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Chapter

Improving Risk Communication Strategies through Public Awareness and Engagement: Insights from South Tyrol and Carinthia

Lydia Pedoth, Fabio Carnelli, Gernot Koboltschnig, Paul Krenn, Anna Rudloff, Willigis Gallmetzer, Pierpaolo Macconi and Nicola Marangoni

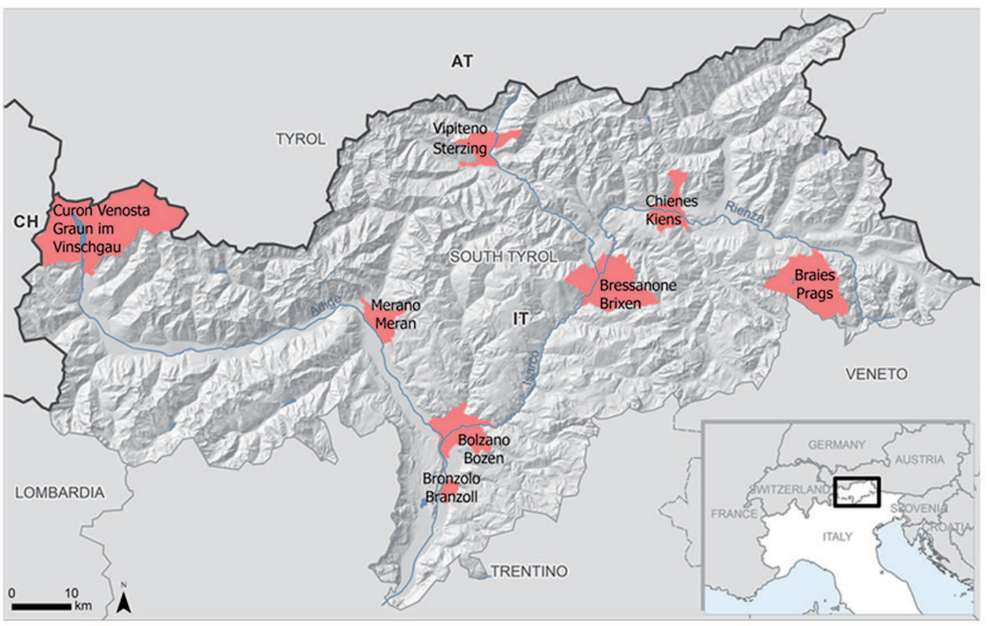
Abstract

This chapter presents experiences and results from the INTERREG Italy-Austria Project RiKoST-Risk communication strategies. The project is a collaboration between partners from research and public authorities and aims at improving target-group-oriented risk communication in South Tyrol (Italy) and Carinthia (Austria). Risk communication plays an essential role for risk governance and may address different aspects and fulfill various purposes, from informing about natural hazards, generating acceptance and awareness for structural and non-structural measures, to triggering participation, increasing resilience, and supporting the development of a risk-competent society. To be effective, risk communication needs, firstly, to acknowledge the needs of different target groups and, secondly, to develop approaches, tools and contents that are most suitable to reach and involve them. This chapter describes the results from different activities carried out in the project: a population survey to better understand people's risk perception and their knowledge about natural hazards, the information channels they use and trust; awareness raising activities in different municipalities; interactive lessons and a workshop in schools; stakeholder workshops. Our results show that that existing non-structural protection and prevention measures, especially Hazard Zone Plans, are little known among the population, that trust in the responsible authorities is high and that there is a need for a risk dialog through different risk communication activities at different stages to provide targeted information on how individual citizens can contribute to risk management. The chapter concludes on how the presented results can be used by public authorities and policy makers to innovate risk communication strategies and to initiate a risk dialog with the overall aim to improve risk governance at local level.

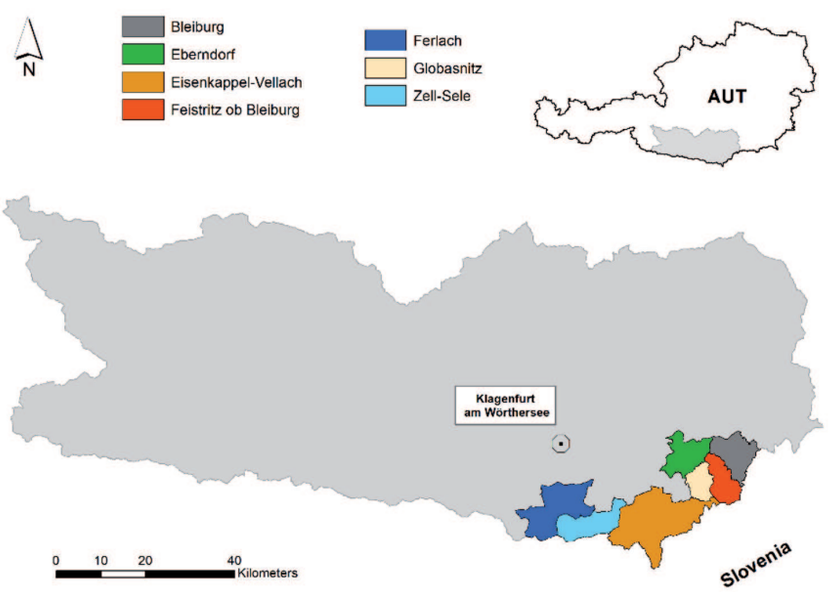
Keywords: risk communication, risk perception, natural hazards, risk governance, public awareness

1. Introduction

Ecosystem-based approaches to Disaster Risk Reduction (Eco-DRR) have multiple social, economic, and environmental benefits and their implementation needs "an inclusive, "all-of-government" and "whole-of-society" approach" [1] to ensure its legitimacy. Eco-DRR entails combining natural resources management approaches, or the sustainable management of ecosystems, with Disaster Risk Reduction (DRR) methods, such as early warning systems and emergency planning, to have more effective disaster prevention, reduce the impact of disasters on people and communities, and support disaster recovery [2]. This chapter presents experiences, results, and good practices from the INTERREG Italy-Austria project



Source: Map created by Eurac Research based on data by the Autonomous Province of Bolzano, 2020



Source: Regional government of Carinthia

Figure 1.
The RiKoST pilot municipalities in South Tyrol (above) and Carinthia (below).

RiKoST (Risk communication strategies) that aims at improving risk communication strategies for an inclusive risk governance. Indeed, risk communication should not be solely intended as a separate phase of risk management but something necessary throughout the whole risk cycle (see chapter [3] of this book) to make risk governance inclusive and effective [4]. Communication can be conceived as "meaningful interactions in which knowledge, experiences, interpretations, concerns, and perspectives are exchanged" [4] in every phase of the risk cycle, depending on different levels of complexity, ambiguity, and uncertainty. It is not only an external tool to inform or gather people, rather it is the core of risk governance, based on social learning among decision makers, stakeholders, and the public. Namely, risk communication can be structured into four components: the source of communication, the content, the communication channel, and the target group [5]. Furthermore, there is no universal strategy for risk communication, but it must be adapted to the specific context and target group. Many authors [6–8] agree that the use of maps can significantly contribute to the success of risk communication. In [6] authors even argue that maps are a fundamental tool for informing the population and justify this with the possibility of raising risk awareness, promote personal responsibility and communicate residual risks. In general, one of the prerequisites for successful dialog-based risk communication is that both the public and decision-makers are actively engaged in a social learning process [9]. Thus, to improve risk communication and foster a risk dialog, an understanding of risk perceptions among the public and of patterns of risk communication among risk governance agencies is necessary [10]. These assumptions were the premises for the RiKoST project. The project is a collaboration between partners from research and public authorities and aims at improving target-group-oriented risk communication in South Tyrol (Italy) and Carinthia (Austria) and to develop innovative measures and tools to disseminate technical content in a clear way, to raise awareness and to establish a process of dialog between institutions and population.

Within the scope of the project, 13 pilot municipalities in South Tyrol and Carinthia have been selected where different activities have been implemented. The selection includes both urban and rural municipalities, municipalities that have recently experienced a natural hazard event and municipalities that did not, and municipalities that have an approved hazard zone plan (HZP) and others without. In South Tyrol HZPs are a recently introduced legal binding planning instrument developed at municipality level, in collaboration with professionals and departments of the provincial administration. In 2018, when selecting the pilot municipalities for the project about half of the municipalities had an approved hazard map. **Figure 1** shows the pilot municipalities, in the following subsections the activities that have been implemented in these municipalities are described in more detail.

2. Questionnaires to better understand peoples' knowledge and risk perception linked to natural hazards

To improve risk communication strategies or to develop new ones, it is important to better understand the population's knowledge about natural hazards, how they perceive risks from natural hazards, but also which communication channels they use and how they think risk management can be improved. The topics of knowledge, risk perception, and action are closely linked and important issues to be considered in the context of risk communication. For this reason, the project has developed a questionnaire on these described topics (**Figure 2**). The questionnaire consisted of 42 questions of different types (closed questions, multiple choice questions, open questions) and was divided into the following 4 topics: 1) knowledge about natural

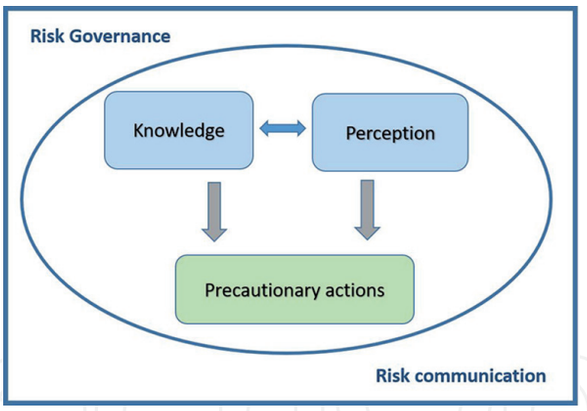


Figure 2.
Framework of the questionnaire.

hazards and existing protective measures (protective structures, emergency and hazard zone planning), 2) risk perception (feeling of safety, perceived probability of being affected, responsibilities), 3) used and preferred communication channels, and 4) suggestions for improvement measures in the field of risk management. To answer the questionnaire, a representative sample of the population in the pilot municipalities in South Tyrol was contacted by telephone. In Carinthia, the questionnaire was sent by post to the inhabitants of the pilot municipalities. A total of 2282 questionnaires were answered (1410 in South Tyrol and 872 in Carinthia).

Results show that in both regions existing protection and prevention measures, especially HZPs, are little known among the population and many citizens would like to be better informed about them. Regarding the role of citizens and institutions, the results showed that citizens clearly think that the responsibility for risk prevention and recovery lies with the public authorities and that they generally have great trust in the institutions. In Carinthia, the most important actor is considered to be the municipality, while in South Tyrol it is the Province. In South Tyrol, 38.1% of respondents think they have basic self-rescue knowledge and 44% of respondents think they are not prepared in case of an event but can rely on institutions. In terms of engagement in risk prevention measures, in South Tyrol on average one third of the interviewed citizens think that they should have a more active role in risk prevention, while in Carinthia even half of the respondents' state this. As far as risk communication is concerned, the importance of mass media (TV, newspapers, radio but also the websites of municipalities and the Province) as reliable sources to receive information about natural hazards and risk has been recorded in both regions; the request to use e-mail, SMS and social media (but also brochures/flyers) to get such information has also emerged, always followed by television as the preferred means of communication. It should be noted that in those municipalities where before RiKoST other projects and initiatives have already been implemented with the participation of citizens, such as public hearings, information events or lessons with natural hazard experts in schools, it was found that citizens are better informed, more sensitized to these topics and do prefer a more active role by the citizenship. When we look at the responses of citizens on what measures they think could improve natural hazards management, we see that in South Tyrol as well as in Carinthia, the most frequently mentioned measures come from the field of information and education followed by the suggestion to promote ecosystem-based solutions such as protective forests. **Figure 3** shows in detail the results of the South Tyrolean survey.

Finally, the results showed that in municipalities that have recently experienced an event, there is a greater sense of insecurity and local population more often feel that existing measures and policies are not adequate to protect them from the impacts of natural hazards.

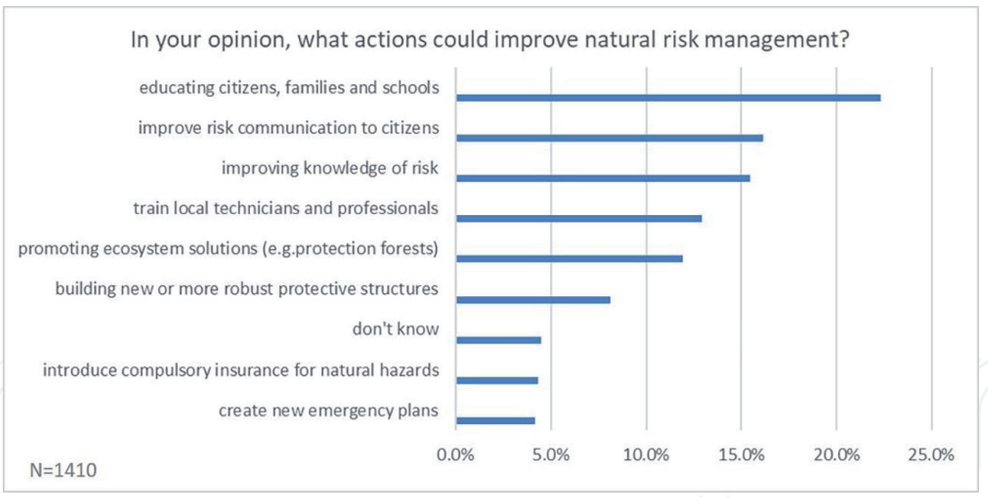


Figure 3.
Results from the population survey in 8 municipalities in South Tyrol.

3. Actions in the communities

In the pilot municipalities in South Tyrol within the framework of RiKoST, different awareness-raising activities have been undertaken: an information day and school actions, both including virtual reality (VR) activities, and an evening information event for citizens in each pilot municipality. In the pilot communities in Carinthia, stakeholder workshops with citizen representatives, local experts, relief units and representatives from local administrations were held to develop local operational plans in a participatory process. Different sources of communication, communication channels, contents, and target groups were thus used in the different actions: brochures, VR glasses with 3D videos about local natural hazards and hazard events, informal talks, maps, classes with historical local pictures and theoretical contents, online meetings and discussions, a game-based workshop, and stakeholder workshops. Different target groups were involved: mayors, citizen, local experts, members from relief units (fire brigade, police, emergency medical service), stakeholders from the tourism sector, middle and high school students. The aim of the different kind of actions was twofold: to raise risk awareness and to explore new ways for generating a collective change in understanding and tackling risk [11].

3.1 On the move in the streets and squares

Like the project slogan "If you know the risk, you know what to do!" well highlights, at the heart of the project lies the assumption that a kind of communication that directly reaches citizens, can raise risk awareness, and initiate a process of knowledge exchange on natural hazards and their management. What we called the "Scouts on the Road" campaign was an information day in the pilot municipalities, where two previously trained students, acted as "scouts", together with one or two representatives of the project, were out and about in the streets and squares. There they were talking to people, informing them about the project and the topic of dealing with natural hazards, answering questions, and giving them the opportunity to try out the VR glasses on which both HZPs and natural hazard events were simulated thanks to virtual reality. This made it possible to realistically visualize the potential impact of natural hazard events on buildings and cities in South Tyrol (**Figure 4**). In virtual reality, the intensity and probable location of hazardous events can become tangible to explore over time and space both prevention

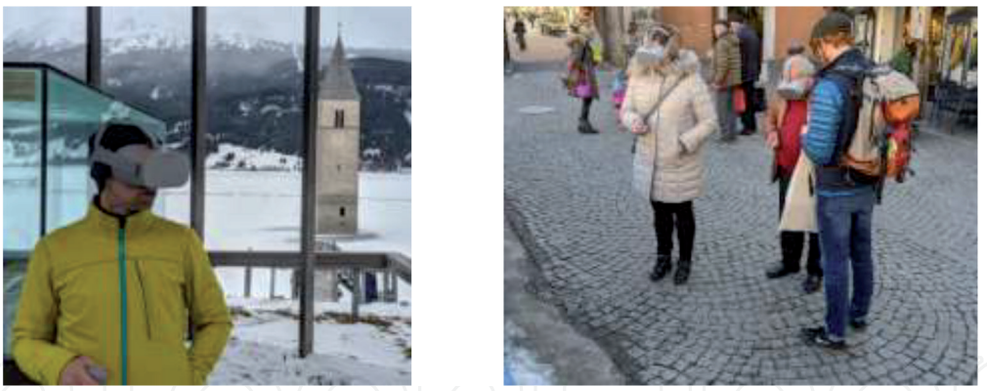


Figure 4.
Pictures from awareness raising activities with the help of VR glasses.

measures and possible impacts. During this campaign, we observed how VR glasses were highly appreciated among the 219 people we met; what was unfortunately not well known were HZPs, while the knowledge of local natural hazards was higher in smaller municipalities than in bigger ones, excluding tourists, who resulted in having a very low risk awareness. Our experiences during the actions and our discussions with the participants have shown that the issue of risk communication is not a particular concern. In comparison, the interest and openness of the participants was greater in small communities than in large ones.

3.2 Activities in primary and middle schools

In the context of the growing attention on risk communication, the role of children and young people have been strongly emphasized by social scientists in recent years. Young people are not only often regarded as considerably vulnerable to disasters [12, 13] but it is also demanded to support their empowerment as active agents in prevention, response, and recovery [13, 14]. Students have also the potential to transmit knowledges to their peers and families, thus working as amplifier in terms of awareness raising and peer education. Furthermore, environmental education has been recently introduced in Italian schools as compulsory class to raise awareness on issues, which can have a link to natural hazards and related risk, especially in terms of climate change adaptation. For these reasons, two different kinds of activities were undertaken in schools: a) classes designed within RiKoST about natural hazards and possible prevention measures (such as the local hazard zone plans) and implemented in 8 schools, and b) a pilot simulation game with 33 high school students from one school of Vipiteno (one of the pilot municipalities of the project) (**Figure 5**).

The main activities took place between September 2019 and February 2020 and were carried out by two scouts and one or two representatives of the project partners. The schools were chosen in the 8 pilot municipalities involved, including middle and high schools and both Italian and German schools. In total, 291 students were involved in the activities. After a short introduction to the project, the classes included essentially three main components: a frontal class, the use of VR glasses, and a practical and interactive explanation of HZPs. At the end of the lesson, the students also received cardboard glasses with a QR code that allow them to watch the 3D videos on their mobile phones.

In terms of impact on the students, results from a short survey answered by the students showed that the classes were clearly understandable and gave a good overview of natural hazards. The VR glasses were much appreciated because they have been considered as useful to better understand maps and because they provide

Figure 5.
Pictures from school activities in South Tyrol.

a more realistic representation of potential local impacts of some natural hazards. Furthermore, they resulted to be a good tool to raise awareness in a more interactive way, and to address the link between risk perception, personal emotions, and believes. Finally, the use of local anecdotes, images and impacts of local events appeared to leverage senses of belonging and local knowledges.

Complementary to the described lessons, a simulation game was developed to explore if this type of action can contribute to risk communication towards young people, also in the broader context of the nexus between natural hazard risk management and sustainable development. Simulation games are recognized as favorable method in disaster and sustainability education (e.g., see [15, 16]). At the core of the simulation game was a scenario in which students took over different roles of a fictitious community (e.g., farmers, hotel owners, students) and discussed their local HZP and practical consequences based on predefined conflicting needs and aspirations and with a limited budget. The simulation game-based teaching module was tested in a pilot workshop in Bolzano with 33 students between 15 and 16 years old. It consisted of an introductory briefing phase, a simulation phase, and a debriefing phase for reflection.

The qualitative analysis of the method confirms that the developed simulation game contains different characteristics of transformative pedagogic practice[1]. It allows to experience natural hazard risks in an interdisciplinary manner as an example for complex and contested human-environment relations in mountain regions. Further, it encourages young participants to get involved with individual knowledge, experiences, and ideas. Finally, critical consciousness can be supported by experiencing and reflecting upon the role of power structures in decision-making processes on human-environment relations. Regarding objectives of risk communication, young people participating in the simulation game may increase their risk awareness through controversial discussions on natural hazard risks as a locally relevant societal challenge. Further, a comprehensive understanding of hazard risks and related challenges can be a prerequisite for making informed decisions. Although the study indicated that the developed simulation game holds potential to contribute to transformative natural hazard risk education, it also depends on the performance of the facilitator and the integration of the module in the local educational system and running teaching practice. For South Tyrol it has

[1] Transformative pedagogic practice is approached by the three indicators weak framing (i.e., strong student orientation), weak classification (i.e., weak disciplinary boundaries), and a learning environment that encourages critical consciousness [17, 18].

been concluded that the module could be integrated best in geography education or as an extracurricular workshop.

3.3 Evening information events for citizens

As a further action, the project organized evening information events, in cooperation with the mayor, councilors and/or technicians of the municipality to better fit the event to local needs. As an introduction, a representative of the Agency for Civil Protection presented the natural hazard situation in the respective community and recalled past events with the help of historical photos. In some municipalities, ongoing or planned projects for the construction of protective measures were also presented. The results of the survey for the respective municipality were then presented to the citizens. Afterwards, a joint discussion was promoted between experts, project representatives and citizens to identify possible improvements in risk communication. The discussions were sometimes hindered by the online mode of the meeting, which resulted in being the first of this kind among some municipalities and which was forced by the Covid-19 pandemic. In general, participation was higher in smaller municipalities, maybe due to a better engagement of citizens via direct information sources. During the informative evenings, some proposals were suggested and discussed to improve the involvement and role of citizens in risk prevention, especially in terms of non-structural measures. The positive role of institutions and the need to work more on what citizens "can really do" were stressed: improving knowledge of the local area and promoting actions in schools were brought up as topics to be fostered and further developed. In this regard, the role of historical memory and concrete actions to transmit the local history of the territory into the present were also brought to attention. During these events, the importance of easily accessible information, regular information events, and broader training and education in schools were highlighted as measures for the future to increase knowledge and awareness about natural hazards.

3.4 Involving stakeholders in flood risk management workshops

In case of flooding, operation checklists aim to support local authorities and relief units [19]. In contrast to common emergency plans, these checklists contain specific information and guidelines for authorities and relief units for disaster mitigation [20]. Flooding "hotspots" are identified based on hazard maps and potential damages can be minimized with prepared mitigation strategies. Especially in municipalities where structural measures cannot be realized soon due to financial bottlenecks, operation checklists are a valuable addition to concentrate available resources in time as well as to identify critical/vulnerable places, and to minimize potential disaster caused damages [19, 21]. Operation checklists are based upon 2D-hydraulic model results of critical flood levels and intensities (scenarios) where a significant increase of damage potential can be observed. In the pilot municipalities in Carinthia the modeled results were discussed with local stakeholders (e.g. citizen representatives, local experts), authorities, relief units (fire brigade, police, emergency medical service), and administrations (flood protection, road maintenance, railway, electricity, and water supplier) in a first (physical or virtual) workshop that aimed at reducing the number of relevant scenarios and considering potential counter measures based on their experiences and knowhow. A second stakeholder workshop aimed at designing detailed counter measures for each defined scenario. According to the stakeholder definition given in Ref. [22], the following actors should be part of the process: people who are a) legally involved in case of flooding and/or b) will practically use the checklist in the event of flooding (primarily district authority,

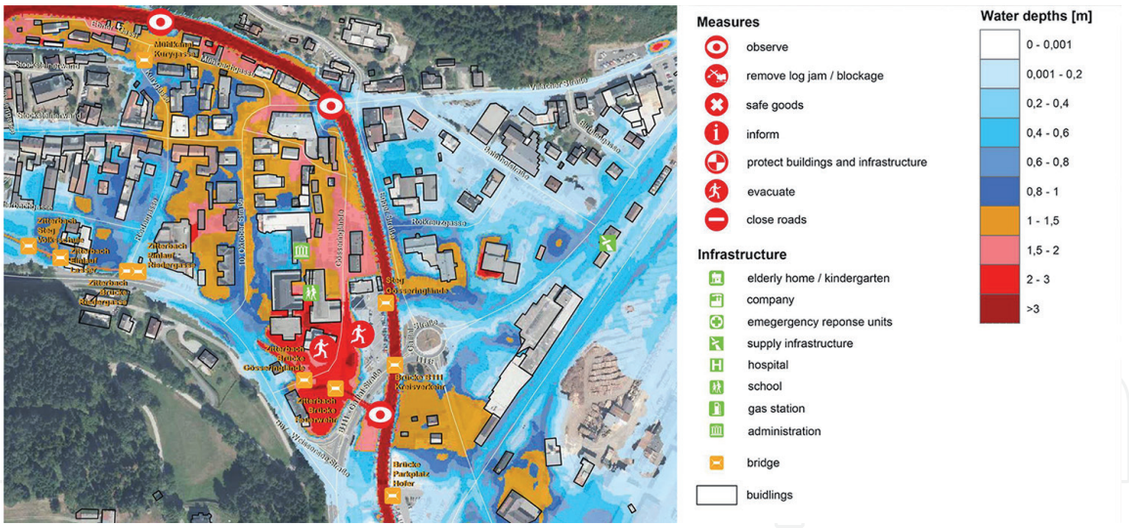


Figure 6.
Example of a map as part of an operation checklist (source: [19]).

mayor, operation controllers, relief units) and/or c) provide an essential technical input and/or d) are responsible for linking disaster control on regional and national levels and/or e) can support or block the initiative and/or f) are a representative of vulnerable groups (e.g. children, people in need of care).

The outcome of the workshops is a checklist divided into a textual part (descriptions) and maps. The relevant flood plains including prevalent water depths are mapped for each specific scenario. Additionally, these maps contain marks and labels about critical and sensitive infrastructure such as hospitals, nursing homes, schools, relief units, gas stations, etc. (**Figure 6**).

The specific markers represent local measures that are described in the textual part of the operation checklist. Moreover, the textual part of the operation checklist includes a) definitions of assumed scenarios, b) descriptions of effects and risks and c) lists and descriptions of necessary counter measures ("who does what, where, and when").

Over the past years, local stakeholders have been actively involved in the development of flood operation checklists. Local relief units, authorities and people who have witnessed major flood events added valuable information and insights in terms of their experiences, historic photographs, and personal and institutional event documentations. Having those local stakeholders involved, however, might be tricky at times since more careful handling than with experts is needed. Personal experiences have shown that organizers need to create an atmosphere where stakeholders are actively involved and can express themselves without being overstrained by too specific or technical information [23]. Hence, it is necessary to motivate and push stakeholders to actively participate in the workshops by making them aware of their personal advantage of reducing risk and potential damages caused by flooding. Past projects and results from RiKoST, however, have shown that with their knowledge these stakeholders provide an essential input during the workshops, especially when they are also actively involved in the actual disaster mitigation process.

4. Implications of results in practice and for policy making

The results of the surveys showed that especially the measures to train schools, families, and technicians are seen as the most important ones. As a result, contact has been established with the South Tyrolean school authorities and a training

course on natural hazards and risk prevention having teachers as target will be organized in the coming months. In addition, a 2-day training workshop for natural hazard practitioners will be held soon in South Tyrol, with a specific focus on risk communication.

Furthermore, our survey results have also shown that many people have an insurance for natural hazards without being aware of what is really covered by their policies. This aspect is now explicitly addressed in communication activities about natural hazards to make people aware that insurances are not enough, and additional mitigation measures are needed. For the stakeholder workshops in Carinthia, the findings of the opinion survey have already been integrated. But also, within the daily practice, when employees of the Carinthian administration dealing with natural hazards prevention are asked about protection measures by affected parties, these findings are integrated. It does not mean a huge change of administrative processes, but it mainly means to take use of a different wording. In detail, it is about to communicate:

- the specific problem of the potential natural hazard (detailed description of process and possible damages and losses),
- the probability based on documented events (even if it is only a historic newspaper article or an old picture) or on scientifically based calculations,
- that there is a problem without inciting fears (making aware but not urging),
- that the problem could affect vulnerable people (raising emotions),
- that building in endangered zones is strictly not recommended,
- self-responsibility by making people aware and support them, that even they and their contribution are part of a solution and
- residual risk by making aware, that mitigation measures are limited and bigger events with a lower probability can occur.

The process of a new risk communication has already started in Carinthia by teaching employees of the governmental administration in a first step and then to teach employees of municipalities (spatial planning and building authorities).

In both regions, our results clearly show that people do trust public agencies to apply proper methods to mitigate damages from natural hazards. This can reduce risk perception and have a negative impact on citizens' self-responsibility. For this reason, it is particularly important in risk communication to address and inform about what measures individual citizens can take and how they can better prepare and protect themselves. Indeed, in terms of risk prevention the results of the surveys and the activities carried out in South Tyrol have been supporting the development and design of a new web platform for knowledge exchange in the field of natural hazards that will be accessible also for the public and contain this type of information. This natural hazard platform will be available from October 2021.

In terms of innovative tools, the use of VR glasses resulted in being a good tool to raise awareness and to address the link between risk perception, emotions, and knowledge in a more interactive way. Simulation game approaches not only hold much potential to raise awareness for disaster risk but also empower underrepresented population groups, such as young people, for participation processes in natural hazard risk management. Eventually, this may be a keystone

for resilience-building. Nevertheless, the study on the transformative potential of simulation games in South Tyrol illuminated that the introduction of innovative approaches often faces numerous structural barriers, such as the educational system and culturally embedded pedagogic practice.

The project RiKoST gave the chance to develop and apply new methods, to evaluate them, to improve them and to give recommendations on how with to improve targeted risk communication strategies. The project related activities and experiences should not remain within the frame of a project, but as shown, they are triggering some potentially long-term risk communication activities and they should be taken up by practitioners and policy makers also in future and be integrated in institutional policies and initiatives. This is also the reason why it is so important in this type of project as RiKoST, that academic partners and partners from practice work together from the beginning, in the development and in the implementation, to enable sustainable changes.

5. Conclusions

Although the responsibility and availability of hazard maps is different in South Tyrol and Carinthia, the value of information concerning natural hazards risk is the same and both regions use hazard maps as a tool for risk communication. In Carinthia, flood operation checklists can be considered a refinement of hazard maps. They show hotspots of flood scenarios and spots where intervention measures can be most effectively applied. Effective operation checklists, however, do not only depend on the quality of maps, but they also strongly depend on stakeholders' engagement: if they have been properly involved into the elaboration process and they can acknowledge their own contribution in the final product. Our results from both regions show that it is important to use local anecdotes, local events, and local knowledge and to improve the understanding of maps.

Many of our results and experiences can also be transferred to other aspects of risk management, such as the role of protective forest or Eco-DRR (see chapter [24] of this book). One of our findings is that schools are an important actor for risk education. The topic of natural hazard and risk should become part of the school curricula and the education process and should also include topics such as Eco-DRR. The experiences and recommendations of the RIKoST project can also be applied to this field, namely, to undertake excursions in local contexts, for example by organizing an excursion with students to protective forest in the area. We realized that VR reality is a good tool to raise awareness and to start a discussion with students or citizens. A 3D video could for example visualize the role of protective forest by showing natural hazard scenarios with and without protective forest.

Just like the issue of natural hazards in general, Eco-DRR is not part of the everyday life of most citizens. Even though they might know the topic and consider it as relevant (see also results from **Figure 3**), they often do not have a concrete understanding of it or cannot imagine concrete measures that fall within its scope, cannot make a concrete connection to their immediate environment. Therefore, to raise awareness it is important to develop target specific messages and tools and to think about how they could be implemented and linked to other topics such as increase of life quality, landscape protection or sustainable development.

The main value of RiKoST was to set initiatives and to get into a risk dialog using different communication channels and contents for different targets, working with stakeholders and the public at a local "municipal" level. If stakeholders and the public are properly included in the process of risk communication, they will raise their awareness and increase the knowledge about their own responsibility and how

to respond to natural hazards. Improving risk communication and awareness is not the beginning of a process of reducing state responsibility but a process to build up effective local capacities to foster a social learning process, to promote a risk competent society which can rely on national and regional/provincial institutional support. Considering the aim of this volume the challenge for the future should be to include Eco-DRR measures, such as protective forests, into targeted risk communication actions.

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Conflict of interest

The undersigned hereby confirms that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work nor financial or non-financial interest in the subject matter or materials discussed in this publication that could have influenced its outcome.

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