially disaster relief and care organizations, as well as to build stronger connections and channels of communications between relevant stakeholders (e.g., between first responders and intermediaries for vulnerable people). In this report, this category includes social innovations and practical innovations.

We define **market innovations** as new technologies and tools (e.g., new algorithms, methods and products to utilize mobile positioning data in crisis prevention and response) that can be further developed and/or used by private sector actors. In this report, this category includes product innovations, which can be developed and sold on the market.

A **research innovation** in the context of this report is one that improves the process and outcomes of conducting research.

Although this report presents the innovations in terms of the separate categories of process, market and research, it is important to note that many of the process innovations support the market innovations and vice versa. Likewise, the research innovation is meant to support both process innovations (e.g., in the development of new vulnerability assessment tools) and market innovations (e.g., in the development of new technologies).

1.2. BuildERS' approach to innovation policy for resilience

The EU's official approach to innovation policy emphasizes that it is linked to many other areas of EU policy, such as employment, competitiveness, environment, industry and energy. The EU sees the main role of innovation as turning research results into new and better services and products in order to "remain competitive in the global marketplace and improve the quality of life of people in the EU" (Gouardères, 2021).

The European innovation policy landscape is complex. It is wide-ranging, context-dependent, and constantly changing. There are regional innovation ecosystems that consist of multiple types of actors, including: universities, researchers, non-governmental organizations, start-up businesses, multinational corporations, local policy-makers, city planners, and national policy-makers.

Innovation can help or hinder resilience, depending on what kinds of innovations emerge, how, and for whom. The framing and overall goals of the BuildERS project means that we approach the issue of innovation policy with an emphasis on what kinds of innovation are generated, for what purpose, and how the costs and benefits are distributed. In the interest of building or maintaining societal resilience, it is essential that policy-makers pay attention to who might benefit and who might be harmed or neglected by innovation policy, in order to ensure that innovation promotes rather than erodes resilience. Thus, the goal of ensuring that innovation policy supports resilience runs through this report.

BuildERS has developed a number of innovations that seek to contribute to more effective disaster management (see Appendix A). This report starts by showcasing the key innovations that came out of the BuildERS project and recommending policies that can encourage the effective use of those innovations. It then goes on to give general guidance for how innovation policy at the national and EU levels can be shaped in a way that encourages resilience-building alongside other goals such as maintaining a competitive economy.

Therefore, the direct target audience of this report is policy makers, but the end goal is for these recommendations to be put into policy and for the policies to be implemented in a way that helps several other target groups. These include:

- People in vulnerable situations and socially marginalized people,

- Practitioners responsible of disaster risk assessment, preparedness and contingency planning (incl. disaster management and civil protection authorities),

- First responders,[1]

- Care organizations and intermediaries of people in vulnerable situations,[2]

- Experts in the fields of risk and crisis communication,

- 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 (Research, Development, and Innovation) networks.

1.3. Structure of the report

The focus of this report is on the key innovations developed in the BuildERS project, policies that can encourage their effective use, and policies that could help further develop these kinds of innovations for increased resilience in the EU. As such, this report has two main parts: 1) specific policy recommendations for supporting BuildERS innovations, and 2) general guidance for national- and EU-level innovation policy.

The first part of the report (in Sections 4, 5, and 6) starts by showcasing key innovations that came out of the BuildERS project and recommending policies that can encourage the effective use of those innovations for building the resilience of European communities in the face of disasters. Most of the innovations featured here are part of the BuildERS Inclusive Crisis Management Toolbox, which was co-created and validated with practitioners in WP 6 (specifically, D6.6). The toolbox consists of nine elements (see Figure 1).

---

[1] First responders are organizations or trained persons who respond immediately to an emergency or disaster. In practice, they are emergency medical technicians, paramedics, firefighters, rescuers, police officers or (para)military personnel.
[2] By intermediaries, we mean authorities, affiliated (non-profit sector) agencies and individual volunteers, who provide care, relief and support for the communities and individuals in vulnerable situations. These are, for instance, providers of psychosocial support, health care and other wellbeing services like soup kitchens.
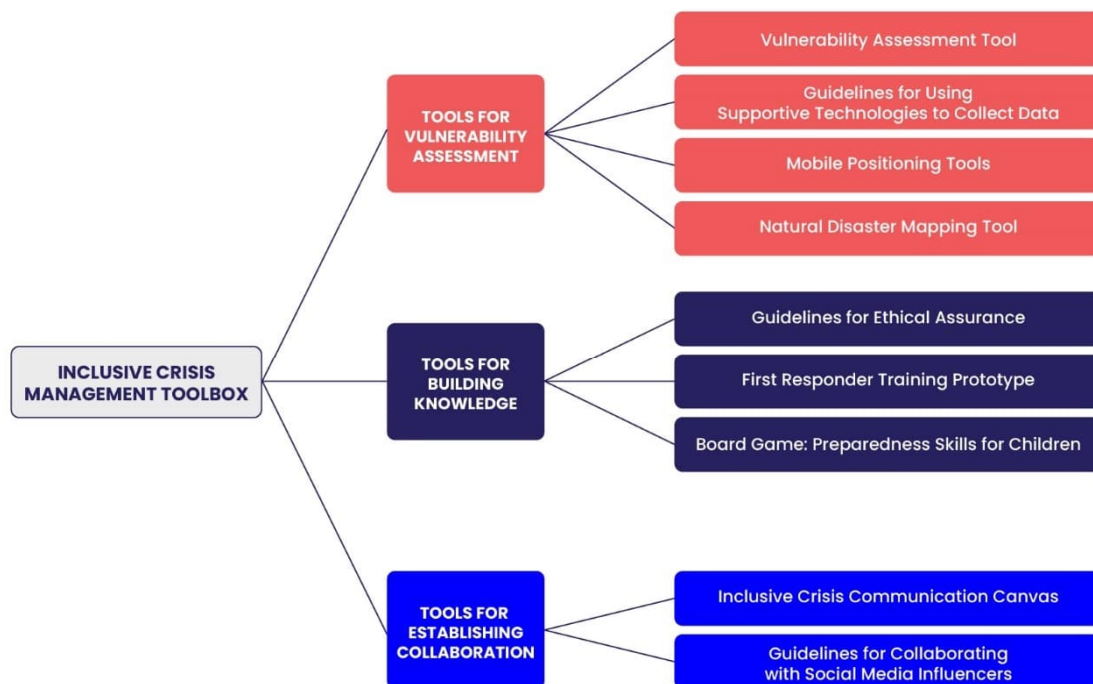
Figure 1: BuildERS Inclusive Crisis Management Toolbox
(Source: D.6.6, p. 24)

This toolbox can increase disaster managers' capacity to access, understand, and react to information, in order to better address the individual, socio-structural and situational aspects of vulnerability. These tools were all validated and co-created via interactive workshops with practitioners in WP6. The tools themselves, as well as how they were validated and co-created with practitioners, are described in detail in D6.6. This report will give a brief overview of all of the innovations in the toolbox, except for the Guidelines for Using Supportive Technologies to Collect Vulnerability Data, which are not sufficiently developed to be included here.[3]

In addition to tools from the BuildERS toolbox, this report also includes a Cost-Benefit Analysis Framework for Using Technologies in Disaster Management, which is developed and presented in D5.4, as well as Ethical Guidelines for Policy Formulation, which are presented in D7.4 and Appendix C. These are both process innovations, as they support decision-making.

Sections 4, 5, and 6 offer a description of each of the innovations listed above, the needs it addresses, and relevant policy recommendations to encourage the effective use of that innovation. We start with

---

[3] An analysis of potential technological fields and solutions is available in D6.4 (End-user assessment of the new tools and technologies for disaster management). A short summary of the most promising technologies, based on the stakeholders' views, is also provided in D6.6 (Stakeholder validation of research findings and co-creation of innovations).

the process innovations, then cover the market innovations and the research innovation. The policy recommendations are listed according to three different levels of governance: local, national, and EU. These are color-coded in the text, to allow for easier reading, as: **EU**, **national**, and **local**.

The last part of the report offers general guidance for how innovation policy at the national and EU-levels can be shaped in a way that encourages a better focus on building resilience. It is worth noting that BuildERS research did not focus on national and EU-level innovation policies *per se* (in terms of specific national strategic policies), but rather considered how broader policy and practice impact the resilience of vulnerable populations during disasters. Therefore, we offer general guidance in Section 7 based on what we learned from our research in this project.

2. Methods

These innovation policy recommendations were derived using a step-wise and iterative process. There were two main steps: 1) conducting a review of BuildERS work and innovative outcomes; and 2) getting feedback on the draft report from BuildERS partners.

The first step consisted of analyzing the results from the case studies in WP2, WP3 and WP4, as well as the innovations presented in D6.6, identifying which types of innovations and relevant policy recommendations these findings have generated. As mentioned above, all of the innovations in this report (except for the Cost-Benefit Analysis Framework) have been validated and co-created with stakeholders and practitioners as part of WP6 tasks. This includes: scenario-based table-top exercises; iterative "living labs"; end-user evaluations of the innovations; validation workshops; and the co-creation of the multi-stakeholder Inclusive Crisis Communication Canvas (D6.6). The WP6 workshops with BuildERS stakeholders and practitioners captured stakeholder views on the relevance and usefulness of the innovations developed in WP2, WP3, and WP4, and then further developed and co-created the innovations to ensure their usefulness for their respective decision-making contexts.

After compiling key BuildERS innovations in a draft report, the second step consisted of getting feedback on this report. We received several rounds of feedback from the BuildERS advisory board, project partners, and the assigned internal reviewers for quality assurance and ethics. We also received support and guidance from the DRS01 Cluster Coordinate at CMINE (Rut Erdelyi) and an external policy consultant (Adam Knelman Ostry) in shaping the policy recommendations and structuring this report in the most effective way possible.

In formulating the policy recommendations in this report, we followed the ethical guidelines featured in Appendix B and further described in D7.4. Additionally, we will make these ethical assurance guidelines available on the BuildERS website, as a research innovation that can be used in other similar projects (see Section 6). This document has also been through an internal ethical review by project partners at the University of Tübingen.

3. Ethical guidance for policy-makers

As this report is meant to guide policy-makers in the formulation of policies, we feel it is important to preface these recommendations with some important ethical considerations that policy-makers should keep in mind when translating the recommendations into actual policy.

As enforceable social rules, policies impact people's lives in a wide variety of ways that can be beneficial for some people and detrimental for others. Therefore, the ethical implications of policy recommendations should be considered both in the process of formulating policy recommendations, and *also* in translating those recommendations into policies that will be implemented in practice. We briefly outlined above how we took ethical considerations into account when formulating these policy recommendations. In this section, we offer some guidance for how policy-makers can consider the ethical dimensions of how translating policy recommendations into policy. This guidance is offered below in the form of a series of questions, based on the ethical guidelines that all BuildERS work has used (see D7.4 for more detailed descriptions of these dimensions and the BuildERS ethical framework).

We suggest considering eight key ethical dimensions of policies: 1) Justice and participation, 2) Responsibility and accountability, 3) Freedom and choice autonomy, 4) Trustworthiness and transparency, 5) Privacy and data protection, 6) Non-maleficence and beneficence, 7) Vulnerability, and 8) Social support networks. More detailed guidance can be found in Appendix C.

The first dimension of *justice and participation* includes three key aspects: recognition (whose claims will be heard or not and which people are recognized as needing and wanting help?); distribution (who gets access to which resources?); and capabilities (Are people who receive access to resources able to use them, or are there individual or structural barriers that might inhibit them from using the resources?). Here are some more specific questions to consider when translating this report's recommendations into policy include:

- *Who could be discriminated against or stigmatized by this policy?*

- *How is it ensured that those affected by the policy are able to participate or are represented in decisions about them?*

- *If unequal treatment follows from this policy or the associated action, how is it legitimated?*

- *Does the policy ensure that information is communicated in an accessible non-stigmatizing way through various channels to make sure that most people are reached?*

Policy-makers should also consider *responsibility and accountability*. A key premise in this regard is that in order to be responsible, an entity has to be able to fulfil what is expected. In other words, responsibility requires ability, capacity and knowledge. Key ethical questions to consider here include:

- *Through which measures are people informed about their responsibilities?*

- *How do the policy and associated actions ensure that people are able fulfil to responsibilities that are attributed to them? Are there conflicting responsibilities? Do people have insufficient capacities to fulfill these responsibilities?*

Freedom of choice and autonomy is also an integral aspect of ensuring ethical policies. As democratic societies build on the respect of individual choice and self-determined action, policies should empower individuals to take well-informed decisions and promote respect for them. Along these lines, key questions to consider include:

- *How are people informed about the consequences of their actions (i.e., what does "misbehavior" lead to)?*

- *Does the policy take into account that structural pressures might hinder people from acting in their own interest?*

- *How does the recommendation support people in taking autonomous decisions (in their own interest) if they are not capable of taking decisions on their own?*

Policy-makers should formulate policies in a way that is *trustworthy and transparent*. From an ethical point of view, authorities should earn trust by being trustworthy. A main aspect of becoming trustworthy is transparency about decision-making processes. Here, policy makers should consider the following questions:

- *How does the policy ensure that its strategies and actions are made transparent and open for criticism?*

- *How does the policy ensure self-reflection when actions are taken, as well as public involvement in the implementation? If it doesn't, why not?*

- *Are there any supervision strategies or corrective mechanisms included in the processes and actions that stem from the policy in order to ensure transparent accountability?*

A key aspect of many of the policies featured in this report is sharing data in order to help vulnerable people. However, this comes with a host of concerns about how data is shared in a way that ensures *privacy and data protection* and prevents the misuse of data. This includes considering the following questions:

- *Does this policy suggest that only the minimum amount of personal data necessary to achieve the policy goal is collected, in order to avoid the collection of unnecessary or excessive personal data?*

- *If the policy involves the use of personal data, does it outline measures to be taken to prevent misuse by third parties (e.g. access regulation)? How are personal data protected?*

- *To what extent might the policy and the associated actions lead to limitations on individual privacy and how are they justified?*

The dimension of *non-maleficence and beneficence* are values usually discussed in the medical context. Nevertheless, it is also important to weigh the risk of harm and chances for benefits in the domains of technology development and disaster management. This includes considering the following questions:

- *Does the policy ensure that the situation of those most vulnerable is better than before?*

- *Might the policy lead to individuals suffering more with the policy than without it?*

- *How does the policy support a balance between benefits and costs when taking this recommendation?*

Policy-makers also need to consider how the policy approaches the issue of ***vulnerability***. This includes considering the following questions:

- *If the policy is based on vulnerability assessments or risk assessments, what did these consider?*

- *Does the policy account for the interplay of individual, socio-structural and situational factors of vulnerability?*

- *Does the policy include guidelines for those who implement the policies on how to prevent stigmatization and ensure accessibility?*

Lastly, policy-makers need to take into account how a policy might impact **social support networks**, which play an important role in resilience.

- *Does the policy promote cooperation between disaster management and social service providers?*

- *Does the policy place most of the responsibility on social support networks? Are there alternatives for those who don't have a strong social support network?*

With these important ethical questions in mind, we can now move on to the BuildERS innovations and the corresponding policy recommendations, featured in Sections 4, 5, and 6.

4. Process innovations

The process innovations described below can help with decision-making, strategy, and action for disaster management. They can also be seen as "social innovations" or "practical innovations", as mentioned in the BuildERS DoA. The process innovation policy recommendations synthesize best practices and lessons learned from BuildERS' case studies and stakeholder engagement activities.

4.1. Vulnerability Assessment Tool

The Vulnerability Assessment Tool for better-informed crisis management prioritization was developed in response to a gap identified in WP2 of the BuildERS project and is a result of Task 4.4. The research revealed a lack of systematic analysis of social vulnerability factors in crisis management, as well as a lack of guidelines (D2.2; D2.5; Orru et al., 2021). This gap was identified as one of the key impediments in preparing for and organizing rescue and support efforts in times of crisis in many European countries (D2.2; D4.4;, Orru et al., 2021).

Our new assessment tool addresses this gap by facilitating the identification of different manifestations of vulnerability along the dimensions of human agency, technological structures, and social support structures (in terms of both private relations and state actors). As such, this tool can help provide an essential overview of the potential vulnerability configurations in specific regions, and in specific situations.

The BuildERS Vulnerability Assessment Tool is intended to be used by crisis managers and is based on an analysis of the strengths and weaknesses of existing approaches, covered in WP2 and T4.4. The tool was designed together with researchers, authorities and non-profit agencies (Orru et al., under review).[4] It integrates data managed by different authorities and highlights the need to complement registry-based data (e.g., public health registry) with vulnerability assessments done by representatives of diverse stakeholders (e.g., care organizations). In taking this more integrated approach, it **helps crisis managers to understand multiple factors influencing people's ability to cope with disaster and to plan more effective prevention and response strategies**. It builds on a dynamic and intersectional perspective of vulnerability and guides relevant stakeholders to systematically bring together: 1) possible hazard scenarios, 2) the related factors of vulnerability, and 3) the sources of vulnerability-related information (D4.4, p. 40).

The main components of the vulnerability assessment tool are presented in Figure 2. To use the tool, one starts with a particular scenario or crisis situation, because the crisis circumstances (i.e., the type and degree of emergency, including environmental and technological circumstances) will shape the hazard exposure and adaptive capacities of different individuals. Then, specific vulnerability factors are identified, guided by the four key categories of vulnerability factors. This allows for the identification of types of individuals that might be negatively affected due to this particular crisis and their particular vulnerability factors. One can then determine the other vulnerability factors that intersect in unique ways in a particular situation, again guided by the categories of vulnerability factors.

---

[4] The process of co-creatively developing and testing this new vulnerability assessment tool is described in more depth in D6.6 (pp. 27-33), as well as in a manuscript called "Imagining and assessing future risks: A dynamic scenario-based social vulnerability analysis tool for disaster planning and response" by Orru et al. (under review).

The relevance of these vulnerability factors may change in different crisis circumstances. Therefore, derivations of an initial scenario should be included in the analysis. For instance, one scenario could be the disruption of the electrical supply during a particularly cold period of time. A factor of vulnerability in the "Critical infrastructure and means" category would be electricity-dependent heating, and people negatively affected by this would include clients of electricity-dependent communal heating. Some important intersecting factors from other vulnerability categories would be if people have small children and/or are dependent on external help on a daily basis (D4.4; D6.6; Orru et al., under review).

The four categories of vulnerability factors intersect in unique ways, creating synergies, aggravating or balancing each other out depending on the specific crisis situation. This allows crisis managers to hone in on the individuals that need the most attention in this specific crisis. The final step is to connect the identified vulnerability factors with the indicators of vulnerability in existing databases and other information sources, listing openly which information sources are used in the vulnerability assessment. So, for the example above, one would want to cross-reference databases of: communal heating clients, people with small children in the area, and people registered for daily visits from social services and/or care organizations. BuildERS testing has revealed that combining several indicators from several different datasets (e.g., census databases, population registries, community survey data, unemployment insurance data, health information systems data, and social service databases) enables a cross-sectional and more detailed depiction of vulnerabilities (D4.4.). Of course, when dealing with personal data, compliance with GDPR and national regulations on data protection and privacy must be ensured.
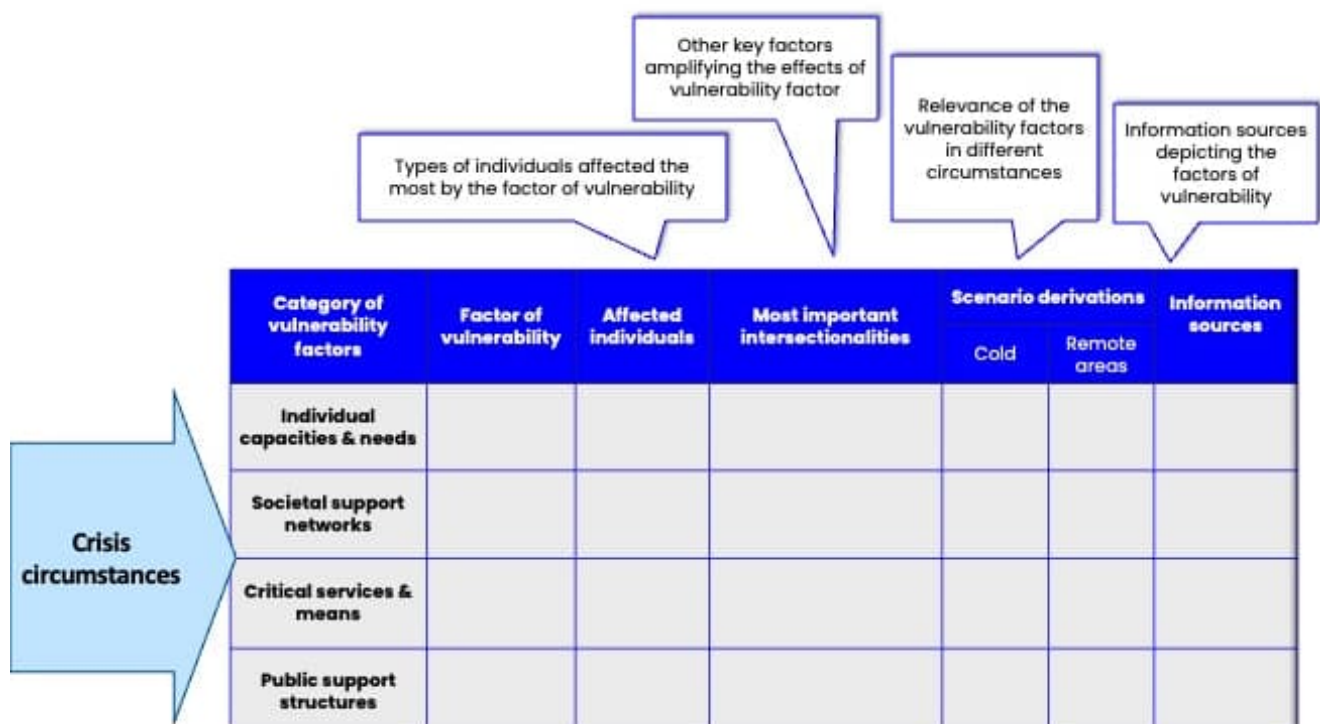

Figure 2: BuildERS Vulnerability Assessment Tool worksheet
(Source: Orru et al., under review)

There are many benefits that this tool offers. It can help improve the transparency of decision-making because it encourages disaster managers to explicitly list the different sources of information on vulnerability that they intend to use for assessments. By engaging the members of society that are potentially most affected by a crisis, the tool can be used to increase the fairness of crisis planning. It can be used in both the planning and response phases of disaster management and it can be used to explore different scenarios, as well as variations of the same scenario. This is an important feature, because 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. More information about the Vulnerability Assessment Tool can be found in: D4.4; Orru et al., under review; D4.8; D6.5 and D6.6. ***The Vulnerability Assessment Tool worksheets and instructions will soon be downloadable from the BuildERS website, and there is a video on the website that explains how the tool can be used.***

Ethical considerations

On an ethical note, it is important to stay aware of some key issues when it comes to data. The first issue is that data can be misused. Therefore, precautions must be taken to protect data from being misused. The second issue is that all data is collected in a selective way and is, thus partial. As such, it should not be assumed that the data gives a comprehensive picture of the situation. Policy-makers and practitioners should actively think about who is being left out of the data. Finally, as the EU's GDPR regulation makes clear, data is sensitive in so far as it reveals personal attributes. Data should be collected only in so far as there is a legal basis that allows for it.

The next short section offers policy recommendations to support the effective use of this tool, focused on both improving data collection for vulnerability assessments as well as how to improve vulnerability assessments themselves.

Policies to support improved data collection for the Vulnerability Assessment Tool

EU/national/local: Actors responsible for collecting and structuring vulnerability-related data should **use the BuildERS Vulnerability Assessment Tool to guide data collection**. More specifically, this entails:

- o that data is collected in a way that captures *self-perceived* vulnerability in particular situations or different types of crises (which can be collected, for example, via surveys, interviews and workshops with potentially vulnerable people);

- o greater disaggregation of data in order to better capture social diversity, including the data on self-perceived vulnerability;

- o improved timeliness of data collection to avoid stale information;

- o an extended collection of location-specific data, to better account for the situational aspects of vulnerability; and

- a minimal data policy, under which only the least amount of data needed is collected[5] in order to reduce noise (i.e., conflicting or unnecessary data).

There are, of course, limitations when it comes to collecting data in the ways described above. BuildERS has reviewed and applied a number of innovative tools and procedures that can support researchers and decision makers in addressing the limitations on data collection (e.g., crowdsourcing, using positioning data and location-based solutions, and data sharing between authorities) (see Section 5 on market innovations, as well as D5.5).

EU: Help member states to develop databases using better data sources and to use better data collection methods. This needs to be done in coordination with privacy regulators to ensure high standards of privacy and security protection, while also creating the opportunity to use and integrate different databases to support the identification of vulnerable people in emergencies. One option is "regulatory sandboxes", which are used to experiment with data-related scenarios in order to discover the risks and benefits of collecting, storing, and sharing data in different ways and to identify the most safe and ethical ways of doing so. This can help address the need to align national legislation with GDPR, ensuring the possibility and legal basis for the use of personal data to protect the lives and health of vulnerable people in emergencies (D4.4, p. 68).

National: Facilitate the sharing of information to increase vulnerability awareness during crises. Crisis management authorities should convene a working group comprised of managers of social databases (for example, census databases, population registries, community survey data, unemployment insurance data, health information systems data, social service databases, and care organizations' registries) to explore options for information sharing in service of better vulnerability awareness during crises (i.e., vulnerability assessment) (Figure 3). Such databases can be inadvertently misused and misinterpreted; as such, involving the people responsible for collecting and managing the data will help ensure a better understanding of the data (D4.4, pp. 33-34 and p. 68; D2.2). This should include the creation of rules to prevent the misuse of data.

It is also necessary to agree in which phases of disaster management, and to which level of disaggregation/personalization such data can be used across different databases. For instance, during the planning phase, more anonymous data is sufficient; however, in more specifically targeted operations (e.g., rescue operations), personalized data should be accessible. These conditions need to be agreed on by all relevant stakeholders.

---

[5] While greater disaggregation is needed, more data is not always better. The selection of what data to collect needs careful consideration.
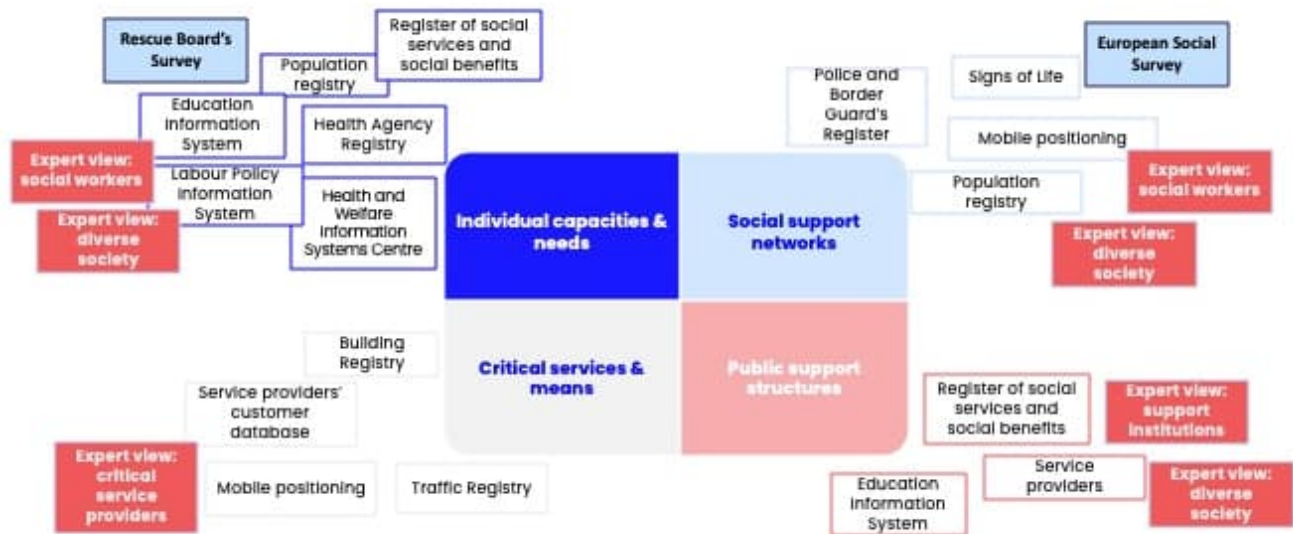
Figure 3: Examples of information sources for vulnerability-related data
(Source: D6.6, p. 33)

Policies to support improved vulnerability assessment processes

EU: Disseminate the BuildERS' Vulnerability Assessment Tool and help show how it can be integrated into risk assessment processes in national regulations, and used to complement emergency planning accordingly (D4.4, p. 68). For instance, the JRC or the newly established CPN (EU civil protection network) could host the tool on their website. DG ECHO might use this tool in EU-wide civil protection exercises.

National: National crisis management authorities should **use the Vulnerability Assessment Tool as the basis for analyzing situation-specific social vulnerabilities in national risk assessments and crisis management plans** (D4.4, p. 68). However, it is important to keep in mind that, depending on the indicators examined, different results will emerge. They should start by identifying which indicators are most important in different situations. It is also important to include diverse perspectives in assessing vulnerabilities (as mentioned below).

- As a supplement to the elaborated Vulnerability Assessment Tool, **establish guidelines for how to prioritize helping vulnerable people during a disaster**. These guidelines should be based on an ethical evaluation and well-defined criteria that can be applied to different scenarios according to various vulnerable situations (e.g. permanent social care clients) (D4.4, p. 68). It should not be forgotten that vulnerability is a dynamic condition and, as such, people who are in the affected area and were not previously considered vulnerable might not be able to help themselves during a crisis (for example due to injuries, shock or trauma) and might also need prioritized help. Furthermore, it must be emphasized that although the tool is helpful for clarifying who might be more vulnerable during a disaster, it is only one of many tools that disaster managers should use as it cannot predict every need.

- **Establish guidelines and ensure resources for local authorities to use the Vulnerability Assessment Tool**. The guidelines should specify how local authorities can assess the number of potentially vulnerable people in their area who might need special assistance in

different crisis situations (D4.4, p. 68). The instructions included in the Vulnerability Assessment Tool can provide the basis for these guidelines.

National/local: Facilitate the involvement of NGOs, care organizations, and other intermediaries in the vulnerability assessment and emergency planning process so that solutions to reduce vulnerability can be developed jointly (D2.2). To more easily identify a multitude of factors that determine vulnerability in a given situation, as well as how these may change over time, we recommend that intermediaries (i.e., actors that are in contact with different social groups in their everyday work) are involved in the task of assessing vulnerability. These actors could be social service providers and care organizations, but also decision- and policy-makers in a broad range of areas, such as education and spatial planning. Involve national-level umbrella organizations that work with vulnerable people (for instance, organizations related to specific impairments, age groups, socioeconomic conditions, family structures, social service users) in vulnerability assessment processes (D4.4; D2.2). NGOs and care organizations should facilitate discussions among the participants and clients of their organizations on the vulnerabilities that may occur in crises in order to best represent their interests and concerns to policy-makers (D4.4, p. 68; D2.2).

Local: Consider integrating the Vulnerability Assessment Tool into municipal emergency planning to identify people with greater needs for assistance, in order to support their independent coping and to help them prepare for the appropriate provision of information and assistance in a crisis (D4.4, p. 68). However, it is important to keep in mind that, depending on the indicators examined, different results will emerge. Start by identifying which indicators are most important in different situations. It is also crucial to include diverse perspectives in assessing vulnerabilities.

4.2. Inclusive Crisis Communication Canvas

BuildERS research also found that there was a need for disaster managers and first responders to better understand and address communication-related vulnerabilities in the context of disaster management (D1.4; D4.5; D4.8; D6.5; D6.6; Hansson et al., 2020). More specifically, there is a need to reduce communication barriers in order to allow all affected individuals to access, understand and act upon given information (Demeritt et al. 2013, 147; D4.8, p. 50). This relates to a more general gap between short-term crisis management and long-term strategies to reduce vulnerabilities.

In response to these needs, we developed the Inclusive Crisis Communication Canvas. This tool consists of a series of worksheets and templates meant to help disaster managers (including those authorities, organizations and communities that are responsible for crisis communication) **design more effective and inclusive communication strategies by enabling them to better account for communication-related vulnerabilities that might affect people's ability to respond to a disaster**. As such, this tool relates to Task 6.4 to co-create a multi-agency crisis communication strategy tool.

The canvas tool enables crisis managers to create a one-page overview of the target audience for crisis-related information, as well as other relevant stakeholders and communication channels. In order to facilitate its use, the canvas is accompanied by two supplementary tools: **Guidelines and Supportive Questions sheet** and the **Stakeholder Mapping Chart**. These tools help first responders think outside the box when filling out the canvas. The process of filling out the canvas (with the help of the Guidelines and Stakeholder Mapping Chart) encourages authorities to consider how the different phases of a crisis require a dynamic, adaptable communication strategy that should

be revised as needed. More specifically, the Stakeholder Mapping Chart is useful for strategic planning processes before a crisis, while the canvas can be used during an acute crisis.
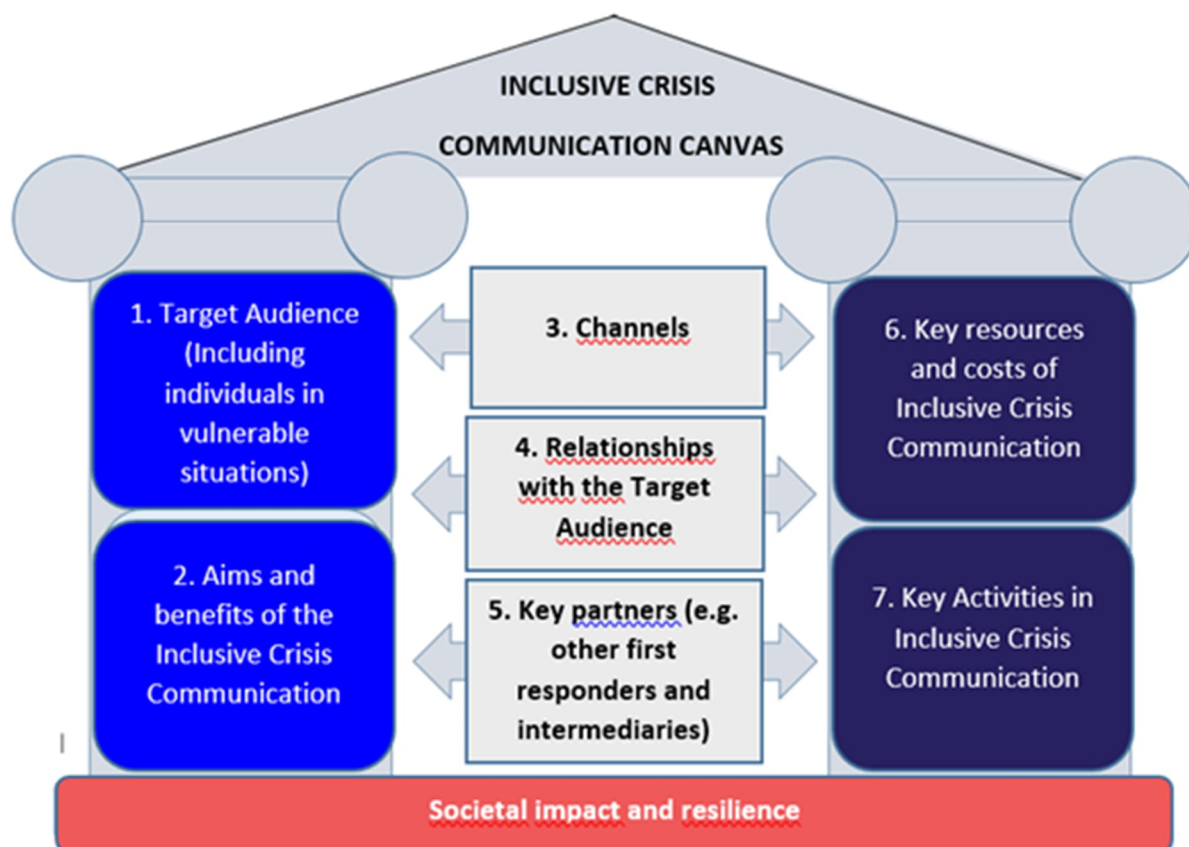
Figure 4. Overview of the Inclusive Crisis Communication Canvas
(Source: D6.6, p, 78)

A key benefit of using the Crisis Communication Canvas is that it is inherently inclusive. It encourages authorities to actively consider: the alignment of their target audience and the beneficiaries of their services; appropriate and effective communication channels (both now and for the future); how the various communication channels are integrated; trust levels and relationships of target audiences and related stakeholders; and how to reach the most marginalized and vulnerable people.

More information can be found in D6.5 and D6.6. ***The template and instructions will soon be downloadable on the BuildERS website.***

The next short section offers policy recommendations to support the effective use of this tool.

Policies to support the use and development of the Communication Canvas

EU/national/local: Fund the development of a digital version of the Inclusive Crisis Communication Canvas that can guide end-users and assist them in the documentation and analysis of stakeholders and communication channels, as well as in measuring the efficiency of different crisis communication channels. It is challenging for first responders to fill out the questionnaire, canvas, and stakeholder chart on paper, especially in the heat of a crisis (D6.5, D6.6).

EU/**national**/**local**: Incorporate the BuildERS Inclusive Crisis Communication Canvas into existing disaster and disaster preparedness communication strategies.

4.3. Guidelines for Collaborating with Social Media Influencers

Social media can play a vital role in disaster management as a source of information before, during and after a crisis. Crisis managers are increasingly interested in collaborating with social media influencers in order to use digital trust networks for these purposes. Social media influencers are those who have established a significant number of relationships in social media communities with a significant influence on a large number of followers through content production, content distribution, interaction, and personal appearance on the social network (Enke 2019). These actors often have thousands, hundreds of thousands or even millions of followers. Therefore, it can be quite helpful for public authorities to communicate crisis-related information in collaboration with social media influencers, in order to reach a larger number of their constituents and/or beneficiaries. For instance, Swedish lifestyle influencer Angelica Blick interviewed the Minister for Social Security about the COVID-19 pandemic in order to give accurate information about the virus to her followers.

As this kind of collaboration is a rather new practice and there are inherent risks involved (e.g., credibility and reputational risks), we found the need to develop guidelines for authorities. The aim of our Guidelines for Collaborating with Social Media Influencers is to **help public actors navigate the world of using social media influencers as a channel for risk and crisis communication**. These are practical, concrete guidelines on how to collaborate with influencers and what to consider before, during and after a collaboration.[6]

The Guidelines consist of four parts:

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

More information about the Guidelines for Collaborating with Social Media Influencers can be found in D5.4 and D6.6*. **The Guidelines themselves will be downloadable as a PDF from the BuildERS website.***

The next short section offers a policy recommendation to support the effective use of this tool.

Policy to support the use of the Guidelines for Collaborating with Social Media Influencers

National/**local**: Authorities should **use these guidelines when engaging social media influencers in risk communication**. Collaborating with social media influencers for risk and crisis communication can help broaden the reach of risk communication by reaching and engaging younger audiences or those who do not follow traditional media channels. These guidelines can help authorities choose the best strategy for doing so (D6.6 and D.5.4).

---

[6] Potential opportunities and risk factors are further explored in D1.4, D2.3, and D6.2.

4.4. Board Game: Preparedness Skills for Children

BuildERS research found that children are one of the recurring groups who are likely to be vulnerable during a disaster (D1.3). In order to address this vulnerability, we developed a board game to **teach children (aged 5 to 10) how to react to crisis situations and how to spread information to their peers** (D6.6; D8.4).

The BuildERS board game consists of four different scenarios: a fire, an earthquake, a flood and a pandemic. Questions for younger children (5 to 7 years of age) are based on visual card pairing (e.g., a fire extinguisher and a fire; a face and a mask; a mobile phone with 112 and a building on fire), whereas questions for 8 to 10-year-old children are more complex and some require either a complex answer or a physical demonstration.

Figure 5: Board game lay-out
(Source: D6.6, p. 69)

It is intended to be used in formal and informal educational settings in which educators can help guide the children through the game. It has been produced in five languages (English, Finnish, German, Italian and Hungarian) in order to ensure that it can be used widely. For more information about the BuildERS board game and how it was co-created and tested, see D6.6 and D8.4. *The board game can be downloaded from the BuildERS website and printed out on A4 sheets of paper, to ensure wide-spread accessibility.* It will be distributed across other educational platforms, offered to other projects as well as schools.

Policy to support the BuildERS board game

National/local: Distribute the BuildERS board game to public and private schools, as well as informal educational centers (such as local NGOs and community centers) to be used as part of their crisis preparedness education for children. The distribution of the game should especially focus

on venues and organizations that support vulnerable or marginalized people, such as migrants, disadvantaged children, and children with developmental difficulties.

4.5. Prototype of a First Responder Training Program

First responders are a key source of information and help during a crisis. However, BuildERS research found that first responder agencies and their staff are often unprepared (or at least underprepared) to handle communication with people who have mental health conditions, neuropsychiatric disorders, and/or intellectual impairments (D4.1). Yet, these are some of the most vulnerable people during crises.

In investigating this further, it was found that first responders need to be equipped to:

- address the digital divide in risk and crisis communication (e.g., publishing crisis-related information in social media and internet platforms);

- combine digital communication with door-to-door interaction, text messages, and broadcasting in radio and TV, in order to better reach those who have mental health conditions, neuropsychiatric disorders, and/or intellectual impairments;

- collaborate with other service providers (like the psycho-social support services) and intermediaries of persons with difficulties in communication and/or social interaction;

- make information as accessible as possible for all audiences;

- increase their knowledge and capacity to use alternative and additional communication means and methods such as plain language and easy-to-read language;

- increase their understanding of communicational complexities; and,

- pay special attention to individual's and intermediaries' experiences of situations where misunderstandings have previously happened and/or they have experienced that they have not been heard or given information in the right format (This list comes from D6.6).

In response to these needs, BuildERS developed a Prototype First Responder Training on Accessible and Interactive Risk and Crisis Communication.

There are two separate programs within this training package:

1) A program focused on **enhancing external communication and interagency collaboration** for communication specialists and commanding officers in first responder organizations; and,

2) A program focused on **improving social interaction and communication with people who have special communication needs** – intended for field operations officers who respond to emergency situations and interact with citizens and for students of basic first responder training.

The first program consists of a half-day preparedness drill that uses the Trasim online platform[7] to simulate external communication during a crisis situation, including with intermediaries for vulnerable people. The intended learning outcome is for participants to gain more effective communication skills when helping vulnerable people in a crisis. An important aspect of the training is that it simulates the vulnerabilities that can be generated by exchanging information via social media and other digital communication channels. Participants also learn how to better deal with information disorder; how false and harmful information is spread and how it can be handled (to some extent) (based on Hansson et al., 2020).

The second program consists of six modules (worth two ECT credits) that can be integrated into existing curricula. Students can take the course independently without the involvement of a teacher. Each of the first five modules focuses on building competence in interacting with people who have different types of challenges:

1. Intellectually impaired individuals
2. Self-destructive and suicidal individuals
3. Individuals with memory disorders
4. Neurodiverse individuals (individuals with autism spectrum disorders and attention deficit hyperactivity disorder, ADHD), and
5. Individuals who have communication challenges and who are at risk of becoming victims of domestic violence, especially during crises.

Figure 6: Screenshot of an e-learning module
(Source: D6.6, p. 62)

The sixth and final training module aims at improving the resilience of the first responders themselves. It deals with the elements of resilience, such as increasing awareness skills, improving skills on

---

[7] Trasim is a digital exercise platform designed to allow participants to work with different simulated management situations, such as a crisis. This platform was developed by Insta Group Oy (Insta, n.d.).

mentalization (e.g., methods to stimulate the amygdala and orbitofrontal cortex), understanding how the body and the nervous system respond to stress, listening to the messages of the body and methods to recover from stressful situations.

As this training program is a prototype, it can serve as a sort of "starter kit" for teachers and trainers, who may find inspiration to design even better forms of training that are customized to their students' and staff's specific needs.

More information about the prototype training package can be found in D4.1, D4.8, D5.5, D6.4, and D6.6. ***Currently, the only way to access the training package is the CEPOL's LEED platform (in English) and the Finnish Police University College's Moodle platform (in Finnish and soon in Swedish). In order to access the training programs, the student must be a law enforcement officer.*** However, the Police University College in Finland is discussing possibilities to utilize the training in cross-institutional studies with other universities.

Policies to support and develop the First Responder Training Programs

EU/national/local: Facilitate, through funding opportunities, the further development of this prototype training package in collaboration with practitioners and stakeholders.

Local: Allocate resources for the training of first responders in inclusive risk communication using BuildERS First Responder Training Prototype, which can and should be customized according to local contexts.

4.6. Cost-Benefit Analysis Framework

BuildERS D6.4 analyzed how several emerging technologies, including data crowdsourcing, drones, and satellite imaging, might be able to help with crisis communication and disaster response. As a follow-up to that report, D5.4 conducted a cost-benefit analysis for decision support for policy-makers when choosing whether and how to use these supportive technologies in disaster management.

An investment strategy was drafted to support authorities in making such decisions, **outlining where resources are best placed to strengthen social capital, risk awareness, disaster preparedness, and long-term societal resilience.** The focus lies on emerging technologies and tools that offer opportunities for disaster risk management, namely mobile positioning data, social media crowdsourcing, drones, and satellite imaging. However, the framework that was developed can also be used as decision-support regarding investing in other technologies.

For each technology, it considers the following:

1. **Usage**: Where along the disaster risk management cycle can the technology be applied?

2. **Costs**: What is the cost of investing in the technology for disaster risk management?

3. **Benefits**: What benefits can the technology yield in disaster risk management?

4. **Cost-benefit ratios:** What is the overall monetary value of the different investment options?

5. **Risks**: Are there any risks in using the technology for disaster risk management?

6. **Forecast**: How is the technology likely to develop in the near future?

7. **Provision**: Who is providing the technology?

(Source: D5.4)

More details about this framework are offered in D5.4, which will be available on the BuildERS website.

Policy for Using the Cost-Benefit Analysis Framework for Decision Support

EU/national/local: We encourage policy-makers to **use and further develop this tool for support in making decisions about whether or not to use certain technologies in disaster management**.

4.7. Ethical Guidelines for Policy Formulation

The final process innovation presented in this report is a set of ethical guidelines for policy formulation. **These guidelines consist of important questions that policy makers should ask in the process of translating policy recommendations (such as those put forward in this report) into actual policies** (Figure 7).[8] These questions are based on eight ethical principles: 1) Justice and participation, 2) Responsibility and accountability, 3) Freedom and choice autonomy, 4) Trustworthiness and transparency, 5) Privacy and data protection, 6) Non-maleficence and beneficence, 7) Vulnerability, and 8) Social support networks. These are the same guidelines that were outlined in Section 3 and the full set of questions, organized in a table by theme, can be found in Appendix C.

In applying these principles, we can take the example of the policy recommendations for the Vulnerability Assessment Tool described in Section 4.1. What is considered in a vulnerability assessment determines whose perspectives or living situations are seen and this can be considered with regards to justice. Furthermore, whether disaster management is seen as entangled with social politics determines which actors are to be involved for bringing policies into action. Although both of these issues were considered in BuildERS project itself and reflected in the development of the recommendations, these guiding questions should also help *policy-makers* to consider these issues when it comes to translating the recommendation into policies.

---

[8] They include the six core ethical principles from our Guidelines for Ethical Assurance in RDI-projects (see Section 6), but include two more dimensions, vulnerability and social support networks, which refer to the operationalization of key concepts (like vulnerability) as well as social structures that should be considered in policy making.

Recommendation	
Addressee of the recommendation: …	
Justice and Participation	
PROCESS-RELATED: Who was not included in the development of the recommendation and for what reasons?	For example: Was the recommendation only discussed with representatives of XYZ from one specific local or national context?
Who could be discriminated or stigmatized by this policy?	For example: Does the policy for instance discriminate or stigmatize those who are unreported and do not engage with authorities in order to prevent a worsening of their situation?
How is it ensured that those affected by the policy are able to participate or are represented in decisions about them?	For example: Does the policy outline any guidelines regarding who has to be included in decision-making processes and to which extent?
If unequal treatment follows from this policy or the associated action, how is it legitimated?	For example: Does the policy focus on and promote only the needs of a certain group? If so, how is this justified?
Does the policy ensure that information is communicated in an accessible non-stigmatizing way through various channels to make sure that most people are reached?	For example: Is information spread via TV, newspapers, radio, social media, care organizations, etc.?

Figure 7: Part of the guidelines' table of questions for policy makers
(see Appendix C)

These guidelines will soon be made available as a downloadable PDF on the BuildERS website.

Policy to Encourage the Effective Use of the Ethical Guidelines for Policy Makers

EU/**national**/**local**: The BuildERS Ethical Guidelines for Policy Formulation should be seen as a useful starting point to **develop standard frameworks of ethical principles to guide policy-makers in drafting policy**, as they emphasize the consideration of those who might be easily overlooked or neglected in policy.

4.8. Policies to support BuildERS process innovations

In addition to the innovation-specific policy recommendations above, the following section offers suggestions for policies that can support the use and further development of more than one of the BuildERS process innovations, such as encouraging the use of the whole BuildERS Inclusive Crisis Management Toolbox (Figure 1). They thus represent more generic recommendations.

EU/**national**/**local**: **Incorporate the BuildERS Inclusive Crisis Management Toolbox into existing training exercises** to test their relevance in local contexts. If useful and relevant, include parts of the toolbox in (a) disaster preparedness activities, and (b) communication strategies.

EU/**national**: **Encourage publicly-funded researchers in the field of disaster management to use the analytical perspectives and tools above**. For instance, research that receives public funding on the EU and national-level should continue to emphasize building on the results from previous Horizon-funded resilience projects (e.g., DRS-01 cluster projects).

National: National agencies could **test the innovations above in "innovation sandbox" activities** currently used in national innovation practice (opportunities to assess the relevance of innovations in risk-free settings, together with regulators). If useful and relevant, these can be integrated into national crisis management strategies.

EU/**national**/**local**: The BuildERS project has developed a framework for understanding the triggers of communication-related vulnerability to disasters/crises, published in Hansson et al. (2020). This informed many of the tools described above (e.g., the Inclusive Crisis Communication Canvas), but authorities could also **use the communication-related vulnerability framework as a practical guide for improving people's capacities to access, understand, and react to risk and crisis communicatio**n.

EU/**national**: **Create "crisis communication collaboration networks" to further develop the BuildERS process innovations** (D2.3; D2.4; D2.5; D6.2). The purpose of these networks would be to facilitate the exchange of: knowledge, innovations, and best practices when it comes to mapping and identifying vulnerabilities; best practices for mapping and strengthening existing support networks; and, best practices for improving risk and crisis communication and addressing the risks posed by information disorder. Thus, these networks could test and further develop the BuildERS' Inclusive Crisis Communication Canvas tool, as well as the First Responders Training prototype and Guidelines for Collaborating with Social Media Influencers.

5. Market innovations

This category of innovations contains promising avenues for further development as products that can be sold on the market. However, it is worth noting that technologies alone are not sufficient to reduce vulnerability and increase resilience. They must be linked back to the process innovations, described above, as well as wider governmental strategies described in the forthcoming BuildERS D5.3 report on Resilience Policy Recommendations.

Again, it is also worth repeating here that there are several ethical issues when it comes to data collected by these technologies. The first issue is that data can be misused. Therefore, precautions must be taken to protect data from being misused. The second issue is that all data is collected in a selective way and is, thus partial. For instance, data collected by smartphones will inevitably leave out people who do not have smartphones, which is a trait that often overlaps with other vulnerability factors, such as poverty and age. Therefore, it should always be assumed that the data cannot give a comprehensive picture of the situation, and policy-makers and practitioners should actively think about who is being left out of the data. Below are the three market innovations that BuildERS helped develop.

5.1. Natural Disaster Mapping Tool

During a natural disaster, practitioners need to be able to quickly and easily integrate data from different sources to form a broader picture of the crisis situation. Diverse sources of information can be combined and used to improve local knowledge and preparedness for such disasters. First responders and secondary responders, such as care organizations, can use the information to locate and help severely vulnerable people. The tool is especially meant for those actors that are not able to use classified data. Official authorities have access to a wide range of data, but other actors (such as care organizations involved in disaster relief) do not have access to such a wide range of data, so they have to utilize public data sources and try to find useful combinations of those data sources.

The BuildERS Natural Disaster Mapping Tool meets this need by **combining different kinds of maps derived from public sources to provide a broader picture** of: the state of a natural disaster (e.g., flooding or seismic activity); the operational locations of non-governmental humanitarian relief agencies; and where there is likely to be a higher proportion of vulnerable people. The latter is identified by combining data on the geographical distribution of vulnerability indicators including: age (both the elderly and children have a higher risk of becoming vulnerable during a disaster), poverty, rates of homelessness, and the percentage of the population that are foreigners. This kind of information can help to plan response activities and manage the impacts of natural disasters.

A demo of the tool is publicly available as a video recording on the BuildERS website: https://buildersproject.eu/media. The demo is based on disasters that took place in Italy between 2015 and 2019 and shows how the data from Italy was collected during the BuildERS project in order to support disaster managers and charity organizations to arrange their work in disasters. Importantly, this demo tool shows how agencies can collect and combine data from public sources themselves. Thus, it is a tool that can easily be further developed for different regions and organizations can use this information to customize their own natural disaster mapping tool.

More information about the co-creation process and the technical implementation of the tool can be found in D6.6 and D3.4 (Maps of the severely vulnerable populations). *These will also be available*

on the BuildERS project website, on the Horizon Results Platform, and in the CORDIS EU Research results portal of the European Commission (https://cordis.europa.eu) (D8.5).

Policies for the further development of the Natural Disaster Mapping Tool

EU/national/local: Fund the collection and statistical analysis of data on the primary needs of homeless people, and the most important sources of information for homeless people in disasters. This information could form an additional layer of data for the tool (with the caveat that it must be kept up to date). It is important that the collection of information is done in an ethically acceptable way and that privacy and data protection are ensured and that no harm is caused. This include taking measures to prevent the tool from being misused. Such information will enable regional and local level actors to provide the necessary help to the individuals in vulnerable situations -- and to provide them with accessible sources of information and communication during disasters.

EU: Formulate a standard definition and criteria for collecting data on homeless populations. 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 (D6.6, p. 40).

5.2. Mobile Positioning Data (MPD) Tools for Rescue Planning and Emergency Management

BuildERS findings' highlight that a key challenge for helping vulnerable people during crises is simply knowing where more vulnerable people are likely to be at a given point in time. Based on technological gaps and opportunities for disaster management identified in the Catalogue of Tools and Technologies and Media Opportunities for Disaster Management (D2.4), the BuildERS project developed two tools that use mobile positioning data (MPD) to locate vulnerable people during a disaster. The first tool is the Mobile Position Dashboard and the second is the SaveMyLife mobile application.

Mobile phone positioning data is gathered by mobile network operators for billing purposes. This data consists of timestamped call records that include the location of the cell tower that the phone was connected to while the phone was used. Therefore, there is both a temporal and geographical dimension to MPD that can be useful for disaster management. This data can be used in order to identify trends over time (using historical MPD) or to identify the location of people in need of help right now (using real-time MPD). The first tool described below, the Mobile Positioning Dashboard, uses historical MPD and the second tool, the SaveMyLife application, uses real-time MPD.

Ethical considerations

As highlighted in D5.4, it is a challenge to use real-time MPD in a legal and ethical way, and this must be considered in any policy formulation in discussion with regulators.

5.2.1. Historical MPD: Mobile Positioning Dashboard

Estimations of potential populations in danger during a crisis situation are usually made using either census data (which does not consider dynamic population changes caused by work-related movement or tourism) or on-the-ground observations (which is very labor-intensive and can be quite imprecise).

The Mobile Positioning Dashboard addresses this issue by using historical MPD to visualize how many people are located in different areas, as well as to identify specific sub-groups (e.g., local residents, workers, temporary residents, tourists). Thus, the tool **gives first responders fast and reliable information on probable population distributions via an interactive map application**. Furthermore, the tool shows the geographical mobility flows and helps to map the central nodes of movement, such as the locations of peoples' secondary homes. In this way, crisis managers can get an overview at the national level and compare the situation at different times of day or different times of the year. The data can be viewed in detail with an accuracy of up to an hour. The dashboard also uses call data records (location data based on phone calls made) during and after disasters to provide information regarding the areas that tend to receive more people when there is a local or regional emergency, such as an earthquake, flood, or bombing (D4.3; D6.4). The dashboard uses passive mobile positioning, which is the data that is automatically collected by the mobile network operator based on customer billing, network maintenance, and performance monitoring.

Figure 8: Dashboard showing the dynamic population statistics in a certain area over time
(Source: D6.6, p. 44)

The main goal of the dashboard is to give rescuers enough information that they can better predict a population's behavior during crisis situations and plan their strategies accordingly, thus enabling them to improve rescue outcomes and to reduce costs. In addition to helping first responders and disaster managers (such as civil protection agencies), it can be useful for foreign embassies and ministries of foreign affairs, in terms of helping them locate and rescue tourists or other foreigners. (D4.7 and D4.8)

This innovation is mostly meant to be used during the pre-crisis phase when disaster managers have the time to analyze previous disasters and events, such as how people usually behave versus how they behaved during previous disasters. Based on this knowledge, planning of resource allocation

and processes for future crises can be designed. However, the dashboard can also be used during a disaster. It was developed to work offline, so if all other connections are down and other databases cannot be used, then this dashboard still works.

The dashboard was developed by BuildERS partner, Positium Ltd., in a co-creative process described in more detail in D6.6. It can be made even more effective by combining data from the Dashboard with the data gathered through other sources, such as SaveMyLife application, featured in the next section. Of course, privacy and data protection must always be ensured. ***The dashboard is hosted on Positium Ltd.'s server and can be made available upon request to Gerttu Pilsas at: gerttu.pilsas(at)positium.com***

5.2.2. Real-time MPD: SaveMyLife Mobile Application

In order to specifically address the need for an increased ability to help tourists and foreigners during a crisis (i.e., people who may not speak the local language or know the local safety protocols), the BuildERS project developed the SaveMyLife mobile application. The app has three main features: preloaded content, a panic button, and an early warning system. The preloaded content provides users with information about the nearest safety points (e.g., police station, local hospital, mosque, community center) and the estimated time required to reach those safety points, as well as real-time updates about the disaster from official authorities. The panic button enables the user to notify relevant authorities that they need help during an emergency. When a victim taps the "Panic Button", rescue teams can accurately determine the victim's location, enabling them to prepare appropriate rescue plans. Based on the user's information provided upon registration (such as age, special needs, and health status), the algorithm automatically categorizes the users into groups. This allows for the accurate identification of vulnerable people, like people with disabilities, pregnant women, children, the elderly, and people with underlying medical conditions (D6.6).

Like the Dashboard tool, the SaveMyLife app relies on MPD to identify where victims are located during a crisis. This application needs to be downloaded by tourists and other foreigners before the crisis, so that they can properly fill out the registration with the information needed to identify their potential vulnerabilities during a disaster. **This information can be used by rescuers to prioritize disaster victims according to their vulnerabilities, and accurately prepare the required aid and resources to help them.** Of course, the information should only be accessible for use in a disaster situation.

This SaveMyLife application could nicely complement Positium's Dashboard described in the previous section (Section 4.2.1). Combining data from the SaveMyLife app and the Dashboard would increase data validity and also the effectiveness of search and rescue efforts, especially if the distress signal could confirm the historical movement and locations of tourists made available by the dashboard (D4.8, p. 61).

The SaveMyLife app is currently available for Android phones, and it can be downloaded publicly from the Google Play Store: https://play.google.com/store/apps/details?id=com.csid.panicbutton
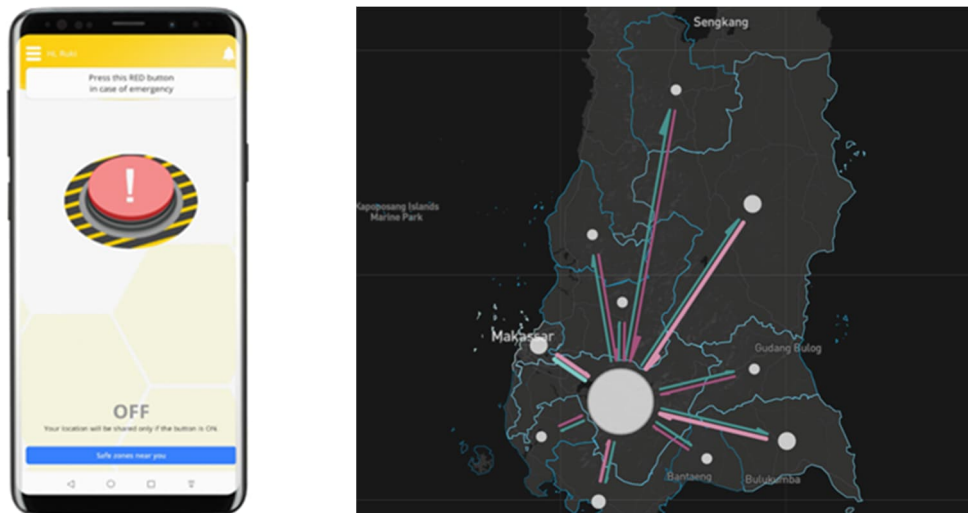
The app is free and has no added or hidden paid features.

Figure 9: SaveMyLife app on the phone and what rescuers see
(Source: D6.6, p. 50)

Policies for Using MPD Tools in Disaster Management

In addition to determining the legal and ethical requirements for data use and protection, the analysis in BuildERS case studies reveals five key preconditions for the use of (merged) databases in identifying persons in a vulnerable situation before and/or during crisis (D4.4, p. 70):

- o Good situation awareness regarding hazard impact in geographical areas for well-targeted data inquiries;

- o Availability of data on vulnerability factors;

- o Accuracy of the datasets;

- o Security of the databases; and,

- o Administrative and technical capacities to manage and share data in a secure way that complies with GDPR and national data protection regulations.

The following policy recommendations help address these issues.

EU/national/local: Facilitate the exchange of knowledge and insights about how best to customize and use these tools (or similar tools) during disasters. Conduct tests and drills in collaboration networks.

EU/national/local: Further develop and integrate the Mobile Positioning Dashboard and SaveMyLife App into a digital application that agencies can easily use. The SaveMyLife app should be easy for people to download and use in their hometown, as well as when they are tourists abroad. Encourage tourists to download the SaveMyLife App via public announcements (e.g., billboards, videos, etc.) at airports, train stations and bus stations. Data privacy and protection must be ensured in accordance with GDPR and national regulations.

EU: **Help develop clear laws about passive MPD usage for dashboards** similar to the one developed in BuildERS (D4.3, p.55; D4.7, p. 39). Positioning data applications have a lot of potential, as demonstrated by BuildERS, but should be deployed only in a clear and safe regulatory framework. At the moment, the usage of MPD is regulated differently in various countries and there are questions for researchers, mobile network operators and crisis managers as to whether the data can be shared

and, if so, on what terms. This also restricts the use of the dashboard geographically and puts rescue workers in an unclear situation: should they make investments to start using such a tool, if, at some point, they will not be able add new data to it?

The following specific steps can be taken to help achieve this goal:

- **Standardize MPD usage, including having unified definitions**. More specifically, policy-makers should establish protocols and guidelines for how MPD can be used by different actors on the national and local level, but also by public and private actors. This should include guidance on how MPD can be used by these different actors under normal circumstances and how the rules and protocols might change during a crisis for the purposes of disaster management. Such a standardization can speed up scientific and technological advancements in the use of MPD in disaster management (D4.3, 55; D4.7, p. 39).

- **Streamline the data and indicators used by disaster management agencies and personnel**. Consider adding the main data points, indicators, and variables collected by MPD to the composition of official EU- and national-level statistics so that simpler indicators can be used to solve everyday problems (D4.3, p. 55). Many institutions, such as municipality governments who have a more strategic planning role in disaster management, may not need access to all possible functions of the dashboard. Rather, they might focus only on some specific statistics. However, if they know about all of the main indicators, then all relevant institutions would have a more unified overview of the situation (D4.7, p. 39). This must be done in a way that ensures compliance with data protection and privacy laws and guidelines.

- **Allow anonymized MPD to be used by scientific researchers so that new dashboards, applications, and solutions can be developed**. This would allow for scientific and technological advancements in the use of MPD in disaster management (D4.3, p. 51). Improved access to data (in a way that protects personal data and prevents its misuse) can facilitate scientific and technological advancements in the use of MPD in disaster management.

National: **Use MPD dashboards, like the BuildERS Dashboard presented in this report, for risk analyses, urban and regional planning, and disaster management strategies in general**, especially in areas where there are heightened risks for disaster (threat of floods, storms, or man-made disasters) (D4.3, p. 55). Again, this must be done in accordance with GDPR and national data protection regulations.

National: **Consider using applications that utilize mobile positioning data, like the BuildERS Dashboard, in the planning of evacuations**. This could be useful as the accuracy of MPD surpasses that of traditional, survey or census-based sources of population statistics (D4.3, p. 55). Ethical considerations must be followed (see Appendices B and C).

National: At times of widespread power outages (as tends to happen during disasters), there are issues with mobile phone cell coverage. This could be resolved if authorities **set a minimal timespan for the expected amount of time that mobile phone tower batteries should stay charged during a massive power outage**. The risk of cell coverage loss should be integrated into risk analyses (D4.3, p.51).

National/local: **Customize and implement the SaveMyLife app and the Dashboard as part of disaster preparation planning**, to help inform disaster managers how many emergency personnel

should be deployed to a certain area during a crisis. Make sure at least a few members of disaster management teams know how to use these tools in the event of a disaster. Keep them updated throughout the preparation phase. Incorporate these tools into disaster drills, to practice using them in the decision-making process. Note that the mobile positioning data should only be one of several variables taken into consideration, and that data privacy and protection must be ensured in accordance with GDPR and national regulations.

National/local: Develop methodologies to identify the share of populations in different geographical areas who have multiple homes and who move between two or more places very often. With the information of these additional groups, rescue planning with these dashboards could be made even more accurate.

National/local: Authorities responsible for risk communication can **use tools applying historical mobile positioning data,** such as the BuildERS Dashboard and SaveMyLife app to pinpoint how, for whom, and through which media the communication and the imminent crisis risks need to be conveyed (see D4.3 and D4.7). If mobile positioning data is utilized for the purpose of targeting crisis management strategies, ethical considerations related to data protection and privacy must be kept in mind. See Appendix C for questions to consider when implementing the recommendations.

Local: Incorporate historical data from the Dashboard into local disaster plans. This could be a highly valuable asset for first responders and other authorities in the pre-crisis phase, helping them to learn from past crises and events (see D4.3 and D4.7). In doing so, data privacy and protection must be ensured in accordance with GDPR and national regulations.

6. Research innovation: guidelines for ethical assurance in RDI-projects

The ethical guidelines that were used throughout the BuildERS project (including as the basis for Section 3 of this report) can be used as a tool by other RDI-projects (Research, Development and Innovation projects) to ensure a high ethical standard in their work. Therefore, we have included it here and in D6.6 as an important BuildERS innovation.

In conducting research and developing innovations for increasing resilience, the BuildERS project involved a variety of ethical considerations (D6.6, p. 70). In order to systematically address these different kinds of ethical concerns, we developed a structured process to raise and discuss ethical aspects of the BuildERS research. This process can be used as it is presented here, or it might serve as a useful blue-print for RDI activities in other projects and will be available on the BuildERS website as an innovation that can be used in other similar projects. The ethical analysis and reflection consisted of three main parts: consideration of ethically appropriate research procedures, ethical monitoring of activities and ethical reflection.

The **consideration of ethically appropriate research** encompasses ethical guidance for empirical research activities, the creation of informed consent and project information sheets as well as ethical consulting. These procedures not only allow for a transparent and well-informed choice for potential participants, but they also ensure that personal data is only collected if truly necessary for the research activities and that it is stored in a safe way. These procedures also include the consideration of precautionary measures for the involvement of participants who are more likely to suffer from re-traumatization or exploitation due to their specific context.

Secondly, to ensure that ethical aspects are also considered throughout the whole research process and with regard to all activities, not only empirical research activities, an additional **ethical monitoring** takes place. For BuildERS, it was structured in three steps. First, all tasks and planned activities are screened for potential ethical issues, guided by six key ethical dimensions: (1) justice and participation, (2) responsibility and accountability, (3) freedom of choice and autonomy, (4) trust and transparency, (5) non-maleficence and beneficence, and (6) privacy and data protection. This screening process brings to the surface any issues that need to be discussed and dealt with at the outset of the project, as well as those that will need to be dealt with at later stages. The team then developed mitigation advice for the ethical issue, for instance to change some aspect of the research plan. An appointed ethics partner (with relevant qualifications and experience) should be part of this process, as well as all partners in the project. The role of the ethics partner is to provide ethics counselling throughout the whole project lifetime and to enable the most appropriate solutions for identified issues as well as meaningful decisions on ethically relevant topics.

Figure 10: Checkbox for the screening on ethical issues
(Source: D6.6, p. 73)

Finally, the ethical questions and challenges are discussed in the research and innovation process in a content-wise way. This **ethical reflection** centers on the concepts of acceptability and acceptance of social and artificial technologies developed within the project as well as the implications these might have. The ethical review of acceptability refers to questions such as: Are tools, technologies or strategies desirable with regard to existing social values and beliefs?

The guidelines themselves will be made available on the BuildERS website as a PDF that can be downloaded.

Supportive policies for the Guidelines for Ethical Assurance in RDI-projects

EU/national/local: Require the use of these guidelines (or similar ethical guidelines) in RDI-projects. The ethical guidelines used in BuildERS can serve as an orientation for other RDI-projects and a starting point for developing standard frameworks of ethical principles. The BuildERS ethics approach provides a basis for improving the involvement and representation of vulnerable people who are often overlooked or neglected in vulnerability assessment and emergency preparedness planning (D4.4; D2.2).

7. Guidance for national- and EU-level innovation policy

This section goes beyond BuildERS-specific innovations to give some general guidance on how innovation policy can be shaped for enhancing resilience. Although BuildERS does not speak directly to national and EU innovation strategies, some reflections are nevertheless useful regarding how such policies affect resilience. It is also worth noting that following a disaster, the political climate may be conducive to generating legal, economic, and social innovations to reduce structural vulnerabilities (DoA, p. 18).

Innovation can help or hinder resilience, depending on how and why it is funded and developed. Innovation can, for instance, undermine resilience by increasing inequalities, if the gains of a certain innovation are privately accumulated and/or if the innovation is implemented in a way that undermines workers' wages or working conditions. Furthermore, if an innovation is available to those who already benefit from socio-economic advantages and is not available to people with lower incomes, it can exacerbate existing inequalities. There are many ways in which innovation can undermine resilience by eroding social capital and increasing vulnerabilities. Therefore, innovation policy needs to be crafted and implemented carefully in order to strike the right balance between the EU's dual objectives for innovation policy of enhancing peoples' quality of life in Europe and also helping actors remain competitive in a global market. The drive for economic competitiveness may dominate goals – and ignore the effects on vulnerability. Policies that prioritize economic concerns over social needs can lead to undesirable consequences, not only for vulnerable people, but also for society at large.

Given this starting point, here are nine suggestions for how innovation policy – and societal/governmental policies more generally -- can keep innovation from eroding resilience and can encourage innovation that builds resilience before, during, and after a disaster strikes.

1) **Fund follow-on research projects to BuildERS,** to gain a further understanding of the causes of vulnerability and resilience in different contexts as well as to develop innovations that address vulnerabilities before, during, and after a crisis. This includes ways of identifying key characteristics that help communities recover from disasters, as well as gaining a better understanding of the complex cascading effects of the disruptions caused by disasters.

2) **Provide additional support for publishing and disseminating these scientific findings and innovations** to a wide group of intermediaries and stakeholders (e.g., social care organizations, journalists, policy-makers) in different languages, and to gather regular feedback.

3) **Evaluate how existing innovation policies, investments, and proposals for new innovation policies may exacerbate inequality, and have the related effect of undermining resilience and social capital.** Along these lines, 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. This means paying special attention to whether innovation investments will help ensure everyone's basic needs are being met. Use tools such as BuildERS' Vulnerability

Assessment Tool, the Doughnut Economy model (Raworth, 2017), a universal needs dashboard of indicators (e.g., Max-Neef et al., 1991), and/or a holistic dashboard of public health indicators (i.e., including physical, mental, and environmental health) to evaluate innovation investments both before and after investments have been made. Special attention should also be paid to whether innovations will increase levels of inequality or potentially decrease inequalities (for example, by increasing accessibility to resources or increasing connections in a community). Such an assessment should include taking into account 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.[9]

4) **Promote (or even require) open-source and open-access technologies**. Use taxes, fees, or other policy instruments to discourage and/or limit the use of patents for profit-maximization alone.

5) BuildERS findings show that there are many not-for-profit organizations that were extremely innovative in response to the pandemic, even without governmental support (Orru et al., 2021; D2.2). **Consider innovation policies that prioritize not-for-profit companies in bids for innovation funding.** As they are prohibited from privately distributing profit (i.e., nondistribution constraint), they do not tend to concentrate wealth and contribute to inequality in the same way that for-profit companies do. Furthermore, their legally-enforceable focus on addressing vulnerabilities and building social capital helps increase resilience. Using innovation policy to contribute seed funding to such efforts could go a long way to building resilience in European communities.

6) BuildERS findings show that existing social capital plays a central role when a disaster strikes (Morsut et al., 2021). We recommend that **innovation policies, broadly crafted, include investment in building social capital.** This includes providing spaces and opportunities (e.g., events) where communities can come together and build interpersonal connections. These spaces should be especially available and open to people in vulnerable situations, as the more connections they can make, the better they will weather any unforeseen crisis. Innovation can play an important role here. This can include funding or otherwise supporting, for instance, makerspaces, places where people can come together to share tools and build, make, and repair things.

7) As for resilience-building measures, **innovation policy more broadly should use more transparent and inclusive budget decision-making systems (i.e., participatory budgeting), in order to decide how best to spend public innovation budgets**. Make sure intermediaries for vulnerable people (e.g., social service providers and care organizations) are at the table.

8) **Make transdisciplinary and participatory research and innovation development more prevalent**. A higher level of participatory inclusion helps make research and innovations (and related policies) more relevant to practitioners. This can be

---

[9] These stakeholders are taken from the Social Lifecycle Assessment methodology, developed by UNEP (UNEP, 2020)

accomplished by enabling a structured, ongoing dialogue between innovation-related stakeholders. The process innovations offered above by BuildERS could help achieve this.

9) Research (and experience) shows that innovation for resilience projects are often focused on short-term, quantitative outputs that are easily countable (Wirkierman et al., 2018). However**, innovation for resilience must inherently have more of a focus on the long-term impacts in more qualitative terms**. The key questions that should be asked about national and EU-level innovation policies include:

- Are innovation investments going to where they are most needed in order to increase the resilience of European communities?

- Are we investing in the right kinds of innovation for disaster prevention and management?

8. Conclusions

This report presented key innovations that were developed and/or used in the BuildERS project in order to improve community resilience before, during, and after disasters. These include process, market, and research innovations. The process innovations described in the report include: the BuildERS Vulnerability Assessment Tool, the Inclusive Crisis Communication Canvas, Guidelines for Collaborating with Social Media Influencers, a board game to give children disaster preparedness skills, a protype of a first responder training program for inclusive communication, a cost-benefit analysis framework to support decision-makers in using technologies in crisis management, and ethical guidelines for policy formulation. The market innovations are those that can be used and/or further developed by market actors, and include: a natural disaster mapping tool, the Mobile Positioning Dashboard, and the SaveMyLife mobile application. Lastly, we presented one research innovation, the Guidelines for Ethical Assurance in RDI-projects, which can be used by those involved in research projects that include multiple stakeholders, like BuildERS has. Specific policy recommendations were offered in order to support the effective and ethical use of each of these innovations at the local, national, and EU-level. Lastly, we outlined nine key points of guidance that can help ensure that national and EU-level innovation policy increases resilience.

9. References

Demeritt, D., Nobert, S., Cloke, H.L., Pappenberger, F. (2013) The European Flood Alert System and the communication, perception, and use of ensemble predictions for operational flood risk management. *Hydrological Processes, 27*, 147-157.

Enke, N., Borchers, N.S. (2019) Social Media Influencers in Strategic Communication: A Conceptual Framework for Strategic Social Media Influencer Communication. *International Journal of Strategic Communication, 13*, 261 - 277.

Ergas, H. (1986) 'Does Technology Policy matter?' CEPS papers No 29, Brussels, Centre for European Studies.

Fagerberg, J., Mowery, D., Nelson. R. (eds.) (2004) The Oxford Handbook of Innovation, Oxford: Oxford University Press.

Gouardères, F. (2021) "Fact Sheets on the European Union: Innovation Policy", European Parliament website. Accessed March 7, 2022. https://www.europarl.europa.eu/factsheets/en/sheet/67/innovation-policy

Hansson, S., Orru, K., Siibak, A., Bäck, A., Krüger, M., Gabel, F., Morsut, C. (2020) Communication-related vulnerability to disasters: A heuristic framework. *International Journal of Disaster Risk Reduction, 51*, 101931. https://doi.org/10.1016/j.ijdrr.2020.101931

Insta Group Oy (n.d.) "Preparedness and Crisis Management Exercises", Insta website. Accessed March 14, 2022. https://www.insta.fi/en/services/national-security/exercise-activities

Jordan, A., Huitema, D. (2014) Policy innovation in a changing climate: Sources, patterns and effects, Global Environmental Change, Volume 29, 2014, Pages 387-94, ISSN 0959-3780, https://doi.org/10.1016/j.gloenvcha.2014.09.005.

Max-Neef, M., Elizalde, A., Hopenhayn, M. (1991) *Human Scale Development: Conception, Application, and Further Reflections*. Uppsala, Sweden: Dag Hammarskjöld Foundation, Apex Press.

Kuran, C. H. A., Morsut, C., Kruke, B. I., Krüger, M., Segnestam, L., Orru, K., Nævestad, T. O., Airola, M., Keränen, J., Gabel, F., Hansson, S., Torpan, S. (2020) Vulnerability and vulnerable groups from an intersectionality perspective. *International Journal of Disaster Risk Reduction, 50*, 101826. https://doi.org/10.1016/j.ijdrr.2020.101826

Morsut, C., Kuran, C., Kruke, B. I., Orru, K., Hansson, S. (2021) Linking resilience, vulnerability, social capital and risk awareness for crisis and disaster research. *Journal of Contingencies and Crisis Management*, 1468-5973.12375. https://doi.org/10.1111/1468-5973.12375

Morsut, C., Kuran, C., Kruke, B. I., Nævestad, T. O., Orru, K., Hansson, S. (2022) A critical appraisal of individual social capital in crisis response. *Risk, Hazards & Crisis in Public Policy*. https://doi.org/10.1002/rhc3.12236

Orru, K., M. Klaos, K. Nero, F. Gabel, S. Hansson, T.-O. Naevestad (under review) *Journal of Contingencies and Crisis Management.*

Orru, K., Nero, K., Nævestad, T., Schieffelers, A., Olson, A., Airola, M., Kazemekaityte, A., Lovasz, G., Scurci, G., Ludvigsen, J., de los Rios Pérez, D. A. (2021) Resilience in care organisations:

Challenges in maintaining support for vulnerable people in Europe during the Covid-19 pandemic. *Disasters, 45*(S1). https://doi.org/10.1111/disa.12526

Orru, K., Hansson, S., Gabel, F., Tammpuu, P., Krüger, M., Savadori, L., Meyer, S. F., Torpan, S., Jukarainen, P., Schieffelers, A., Lovasz, G., Rhinard, M. (2022) Approaches to 'vulnerability' in eight European disaster management systems. *Disasters*. https://doi.org/10.1111/disa.12481

Raworth, K. (2017) *Doughnut Economics: Seven Ways to Think like a 21st Century Economist.* White River Junction, VT: Chelsea Green Publishing.

UNEP (2020) *Guidelines for Social Life Cycle Assessment of Products and Organizations.* Eds. Benoît Norris, C., Traverso, M., Neugebauer, S., Ekener, E., Schaubroeck, T., Russo Garrido, S., Berger, M., Valdivia, S., Lehmann, A.,Finkbeiner, M., Arcese, G.. United Nations Environment Programme.

Vinnova (n.d.) Inspiration for innovation, Vinnova website: https://www.vinnova.se. Accessed March 14, 2022.

Wirkierman, A.L., T. Ciarli, M. Savona (2018) Varieties of European National Innovation Systems. Working Paper: ISI-Growth. http://www.isigrowth.eu/2018/05/19/varieties-of-european-national-innovation-systems/

Appendix A. Sources for innovation policy recommendations – BuildERS deliverables

BuildERS Common Vision Report

D1.2: Final report of the unified theoretical framework on the concepts of risk awareness, social, capital, vulnerability, resilience and their interdependencies

D1.3: Report on segments of vulnerability country by country basis – inside and outside the official data

D1.4: Communication behaviour in Europe and vulnerabilities - understanding communication-related vulnerability and resilience in crises

D2.2: Case country analyses and a cross-country comparative analysis of the functioning of disaster resilience systems D4.4 Reducing social vulnerability by innovative data fusion for more informed rescue prioritization

D2.3: Social media campaign analysis and governments' responses to disinformation

D2.4: Catalogue of tools, technologies and media opportunities for disaster management

D2.5: Institutional arrangements in resilience and disaster management

D3.2: Pre-test report

D3.5: Observations for Draft Policy and Other Measures in Building Resilience for the Severely Vulnerable Populations

D4.1: Managing chemical spill emergency and mis-/disinformation through simulated responses

D4.2: Vulnerability in post-disaster temporary housing

D4.3: Applying mobile positioning data for more precise rescue planning and emergency management under cyber-hazard in Estonia

D4.4: Reducing social vulnerability by innovative data fusion for more informed rescue prioritization

D4.5: Impacts of Elbe flooding disasters on socially underprivileged groups and lessons for resilience improvement

D4.6: Reducing the vulnerability of homeless people in Washington D.C. through more-informed humanitarian policy, first respondent operations protocols and communication measures, and higher social allocations

D4.7: Using mobile operators' data to locate, protect and evacuate tourists and other vulnerable groups in disasters

D4.8: The policy and practice innovations reducing vulnerability of European population to natural and man-made hazards

D5.1: Resilience policy recommendations – First report

D5.4: Recommendations on resource allocation for addressing risks

D5.5: Recommendations on ethically acceptable technologies & tools to improve risk awareness & resilience in vulnerable circumstances

D6.2: Report on stakeholders' views of risk awareness, social capital and vulnerabilities

D6.4: End-user assessment of the new tools and technologies for disaster management

D6.5: Concept for disaster communication design

D6.6: Stakeholder validation of research findings and co-creation of innovations

D7.3: Ethics assurance for case studies

D7.4: Ethics assurance for stakeholder forum

D8.4: Board game

D8.5: Sustainability report

Appendix B. Ethical considerations for policy recommendations

The table below comes from D7.4.

Recommendation	
… **Addressee of the recommendation:** …	
Justice and Participation	
PROCESS-RELATED: Who was not included in the development of the recommendation and for what reasons?	*e.g. Was the recommendation only discussed with representatives of XYZ from one specific local or national context?*
Who could be discriminated against by this recommendation or the targeted actions?	*e.g. Does the recommendation for instance relate to those who are unreported and do not engage with authorities in order to prevent a worsening of their situation?*
How is it ensured that those affected by the recommendation are able to participate or are represented in decisions about them?	*e.g. Does the recommendation outline any guidelines on who has to be included in decision-making processes and to which extent?*
If unequal treatment follows from this recommendation or the associated action, how is it legitimated?	*e.g. Does the recommendation focus on and promote only the needs of a certain group? How is this justified?*
Responsibility and Accountability	
Based on which arguments are responsibilities shifted or attributed?	*e.g. Is the recommendation vulnerable to misuse due to power hierarchies, ignorance or arbitrariness?*
Through which measures are people informed about their responsibilities?	*e.g. Does the recommendation include any measures about ensuring affected people being informed about the responsibilities they have to fulfil?*
How do the recommendation and the associated actions ensure that people are able to fulfil responsibilities that are attributed to them (conflicting responsibilities, insufficient capacities)?	*e.g. Does the recommendation take into account that people have to have the capacities to be able to fulfil attributed responsibilities?*
Freedom of Choice and Autonomy	
How are people informed about the consequences of their actions (what does "misbehaviour" lead to)?	*e.g. Does the recommendation structure the information for affected persons in order to allow them to make conscious and reflective decisions?*
How does the recommendation ensure a certain degree of freedom from external pressures (including structural, systemic, and peer pressure)?	*e.g. Does the recommendation take into account that structural pressures might hinder people from acting in their own interest?*
How does the recommendation support people in taking autonomous decisions (in their own interests) if they are not capable of taking decisions on their own?	*e.g. Does the recommendation take into account those citizens that might not be able to take decisions in their interest on their own?*
Trustworthiness and Transparency	

How are rules of processes and power hierarchies made transparent?	*e.g. How does the recommendation consider that strategies and actions are made transparent and open for criticism?*
How does the recommendation try to ensure that mistakes or shortcomings are made transparent?	*e.g. How does the recommendation support self-reflection on the actions taken and a public involvement in the adjustment? If it doesn't, why not?*
How does the recommendation 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 recommendation?*
Privacy and Data Protection	
How are personal data protected?	*e.g. If the recommendation recommends the use of personal data, which standards and limitations are provided for their use?*
Does the recommendation refer to measures to prevent misuse of data?	*e.g. If the recommendation suggests using personal data, does it outline measures to be taken to prevent misuse by third parties (e.g. access regulation)?*
What effect might the recommendation have on the privacy of individuals?	*e.g. To what extent might the recommendation and the associated actions lead to limitations of individual privacy and how are they justified?*

Appendix C. Ethical Guidelines for Policy Formulation

The table below comes from D7.4.

Recommendation	
Addressee of the recommendation: …	
Justice and Participation	
PROCESS-RELATED: Who was not included in the development of the recommendation and for what reasons?	e.g. Was the recommendation only discussed with representatives of XYZ from one specific local or national context?
Who could be discriminated against or stigmatized by this policy?	e.g. Does the policy for instance discriminate or stigmatize those who are unreported and do not engage with authorities in order to prevent a worsening of their situation?
How is it ensured that those affected by the policy are able to participate or are represented in decisions about them?	e.g. Does the policy outline any guidelines regarding who has to be included in decision-making processes and to which extent?
If unequal treatment follows from this policy or the associated action, how is it legitimated?	e.g. Does the policy focus on and promote only the needs of a certain group? If so, how is this justified?
Does the policy ensure that information is communicated in an accessible non-stigmatizing way through various channels to make sure that most people are reached?	e.g. Is information spread via TV, newspapers, radio, social media, care organizations, etc?
Responsibility and Accountability	
Based on which arguments are responsibilities shifted or attributed?	e.g. Is the policy vulnerable to misuse due to power hierarchies, ignorance or arbitrariness?

Through which measures are people informed about their responsibilities?	e.g. Does the policy include any measures about ensuring that affected people are informed about the responsibilities they have to fulfil?
How do the policy and the associated actions ensure that people are able to fulfil responsibilities that are attributed to them (conflicting responsibilities, insufficient capacities)?	e.g. Does the policy consider that people have to have certain capacities to be able to fulfil attributed responsibilities?
Does the policy avoid placing individual responsibility at the center of resilience-building?	e.g. Does the policy contribute to responsibility between state and citizen? Who has more responsibility?
Freedom of Choice and Autonomy	
How are people informed about the consequences of their actions (what does "misbehaviour" lead to)?	e.g. Does the recommendation structure the information in a way that allows affected persons to make conscious and reflexive decisions?
How does the policy ensure a certain degree of freedom from external pressures (including structural, systemic, and peer pressure)?	e.g. Does the policy consider that structural pressures might hinder people from acting in their own interest?
How does the policy support people in taking autonomous decisions (in their own interest) if they are not capable of taking decisions on their own?	e.g. Does the policy take into account those people that might not be able to take a decision in their interest on their own?
Trustworthiness and Transparency	
How are rules of processes and power hierarchies made transparent?	e.g. How does the policy consider that strategies and actions are made transparent and open for criticism?
How does the policy try to ensure that mistakes or shortcomings are made transparent?	e.g. How does the recommendation ensure self-reflection when actions are taken, as well as a public involvement in possible policy adjustment? If it doesn't, why not?
How does the policy 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 policy?
Privacy and Data Protection	
How are personal data protected?	e.g. If the policy recommends the use of personal data, which standards and limitations are provided for their use?
Does the policy refer to measures to prevent the misuse of data?	e.g. If the policy involves the use of personal data, does it outline measures to be taken to prevent misuse by third parties (e.g. access regulation)?
What effect might the policy have on the privacy of individuals?	e.g. To what extent might the policy and the associated actions lead to limitations on individual privacy and how are they justified?
Beneficence and Non-Maleficence	
Does the policy ensure that the situation of those most vulnerable is better than before?	e.g. Under which conditions might the policy not lead to an improvement to existing measures/procedures/strategies?
Might the policy lead to individuals suffering more with the policy than without it?	e.g. Under which conditions might the policy lead to worse conditions for those whose situation it should improve?
How does the policy support a balance between benefits and costs?	e.g. Under which conditions might the costs overwhelm the benefits that were aimed at?

Vulnerability	
Is the policy based on knowledge about vulnerability and risks?	e.g. Is it based on vulnerability assessments?
If the policy is based on vulnerability assessments or risk assessments, what did these consider?	e.g. Did the assessment approach vulnerability from an intersectional perspective? Does it include quantitative and qualitative data?
Does the policy account for the interplay of individual, socio-structural and situational factors of vulnerability?	e.g. What is its influence on societal inequalities? Or does it target the situational vulnerability (e.g. exposure) only? Does it consider vulnerability as a dynamic condition?
Does the policy include guidelines for how to address vulnerability?	e.g. Does it include guidelines for those who implement the policies on how to prevent stigmatization and ensure accessibility?
Social support networks	
Does the policy promote cooperation between disaster management and social service providers?	e.g. Does it promote knowledge exchange on who is vulnerable and how they can best be reached?
Does the policy place most responsibility on social support networks? Are there alternatives for those who don't have a strong social support network?	e.g. Which authorities can support those who do not have a strong social support network?

CONTACT US

www.buildersproject.eu

@BuildERS_EU

https://www.facebook.com/Builders-2762442730463980/

https://www.linkedin.com/company/builders-h2020