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Contingency Planning in Alpine Regions

A comparative analysis of challenges, strengths and weaknesses between contingency planning and natural hazard management

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Contingency Planning in Alpine Regions

A comparative analysis of challenges, strengths and weaknesses between contingency planning and natural hazard management

FOREWORD

Author: Florian Rudolf-Miklau

The Alpine space is an attractive area to live, work and recreate in. The power of Alpine nature is beautiful and untamed at the same time, while humans were never able to control it. With the early settlement, an awareness of the special conditions of this mountainous environment was developed - its special advantages but also its dangers. Alpine hazards such as floods, mudflows, rockfalls and avalanches threatened the human habitat both then and now.

People in the Alps have learned from their experiences and are adapting to nature. Advances in technology, traditional local knowledge and the ever-increasing connectivity of our society provide a powerful motor for this adaptation to the Alpine environment and its hazards. An avoidance of risk and the preparation for catastrophic events is one of the great challenges of our daily life in the Alpine region. We build protective constructions made of wood, iron and concrete, promote ecological solutions and cultivate protection forests, inform our local population and support our decision-makers with expert knowledge to ensure a higher level of protection in the future.

But what are the consequences for us, if an extreme event is unforeseeable? What happens if our knowledge or financial resources are not sufficient to protect us from a catastrophic event?

Successful management of disaster events needs a good preparation and a well-established collaboration in the response phase. Contingency planners prepare plans at national and regional level that consider local knowledge, existing material resources and documentations of past events. In the response phase natural hazard management experts, with their professional knowledge and understanding of the hazard process, profit from an appropriate contingency plan.

Successful collaboration between contingency planners and natural hazard management experts is subjected to the task of translating the natural hazard as a scenario for contingency planning and improving the understanding of a disaster event as a situation in operational management.

The Natural Hazards Working Group of the Alpine Convention (PLANALP) is dealing with strategies for protection against natural hazards since 2004. Leading experts from all member states of the Alpine Convention exchange views on the protection of the population and the living environment discuss new developments and coordinate joint activities in the Alpine region. By means of these activities the working group strengthens national strategies, supports decision-makers and promotes the entire Alpine region as a forerunner in the management of natural hazards.

Over the last two years, PLANALP was mandated to investigate the question, what natural hazard managers can contribute to contingency planning and how to approximate and reconcile forecasting (planning) and response (management).

With this report, the interface between contingency planners and natural hazard managers is highlighted. The focus is on the translation of the knowledge available in contingency planning for the actors in natural hazard management and vice versa, and how the communication between these two groups can be improved in future. Not only strengths and weaknesses, but also similarities and differences between the various Alpine countries are emphasised, and recommendations for action derived from them.

Just as nature amazes us every day with its beauty, it sometimes hits us just as hard and mercilessly and presents us with challenges that we can only overcome together. This publication will help to improve natural hazard risk management in the future in the Alpine countries and to increase society's resilience to disaster events. The report provides a trend-setting basis for joint and coordinated efforts to protect the inhabitants and improve living conditions in the Alpine region.

My sincere thanks go to the members of PLANALP, who have made a valuable contribution to this report through their exemplary commitment under the currently difficult conditions caused by COVID-19!

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The successful avoidance and defence of disaster events, particularly with respect to the conditions of a changing climate, require a professional collaboration between risk managers and hazard planers in all phases of the hazard risk management cycle. While contingency planners mainly have to implement their expertise efficiently in the preparation phase, the hazard managers have to deal with the comprehensive effects of disaster events in the response and recovery phase.

Ideally, a lively exchange between all actors, e.g. by developing and passing on lessons learned protocols, will lead to mutual interactions, which will help to optimise the management of natural hazards. The challenge, however, is that approaches vary greatly between emergency planners and natural hazard experts and in between countries. Therefore, the consortium designed an online survey and held workshops with several experts from different areas all over the Alps with emphasis on predefined, relevant natural hazards (avalanches/ ice falls, floods, soil slope failures, forest fires).

The PLANALP consortium was commissioned with the question to what extent the natural hazard managers can support the emergency planners in their challenges. A central question was to find out how the requirements of the actors in management (phase of response) could be taken into account by the planners (phase of prevention) and how the two groups could be brought closer together in the Alpine space. The general objective of the study is therefore to ask to what extend natural hazard managers can contribute to emergency planning and how emergency planning can be improved for civil protection actors in order to make information at local level more user-friendly and easier to understand.

Similar to a transdisciplinary research project, we started with a real-world problem defined by the PLANALP country representatives. A mismatch between contingency planning and management was perceived and should be further investigated. A mixed methods approach was applied: the first part consisted of a quantitative survey to find out the status quo about challenges, strengths and weaknesses specific to natural hazards as well as the expert groups natural hazard management and contingency planning; in the subsequent second part qualitative workshops with focus group interviews using the so-called Rapid Risk Appraisal (RRA) were conducted in a total of 5 Alpine countries. The workshops in Italy and Switzerland focussed on the topic of soil slope failures. Avalanches were included in the austrian and italian workshops, whereas floods were of main interest in austrian, swiss, slovenian and german ones.

In the following, we summarize the key points and recommendations of the workshops and the corresponding online surveys:

1. Key points from the quantitative analysis and recommendations based on the online survey:

The online survey was set up to examine the interface between contingency planning and disaster management. 484 completed online surveys from experts from seven PLANALP countries (Austria, Italy, Germany, Switzerland, Slovenia, France and Liechtenstein) were taken into account. The questions focused on the area of responsibility of the experts. They were questioned about data availability, risk communication, structural quality as well as their material and human resources within the contingency planning or natural hazards management.

The quantitative analysis concentrated on the challenges and weaknesses in order to identify key points for improvement in the emergency planning in the area of natural hazards and further allowed to pinpoint common strengths. Although the data availability and risk communication were mostly not rated negative, there are some specific issues that allow further improvement:

- It is recommended to standardize the documentation of damage events with definition of at least necessary parameters. The data about historical events as well as for the management of current events should be available online and on the move.
- Regular meetings and mandatory cooperation at the development of hazard maps should improve the information exchange and relation between contingency planning and natural hazard management as well as between local and supraregional experts.
- More exchange of data and information is not just wanted between contingency planning and disaster management, but also between the countries.

2. Key points from the qualitative analysis and recommendations based on the workshops:

- The workshops highlighted the need for discussion on data availability and related risk communication. The former was frequently cited as a best practice example in all natural hazards. Best practice examples are all characterised by a very high level of data availability, data diversity and systematic data collection. In the case of best practice, local knowledge is already integrated into planning instruments, especially when personal contacts support data exchange. Both tourism and major damage or frequent local events bring attention towards risk prevention and help to improve it. However, good political support and funding is also mentioned as an essential feature for the development of best practice. Furthermore, a high qualification in emergency management at local level and high local commitment (e.g. local construction company's support with heavy equipment like excavators) were repeatedly mentioned.
- Politicians are generally called upon to invest in the expansion of digitisation and the creation of a central natural hazards database with a harmonized, defined data acquisition for each natural hazard process.
- The type of knowledge transfer must be improved at various interfaces. For example, the different levels of planning (hazard zone planning) and local contingency planning need to be better linked in order to achieve a continuous updating of planning instruments. At the interface between contingency planning and natural hazard management, it is necessary to incorporate local knowledge and experience more strongly into planning.
- Risk communication between experts and laypersons must be supported, since without civil society solidarity, neither sufficient data collection at local level nor successful risk prevention and crisis management is possible.
- The need for more training and knowledge transfer between planners and managers, different generations, regional and local volunteers and the use of new digital tools was mentioned in several contexts during the workshops. Cross-national training can also be used to improve risk management and contingency plans.

TERMS AND DEFINITIONS

The following terms and definitions represent a specific understanding that is valid for this report

Avalanches

Snow avalanches are gravitational mass flows that quickly move down steep slopes[1]. Beside snow, they can also contain stones, soil, vegetation or ice. Avalanches are classified according to various criteria. In addition to the type of movement (e.g. dense or powder snow avalanches[2]), a distinction is made between avalanches regarding to their initiation: snow slab avalanches, loose snow avalanches, and glide snow avalanches.

Snow slab avalanches involve the release of a continuous slab of snow over an extensive weak layer. Loose snow avalanches begin at a point in a relatively cohesionless surface layer of dry or wet snow. The initial failure is analogous to the rotational slide of non-cohesive sands or soils but occurs within a small volume (1 m^3) compared to much larger initiation volumes in landslides. Glide snow avalanches are caused by a frictional loss between the snow cover and the soil layer.[3]

Contingency planner / Natural hazard planner

Those people preparing a contingency plan at a national/regional level. Contingency planner need to consider hazard zone plans but also local knowledge about existing material resources, local data and information e.g. event documentation etc. In the Integrated Risk Management Cycle, they are rather located in the PREVENTION PHASE.

Disaster management / Operations management

Management of a natural hazard event at the local, regional, national level in the phases of preparedness and response.

Floods

Water level or outflow exceeding a limit to be determined - generally the lowest (smallest) annual flood. This limit is determined from the water level or flow values or local topographical conditions. In hydrographic statistics, also known as the peak value of a flood hydrograph.[4]

Forest Fires

A forest fire is any uncontrolled fire which partially or completely covers the forest or forest floor, regardless of the type of fire (smouldering fire, ground fire, crown fire), the cause, the type of vegetation (also grass fire below a high forest, fire on a clear-cut area or in the wind protection belt) or the area of the fire (e.g. also rootstock fire or fire of a single tree by lightning).[5]

Ice avalanches / Ice falls

Glacier ice, which breaks and plunges over a steep step, sometimes sweeping snow in the avalanche track with it. Often responsible for large-scale disasters.[6]

Natural hazard

Natural process or phenomenon that may cause injury or other health impacts, as well as property damage, loss of life, loss of livelihoods and services, social and economic disruption, or environmental damage.[7]

Natural hazard management expert

Those people who manage a natural hazard event at the local, regional, national level. This group need to profit from an appropriate contingency plan. In the Integrated Risk Management Cycle, they are rather located in the RESPONSE PHASE.

1 *Harvey et al., 2012*
2 *De Quervain, 1981*
3 *EAWS, 2020*
4 *ÖNORM, 2003*
5 *Müller, 2015*
6 *EAWS, 2020*
7 *Alpenkonvention, 2019*

Rapid Risk Appraisal approach

The Rapid Risk Appraisal approach (RRA) was developed within the EU Interreg Alpine Space Project "GreenRisk4Alps"[8]. It was conceived as a participatory tool to identify the strengths and the points for improvement in the field of risk management in the different Pilot Action Regions for the implementation of future nature based risk reduction measures. The RRA makes use of local knowledge through the involvement of experts in a short (few hours to half-day), collaborative workshop. The "GreenRisk4Alps" RRA approach follows a series of steps, adapted from the ISO standard 31000 for risk management. The three steps are risk identification, risk analysis and risk evaluation.

Risk

Risk is a combination of the consequences of an (hazard) event and the associated likelihood/probability of its occurrence. In a simplified understanding, risk is the product of hazard probabilities and damage potential.[9]

Risk management

A concept that can be outlined with three simple questions. What are the potential hazards? What risk are we willing to take? Which measures of the integrated risk management cycle should we adopt? This idea follows the approach to take into account the effects and damages of natural hazards while defining accepted risk as well as mitigation and adaptation measures. The term risk management is used throughout the report, incorporating the terms natural hazard protection and natural hazard management as certain perspectives.[10]

Soil slope failures

A form of landslides which include soil and/or loose rock material, initiated by a failure in form of a slide (translational slide) or slump (rotational slide) and partly developing a flow-movement (depending on several conditions e.g. water content). Channelized processes as well as spontaneous hillslope failures are considered.

8 *Interreg, 2020*
9 *Alpenkonvention, 2019*
10 *Alpenkonvention, 2019*

1. INTRODUCTION

The XV Alpine Conference in April 2019 decided to renew the mandate and continue the format of the Natural Hazards Working Group of the Alpine Convention (PLANALP). During the ongoing period one focus of the PLANALP mandate was on the contribution of prevention in contingency planning with special regard to synergies and faced challenges within the Alpine region.

The general objective of this study is to approximate and reconcile theory (planning) and practice (management) - asking the question, what natural hazard managers can contribute to contingency planning.

The starting point for a deeper examination of the possible contribution of natural hazard management in contingency planning was the Interreg IIIb CADSES project MONITOR. This project has successfully developed a methodology for monitoring hazard processes and demonstrated their practical usability. The presented solutions are a good basis for the further development of risk management, but for a significantly improvement, some major obstacles have been identified that need to be overcome. In the subsequent project MONITOR II, a harmonized methodology for hazard maps and contingency plans was developed. The project addressed the challenges for an improved risk management, like e.g., the lack of availability and usability of hazard maps and contingency plans and the lack of communication support between stakeholders. The resulting common guidelines could have a sustainable impact at the communication of expert information like forecasts and warnings to allow an efficient trans-border cooperation in preparedness and response.

PLANALP started with a scoping of existing instruments in the Alpine region. A discussion of these tools soon revealed that different internal structures and responsibilities across the Alps lead to major challenges for a uniform approach. One of those challenges is the fact that the approaches between contingency planners and natural hazard experts vary. As a first step, it was agreed within the PLANALP to focus on how to prepare contingency planning for civil protection actors and what information is needed to make the information from the contingency/emergency plans more user friendly and easy to understand at a local level. The premise was to best translate expert knowledge into usable maps and information, and not to create common standards for maps. In the preparation, social aspects and the demographic structure (age, gender, special needs) of a municipality were considered.

Key questions were formulated by the chair and sent out to the members of PLANALP. All member-states gave feedback, and after a lively discussion with valuable inputs from all participating members, the following three pillars were proposed:

1. Collecting existing practises
2. Examining the collaboration between decision makers in contingency planning and natural hazard management through an online survey, and extend the validation of the results with national workshops
3. Grouping recommendations derived from these analyses to improve the cooperation between contingency planning and natural hazard management

To work through those pillars, the Chair commissioned a project consortium consisting out of the Austrian Central Institute for Meteorology and Geodynamics (ZAMG), the Austrian Research Centre for Forests (BFW) and the Leoben University (Montanuniversität) to collaborate on the study “contingency planning in the area of natural hazards”. The consortium defined relevant natural hazards (avalanches/ice avalanches, forest fires, floods, soil slope failures) to keep a focus in the study. By summer of 2020 the consortium designed an online survey and the consortium & PLANALP members distributed it to the respective decision makers in contingency planning and natural hazard management in their countries. The results of this survey then provided the input for the national workshops. In these workshops, the so-called Rapid Risk Appraisal (RRA) was applied as a central method in an adapted form, tailored to the issues of the current project.

The RRA – based on ongoing research – has thereby been successfully integrated into the natural hazard contingency planning in the Alpine region in order to use the latest methods in the surveys and workshops. Based on the validation of the online survey in the national workshops, the consortium provided this report.

2. RESEARCH DESIGN

The starting point of this transdisciplinary project is a research question, based on the real-world problem[11] that was initially articulated and defined in the Seggau Workshop from 2019 in Austria given by the representatives of the PLANALP member states. A mismatch between contingency planning and disaster management was perceived and the necessity to better coordinate existing instruments, initiatives and the responsible teams. Based on the pre-defined problem and further 13 explorative interviews with natural hazard experts five main analytical categories revealed. The categories were described to be important and partly worth of improvement at the interface between management and planning. The five analytical categories are:

1. data availability (data collection and distribution)
2. risk communication (between experts (planners and managers), quality, trust, etc.)
3. structural quality (including bureaucratic obstacles, unregulated responsibility areas, etc.)
4. material resources (constructional, technical resources)
5. human resources (including the willingness to learn)

This analysis is based on empirical evidence from seven Alpine countries: Switzerland, Germany, France, Slovenia, Liechtenstein, Italy and Austria. As mentioned in the introduction, we consider pre-defined natural hazards, namely avalanches/ice avalanches, forest fires, floods and soil slope failures. A definition of each natural hazard is given in chapter “TERMS AND DEFINITIONS”, to be found on page 8f. Our target group are contingency planners and natural hazard management experts. While managers are rather located in the so-called response phase, planners are in the phase of prevention (see more in detail in the chapter “TERMS AND DEFINITIONS”).

The general objective is to converge theory (planning) and practice (management) or in other words, to adjust contingency planning on the practical needs of natural hazard management. To achieve this, we applied a mixed methods approach and combined a cross-national online survey in all seven countries and focus-group interviews in Switzerland, Germany, Slovenia, Italy and Austria. We aimed at providing an overview of the status quo through our online survey. Challenges, strengths and weaknesses at the interface between contingency planning and managing were questioned. The questionnaire was structured through our five analytical categories: data availability, risk communication, structural quality, material resources and human resources. Each analytical category offers groups of questions that are oriented towards the „Integrated Risk Management Model“[12] and its response, recovery and preparedness phase. In chapter 3 we present the outputs of the online survey by considering differences between natural hazards as well as the expert groups contingency planning and natural hazard management.

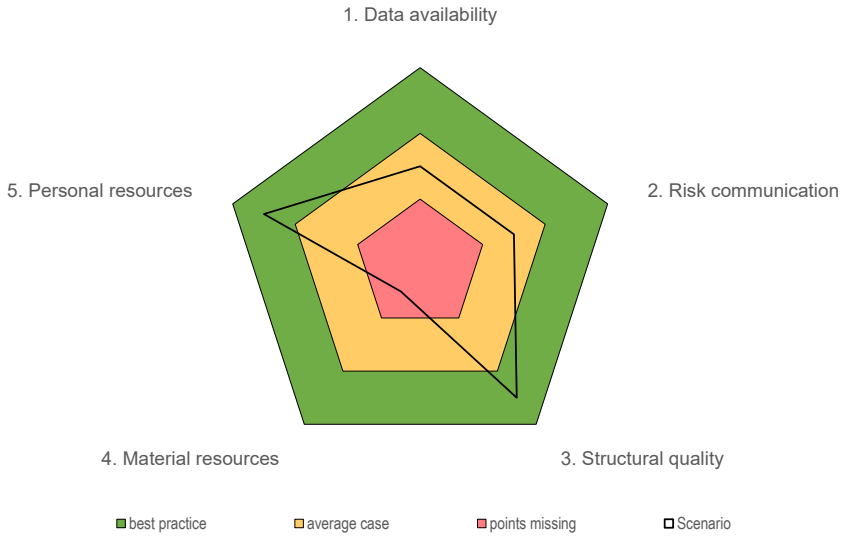

Figure 1: Example of the adapted RRA of a natural hazard.

11 *Nowotny et al., 2001*
12 *FOCP - Federal Office for Civil Protection, 2014*

In addition to that, it was our objective to find out best practice examples and to understand by a qualitative approach the circumstances that support its development, and finally to derive policy recommendations on that basis. Therefore, we applied focus group interviews and the so-called Rapid Risk Appraisal (RRA).[13] The RRA was primary developed within the Interreg Alpine Space Project "GreenRisk4Alps" and has been adapted to the purposes in this research. The adapted RRA considered the above mentioned five analytical categories and the evaluation schemes best practice (high expert satisfaction), average case (improvement desirable) and points missing (low expert satisfaction, improvement necessary). The subjective assessment of strengths and weaknesses by the workshop participants became visualized through a spider chart, which was the starting point for the focus-group discussion. The discussion focused on especially noticeable results and on the questions: What is understood as best practice? What are the reasons for developing strengths (best practice)? What are the suggested solutions for mastering weaknesses (points missing)? The workshop transcripts and interview notes were subjected to qualitative content analysis[14] to identify categories and the main findings discussed in this article.

2.1 STAKEHOLDER ANALYSES FOR THE ONLINE SURVEY AND THE REGIONAL WORKSHOPS

Based on the fact that most countries are differently organised and structured in terms of contingency planning and management we adapted the categorization scheme, that was primarily developed for avalanches "Mitigation types"[15] to our specific needs in order to capture stakeholder country specifics. The scheme differentiates between actors who intervene directly or indirectly in the long-term or short-term, e.g., only during a certain disaster event.

		Intervention "Avalanche and ice fall"	
		direct	**indirect**
Duration	**short term**	Austrian Armed Forces (assistance in preventive avalanche releases, civil protection, prompt assistance in case of an incident → recovery)	Disaster fund (co-financing of emergency equipment for fire brigades, the warning and alarm system and crop insurance premiums; additional funding for measures to prevent future damage and to repair damage caused by disasters)
			Police: maintenance of traffic safety and traffic flow even in exposed natural hazard situations
		Police / Ministry of the Interior: responsible ministry of the police as a traffic actor in natural hazard management and the Alpine Police as a documenter of avalanche accident; traffic actor in natural hazard management (road closure) and documenter of avalanche accidents	Municipalities (Building authority, Transport and Safety Committee - seasonal road closures, agricultural communities as municipal property, Avalanche Commission, forest/land owner - seasonal habitation of summer huts and pastures)
		Avalanche commissions (preventive avalanche releases/avalanche dispersion)	Avalanche prewarning service of the countries (avalanche warning; accident analysis)
		Mountain railways & ski resorts (construction of mitigation measures which at least safe ski areas and it´s infrastructure)	National warning centre of the countries (triggering civil protection signals and informing the population as a core task; coordinating of alarm systems)
		Local municipal administrations (decision making for the community by the mayor based on expertise of the aval. commission; evacuation measures)	Civil Protection Unit (coordination and technical support in case of natural desaster)
			Avalanche commissions (expertise & decision making for e.g. road closure / evacuation)
			Volunteer fire brigade (prompt assistance in case of an incident → recovery)
	long term	District Office (commissioning of projects for technical protection measures)	Risk evaluation
		private companies like Wyssen avalanches, SYNALP ... (avalanche triggering towers, avalanche barriers, winddrift barriers)	Police / Ministry of the Interior: research into the causes of (avalanche) accidents, Alpine police: documentation of accidents in alpine terrain, reporting to courts and public prosecutors as well as administrative authorities; in particular accidents in winter in organised and non-organised ski areas (collisions, lift accidents, avalanche accidents)
		WLV (technical protection against avalanches)	WLV (hazard zone planning)
		Federal Forestry (reforestation, forest protection, forest management)	Municipalities (compliance of hazard zones, regulation of land use)
		Local Forest supervisor bodies (Forest ranger, district forest officer)	Local municipal administrations (decision making for the community)
		Road construction of the countries (commissioning of projects for technical protection measures)	Road construction of the countries (planning, construction, management and maintenance of the state road network)
		ÖBB & Asfinag (construction of mitigation measures which primarly protect resort infrastructure but also effect the forest area; forest and biological measures as an important role in preventing erosion (near traffic lines))	BMLRT (Assignment of tasks / tenders and financing; Legal regulations)
			BOKU/BFW/ZAMG (research & education, development of mitigation measures)
			Alpine Clubs (education & forcing of awareness)
			National Warning Centre / Civil Protection Department of the Countries: (coordination, support and preparation of civil protection plans; monitoring of alarm systems)

Figure 2: Stakeholder Analysis Example – Avalanches / Ice Avalanches Austria.

Country representatives filled in a separate diagram for each investigated natural hazard (avalanches/ice avalanches, forest fires, floods, soil slope failures). This ensured a complete collection of relevant stakeholders that were taking part in the online survey. Like this, we selected regional participants (planners and managers) for our workshops.

2.2 CASE SELECTION

For the regional workshops we additionally defined the case selection criteria of a

a) manageable region
b) region that is affected by at least two forms of the investigated natural hazards
c) region that is differently well prepared for disaster management, meaning it is known that there exist strengths and weaknesses.

13 *Cocuccioni et al., 2020*
14 *Mayring P., 2010*
15 *CAA, 2016*

3. GUEST COMMENTARY: THE RAPID RISK APPRAISAL APPROACH

Author: Silvia Cocuccioni, Eurac Research, Institute for Earth Observation (Bolzano, Italy)

The **Rapid Risk Appraisal approach** was developed within the UE Interreg Alpine Space Project "GreenRisk4Alps"[16]. The GreenRisk4ALPs project aims to develop ecosystem-based approaches to support risk management of the Alpine region. The project focuses specifically on gravity-driven natural hazards and on six different Pilot Action Regions (PARs), located in five different countries of the Alpine region. In order to develop a successful ecosystem-based risk management strategy for the future, the project studies current natural hazard processes and their potential consequences; furthermore, GreenRisk4Alps also analyses how the above-mentioned hazards are currently managed. Finally, the different risk reduction measures are compared and evaluated from the economic point of view; this way the project can propose measures which are not only efficient from the natural hazard perspective, but also accepted and viable from the socio-economic viewpoint.

The RRA was conceived as a participatory tool to identify the strengths and the points for improvement in the field of risk management in the different PARs for the implementation of future risk reduction measures. Consequently, this tool aims at supporting municipalities to increase their resilience to different natural hazard events.

The RRA makes use of local knowledge through the involvement of experts in a short (few hours to half-day), collaborative workshop. The personal information exchange which takes place through such a participatory approach fosters mutual learning and information exchange in a short time frame among experts with a diverse technical background.

The local experts invited to the RRA workshop are selected to provide both technical and applied expertise within the field of risk management (e.g. geology department, torrent and avalanche control experts but also foresters, civil protection, land use planners and municipality technicians), covering also a range of different gravity-driven natural hazards.

The GreenRisk4Alps RRA approach follows a series of steps, adapted from the **ISO standard 31000 for risk management**. The three steps are the following: risk identification (1), risk analysis (2), risk evaluation (3):

The first step aims at identifying the two natural hazards which are the most relevant from a risk perspective (e.g. potentially damage causing hazards).

The Risk Analysis step builds on the previous discussion and represents the core of the RRA. The aim of this step is therefore to analyse risk management practices in place in the PAR, related to the two previously selected natural hazards. In order to cover all the risk management activities, questions are structures following the **Integrated Risk Management cycle** steps[17]. Integrated risk management is understood as a holistic and integrated approach to risk management in which different types of measures are considered as equally important[18].The measures within the risk management cycle therefore cover the preparedness, the response and the recovery phases[19], as also do the question of the RRA. Overall, the approach foresees 23 different questions, grouped in ten different categories (namely hazard and risk assessment, land use planning, man-made and Eco-DRR measures, risk communication, early warning, response and recovery). Each question is presented together with **three possible answers** which correspond to different scenarios of expert satisfaction. The first scenario describes the case in which the participants perceive the specific risk management practice as a best practice or if they are highly satisfied with its quality or implementation. On the contrary, the third scenario, foreses a low expert satisfaction and ample room for improvement. The second scenario provides the intermediate or average case, where experts see space for desiderable improvements. Along with the three scenarios, **discussion points** such as concrete best practice examples of the Alps are listed to provide existent examples or comparisons to which experts could refer to during the discussion. The different experts are asked to answer and discuss each question in detail, explaining

16 *Interreg, 2020*
17 *FOCP, 2014*
18 *FOCP, 2014*
19 *Mikoš, 2013*

how each risk management-related-practice functions in their PAR, considering the differences and similarities for both the selected natural hazards. Finally, experts are asked to come to an agreement and to select one of the three proposed scenarios.

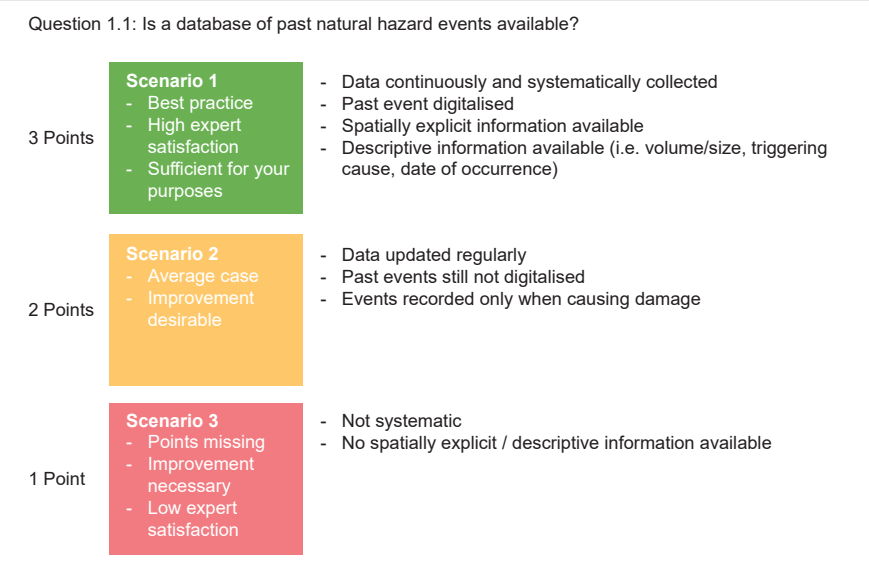

Figure 3: An example of a question of the RRA, including scenarios on which the experts should agree on and possible discussion points attributed to each scenario. On the left also the points assigned to each scenario are reported.

Furthermore, different **scores** are attributed to the three scenarios. The maximum number of points is assigned to the best practice scenario (scenario one); on the contrary, the least is given in case some points are missing and an improvement is considered as necessary (scenario three). The full answer, the selected scenarios and the respective points are all recorded and used in the risk evaluation step.

As a final step, the points assigned in the previous steps are used to generate a spider chart. For this scope, the assigned points are inserted in an Excel Sheet and the average for each category is then calculated.

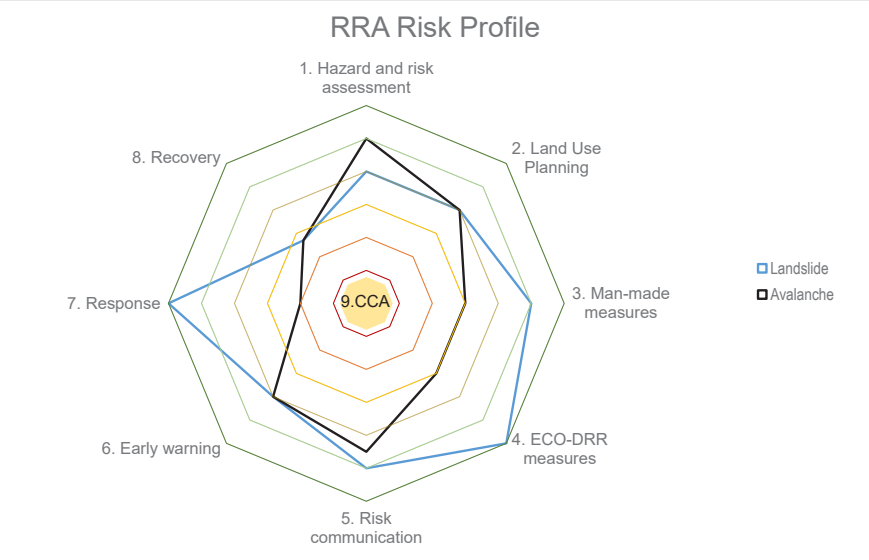

Figure 4: Example of a Risk (management) profile. a spider chart that allows to compare the risk management capacities in place related to different natural hazards.

The spider chart, called here **Risk (management) Profile**, allows to easily compare different natural hazards and various study areas. The larger the area of the polygon (different colour lines for each hazard), the more the activities in the field of risk management are considered as best practices by the participants.

The spider chart is presented and discussed with the participants as a final step of the workshop. This way the participants receive an immediate picture which summarises the RRA risk management practices addressed during

the workshop. The Rapid Risk Appraisal has been already applied within the project in Kranjska Gora (Slovenia) and in Val Ferret (Italy). In the November 2020 the application will follow in Oberammergau (Germany) and Southern Wipptal (Italy). After the completing the RRA workshops in the different study areas, the results will be compared, considering not only the Profile but also the full recorded answers. Best practices or strengths which arise from the analysis of the results of one PAR could be transferred or proposed to PARs presenting specific weaknesses. This way, one PAR can learn from the risk management of the others and a more successful ecosystem-based strategy can be proposed within the project.

4. CHALLENGES, STRENGTHS & WEAKNESSES – FINDINGS FROM ONLINE SURVEY

4.1 INTRODUCTION ONLINE SURVEY

An online survey was created to examine the interface between contingency planning and disaster management in the Alpine countries.

One wants to learn from the similarities and differences between those responsible, between countries and between different natural hazards. To this end, an agreement was reached on four natural hazards, which the participants could focus on in this survey: floods, avalanches/ice avalanches, soil slope failures and forest fires.

The participants should determine whether the range of their tasks lies primarily in disaster management or in contingency planning and then answer the question with focus on one of the above mentioned natural hazards.

Over 500 experts from the Alpine countries Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland took part in the survey, whereby the participants who had a response rate of less than 4.3% were sorted out in advance. Therefore, 484 completed surveys were taken into account.

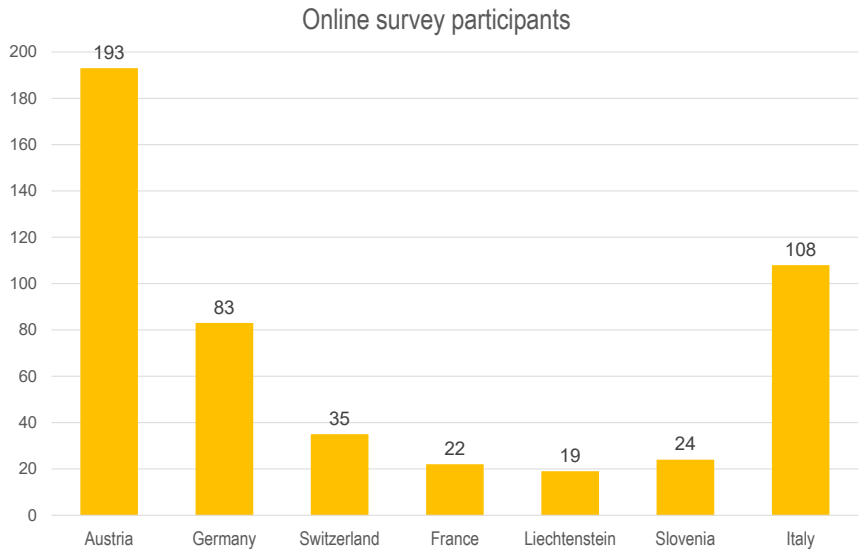

Figure 5: Participants in the online survey by countries.

4.2 COMPARISON OF RISK MANAGEMENT AND CONTINGENCY PLANNING

Looking at the similarities and differences between those responsible and between different natural hazards some interesting observations came up.

For all evaluated natural hazards, most participants of the online survey answered that their area of responsibilities is hardly or not affected by natural hazards. This result could indicate that the infrastructure of responsible persons is very good, but the disaster events occur fortunately quite rarely.

4.2.1 DATA AVAILABILITY

The results of the survey show a weakness in the documentation of damage events – historical and current. The amount and details of information about damage events should be increased for all natural hazards. In addition, the quality of early warning systems was identified as a weakness. There is a lot of potential for improvement and more research on that field.

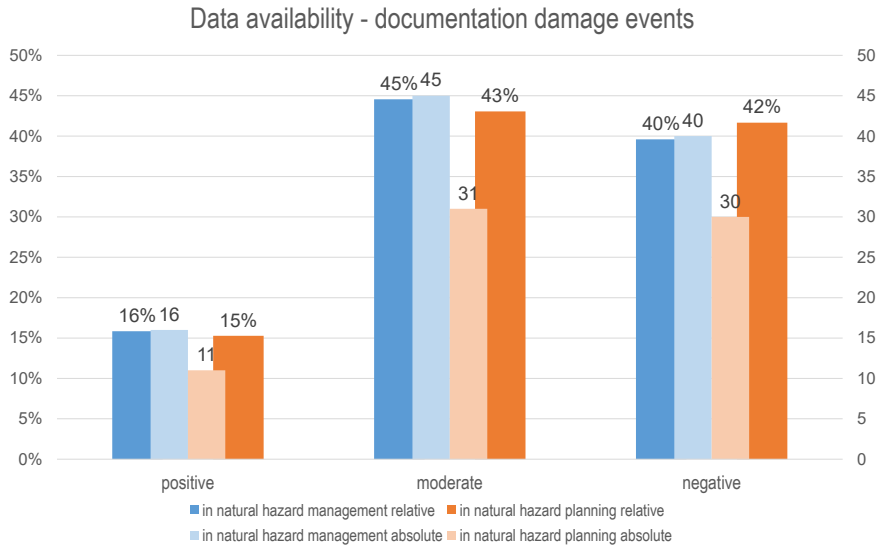

Figure 6: Evaluation of damage events documentation in connection with floods.

Hazard susceptibility maps on the other hand got a quite positive feedback. They exist for all natural hazards, but should be extended, and were rated mostly positive. It is a strength to know which areas are more likely affected by natural hazards and where to put the focus in contingency planning and then disaster management for handling such natural hazard situations. However, the survey also shows a clear need for Web-GIS solutions that are available online and are also available as a one-stop-shop for managers and planners. The working process of contingency planners and disaster managers changed in the last years much more towards digital and mobile availability of the information.

4.2.2 RISK COMMUNICATION

The results of the survey indicate a good quality of the relation between contingency planner and disaster management for all four natural hazards, but the answers about information exchange between them indicates not such a pretty picture in most natural hazards. It seems that the personal relationships between planners and managers are good and strong, but there is no automatic transfer of necessary information and mutual expertise.

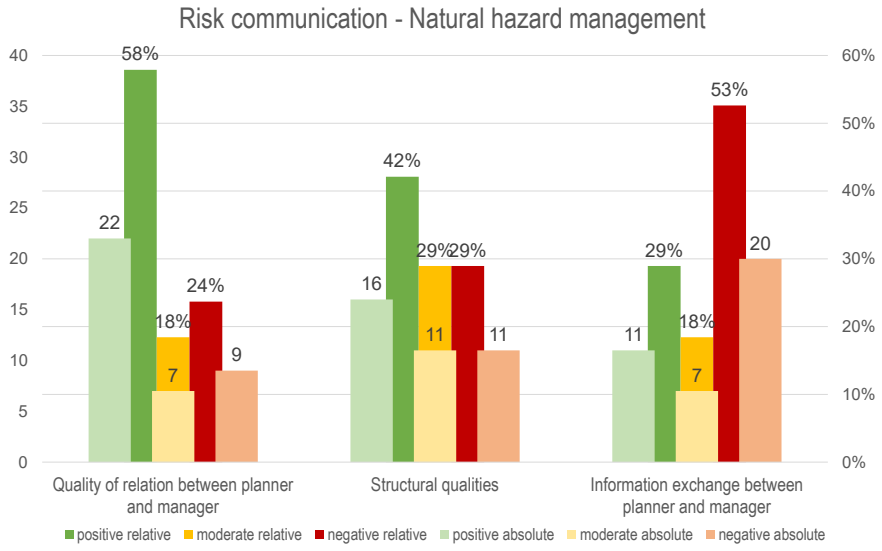

Figure 7: Three focus points of risk communication from a forest fire management perspective.

Looking at the structural quality within disaster management or contingency planning very often the quality was rated worse by the outside group of experts than by the concerning group of experts. This could indicate that structural problems within a group are often not viewed as such. The structural quality within both expert groups has weaknesses and potential for improvement especially within the natural hazards avalanches/ice avalanches and forest fires.

4.2.3 MATERIAL RESOURCES

The need of material resources is specific for every natural hazard, but mainly helicopters, personal equipment (like protective clothing for forest fires or avalanche transceiver, shovel and probe for avalanches), special fire trucks and mobile flood barriers were mentioned as necessary.

Two significant disagreements between disaster management and contingency planning were striking:

In the natural hazard soil slope failures, the expert groups did absolutely not agree on the question, if retention spaces are sufficient. While 65% of the experts in disaster management thought that the retention spaces are sufficient, 67% of the experts in contingency planning answered that the retention spaces are not sufficient. This wide disagreement is surprising and raises the question why these two expert groups have such different opinions. Are their needs that different?

Regarding the natural hazard forest fires the opinions on the questions about the existence of special forest fire brigades and special protective equipment differ very much. Disaster management said that those things exist, while a significant part of the participants in contingency planning disagreed (56% and 67%). This wide disagreement on those two questions is surprising and raises the question why these two expert groups have such different opinions. Do the contingency planner not have the full knowledge about the available material or do these two expert groups have such different needs and expectations in their equipment?

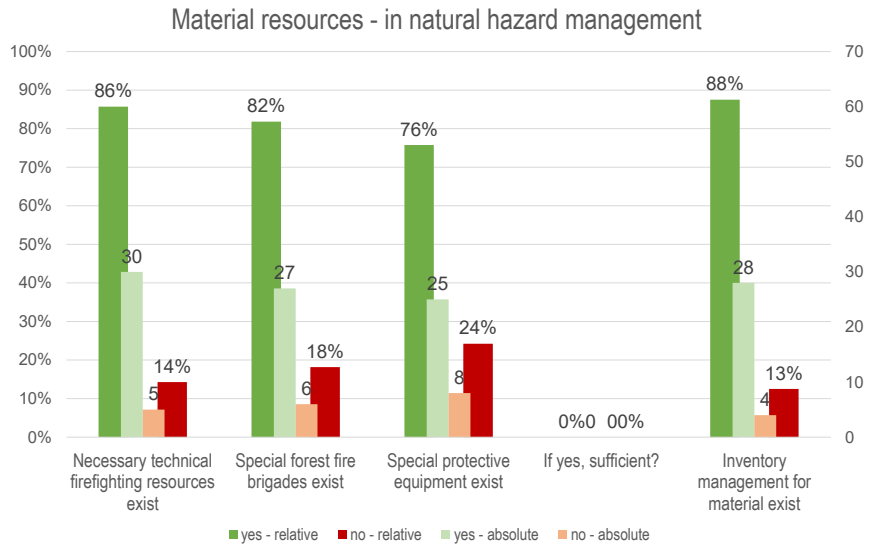

Figure 8: Evaluation of material resources from a forest fire- management perspective.

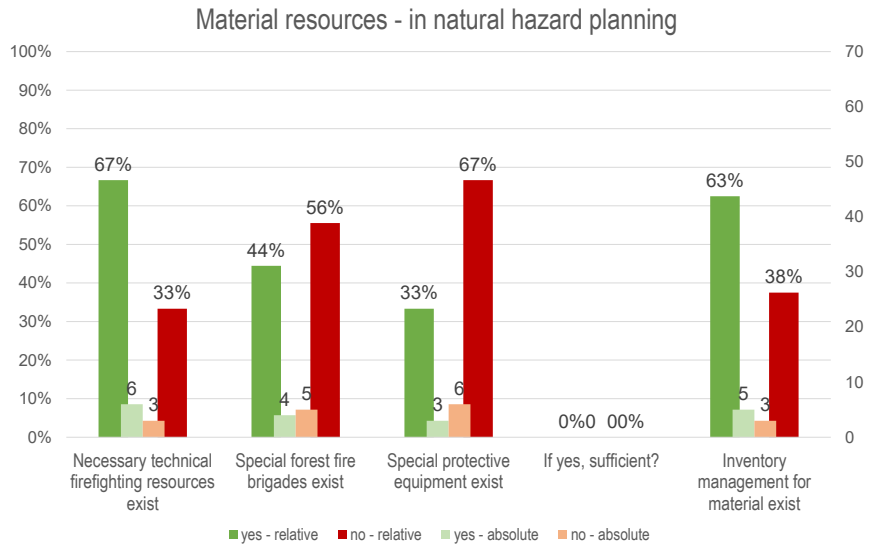

Figure 9: Evaluation of material resources from a forest fire- planning perspective.

4.2.4 HUMAN RESOURCES

The results show a high willingness to learn at all natural hazards and countries, which should be used as strength and for more training of the experts. Additionally, more cross-border cooperation within the natural hazards is wanted. The desire for more exchange of data and information between contingency planning and disaster management as well as between the countries has emerged.

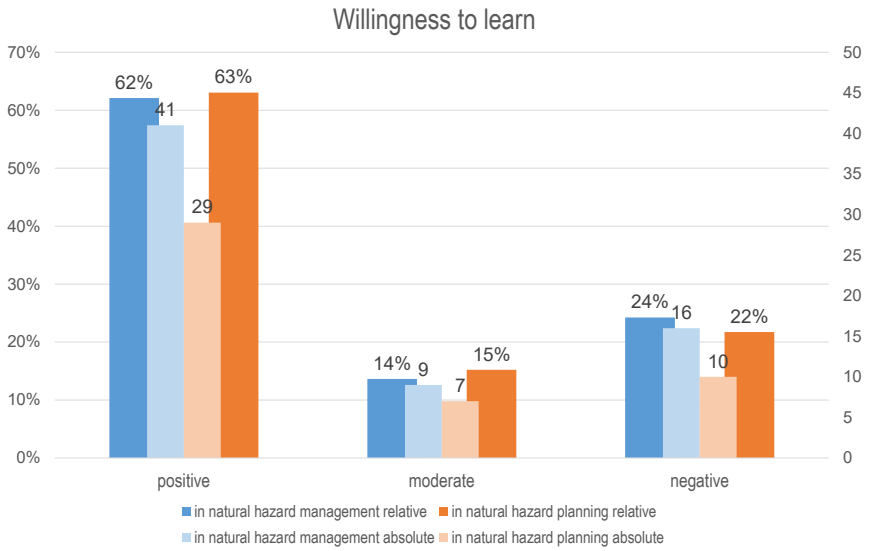

Figure 10: Evaluation of the willingness to learn of the flood experts.

4.3 RECOMMENDATIONS FOR ACTION FROM THE ONLINE SURVEY

4.3.1 DATA AVAILABILITY

The documentation of damage events should be more standardized, defining the necessary parameters. Those documentations should be a digital available, continuous catalogue of local events with the possibility of traceability and the derivation of lessons learned protocols for coping capacities regarding future events.

A challenge in terms of documentation is that hazardous events (also within different countries) are often documented by different institutions according to their pursued goal or purpose. The depth of content for recording events therefore differs depending on the purpose of the documentation. A documentation scheme that allows to be filled by all actors with a uniform minimum input would be an advantage! In the sense of an international unification, standardized recording procedures should be available. For example, in the field of avalanche documentation, one could orientate oneself more on guidelines such as the UNESCO Avalanche Atlas or standards from the EAWS (European Avalanche Warning Services).

In terms of comprehensibility, availability and coordination with current, local features of the hazard warning maps, these were not assessed as positively by management as by planning. Therefore, the contingency planning in the future should evaluate the existing hazard warning maps in cooperation with natural hazard management.

Early warning systems are working, but the input data should be optimized and the network has to be updated, so that all current consumers will be reached. Additionally, the early warning systems should be available earlier, but with lengthening the forecast horizon the quality of accuracy will decrease. Such systems (e.g. regarding soil slope failures) are mostly based on precipitation information or weather forecasts. Local accurate forecasts for small Alpine catchment areas are still difficult. For local emergency managers, more specific weather information would be of great advantage. This is where the challenges lie in research, especially in times of climate change with changing weather patterns.

For natural hazards such as soil slope failures, floods and forest fires, more measuring points should be available for water withdrawal, precipitation measurement and river level measurement – especially in the preparedness phase for the risk manager.

4.3.2 RISK COMMUNICATION

For improving information exchange between contingency planning and natural hazard management and the relation between those experts a yearly meeting/training between planner and manager would be recommended to encourage the development of maps in close cooperation and to communicate lessons learned from practical experience.

An important tool for risk communication between planners and managers are among others the disaster control plans at local level. It is important that the responsible planners at the local level record all (future) relevant risks and that the procedures for deployment are clearly defined for local management. The mapping of certain event scenarios promotes risk awareness and contributes to a better understanding between planners and managers. A joint training on emergency cases would reveal gaps in communication as well as in the digital solutions used and can then be better implemented in existing disaster control plans.

Furthermore, a transformation of pure hazard maps into cross-disciplinary risk maps should also be aimed at (risk maps that include exposure and vulnerability are only available to a lesser extent in some countries).

4.3.3 MATERIAL RESOURCES

The main tasks regarding technical protection measures are to be assigned also to the spatial planners and political decision-makers. Local spatial planning must be well coordinated with existing hazard zone plans. It is important that damage potentials are already avoided during the planning phase. A retention area would often not have to be created if it was kept away from creating new infrastructure from the ground up. Infrastructure on questionable slopes (e.g. with regard to soil slope failures) or within flood plains must be critically examined in the future under the care of responsible spatial planning. Building sins from past decades must not be repeated - with political support. Under these circumstances, some structural measures or financial expenditures will not even be necessary.

4.3.4 HUMAN RESOURCES

More trainings for the natural hazard experts as well as more cross-border cooperation within the natural hazards are recommended.

In some countries, the participation of volunteers plays an extremely vital role in the field of natural hazard management. With increasing settlement pressure and intensifying weather extremes, this volunteer work will become even more important. It is of immense importance to maintain the level of volunteers (e.g. fire brigades) and to increase it in the light of a generally worsening situation due to climate change. In this context, consider volunteers are intrinsically motivated. People want to experience competence and group membership. If people feel self-determined and competent during their voluntary service intrinsic motivation increases. Consequently, invest in training for volunteers and in everything that increases identification with the group.

5. DEVELOPING STRENGHTS AND MASTERING WEAKNESSES – AN OVERVIEW OF THE WORKSHOP RESULTS

Reasons for developing strengths and how to master weaknesses were discussed more in detail in regional workshops in Austria, Germany, Slovenia, Italy and Switzerland. The participating countries decided to focus on country specific relevant natural hazards. In a rapid risk appraisal, each workshop group offered an initial assessment about their regional strengths and weaknesses by considering the fife challenges (data availability, risk communication, structural quality, material resources and human resources) at the beginning of each workshop. Subsequently, the most striking results of the RRA became considered in a focus group discussion. The workshops followed a general guideline but were organized, analysed and summarized by the PLANALP representatives of each country or by their sub-contractors. The following sections give an overview of the discussion about the development of strengths and how to master the weaknesses.

5.1 WORKSHOP RESULTS, FLOODS, UPPER AUSTRIA, AUSTRIA

Date of workshop: 06.10.2020

In the individual evaluations, some examples of best practice were found, especially in the analysis criterion “data availability”. Worst case scenarios only occurred in one case. On average, the group evaluation of each individual category is in the middle field.

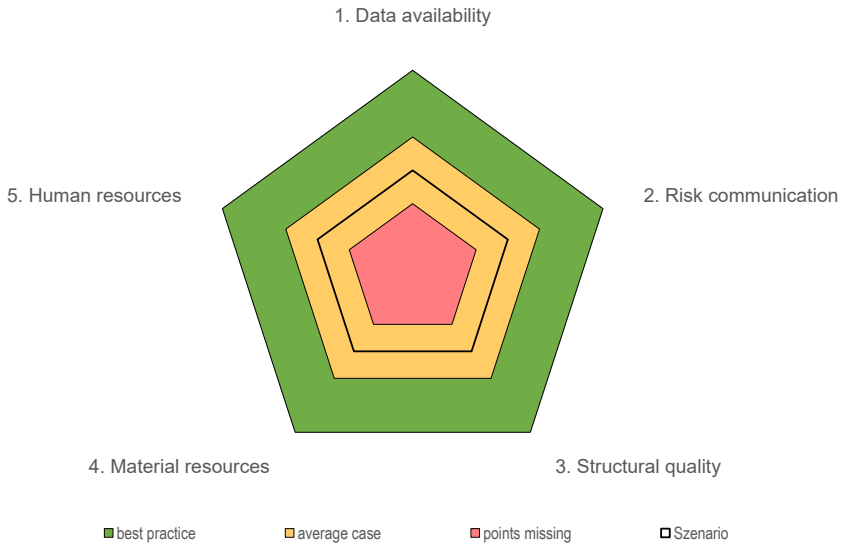

Figure 11: Rapid Risk Appraisal, floods, Upper Austria, Austria.

5.1.1 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS?

In Austria there are several working tools in different applications for the natural hazard “flood”. On a regional level, analysis and forecasting tools are used coupled with advance warning of the emergency services. Historical data on flood events are also collected and documented in an event portal (https://ehyd.gv.at/ and https://gis.die-wildbach.at/wlk).

This event portal was developed in cooperation with research institutions and event data were recorded retroactively. In this context, best practice means that as many events as possible should be recorded, regardless of the extent of the event and the amount of the information. Historical data is used to statistically analyze the probability of recurrence of events of different dimensions. The probability of recurrence of events of different sizes is used to define different hazard classes and to be better prepared for future events.

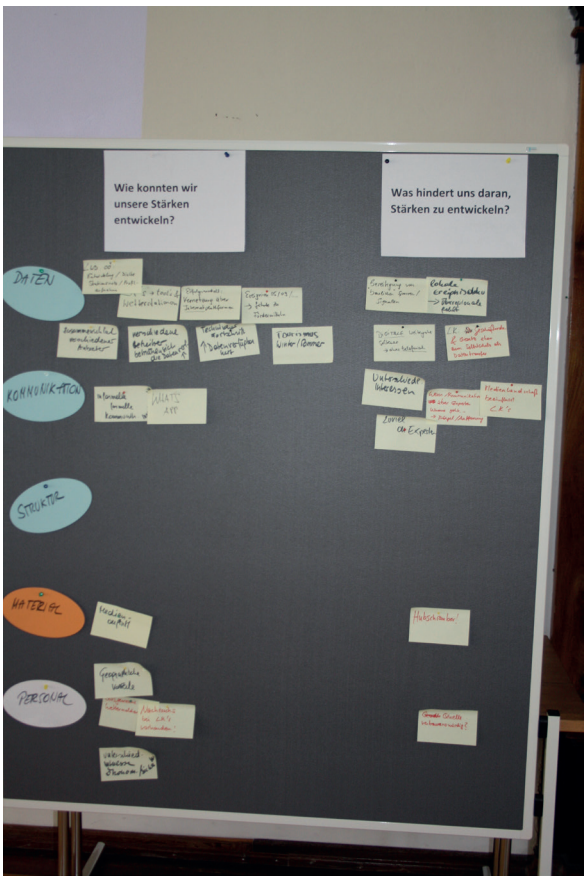

Figure 12: Results of the workshop „Floods“ on the development of strengths and hindering strength development.

Online apps and online databases allow firefighting operations to be recorded and documented in real time. This online availability of this type of data is important and interesting, because even during the missions it is possible to see in which areas and regions problems are currently occurring.

The developments in the individual areas (data availability, risk communication, etc.) are strongly related to the technical possibilities. Analogue data is increasingly available in digital form. These developments are strongly accelerated by major events. However, progress is also being achieved through new and unplanned media coverage (damage pictures and event recording on Facebook or WhatsApp).

Best practice examples in contingency planning can be found primarily in regions where recurring scenarios occur. In recent years, problem scenarios with slope water have become increasingly common. Due to the increasing frequency of problems caused by slope water, Styria decided to create and subsidize slope water maps.

Best practice example “Subsidized slope water maps in Styria”: Municipalities are the contracting authorities who can apply for rural development funding when ordering a slope water map. Slope water maps become created in close collaboration with the municipalities and serve as a basis for regional planning and construction procedures and for slope water concepts and retention basins. The project is in its initial state in Styria, but 43 Styrian municipalities already ordered slope water maps.

The planning area include in general the whole municipality. In the settlement and building areas detailed hydrodynamic models calculate slope water drains. For the remaining area GIS (Geographical Information Systems) evaluation is applied. Slope water maps will be published publicly accessible in GIS Steiermark (https://www.landesentwicklung.steiermark.at/cms/ziel/141976122/DE/), which is a platform that offers spatial data and further products as a basis for planning.

Explanation of Figure 13:

A) In area A there is diffuse flow without large water depths and a high flow rate. No substantial drainage zone.
B) In area B there is the main drain. Area should be kept free, otherwise slope water concepts/prevention measures are needed.
C) Area C: Diffuse flows, closer inspection will be necessary.

In recent years, there has been an increase in the number of missions, which has led to a greater awareness of the need for more documentation of mission. Awareness raising promotes better hazard management.

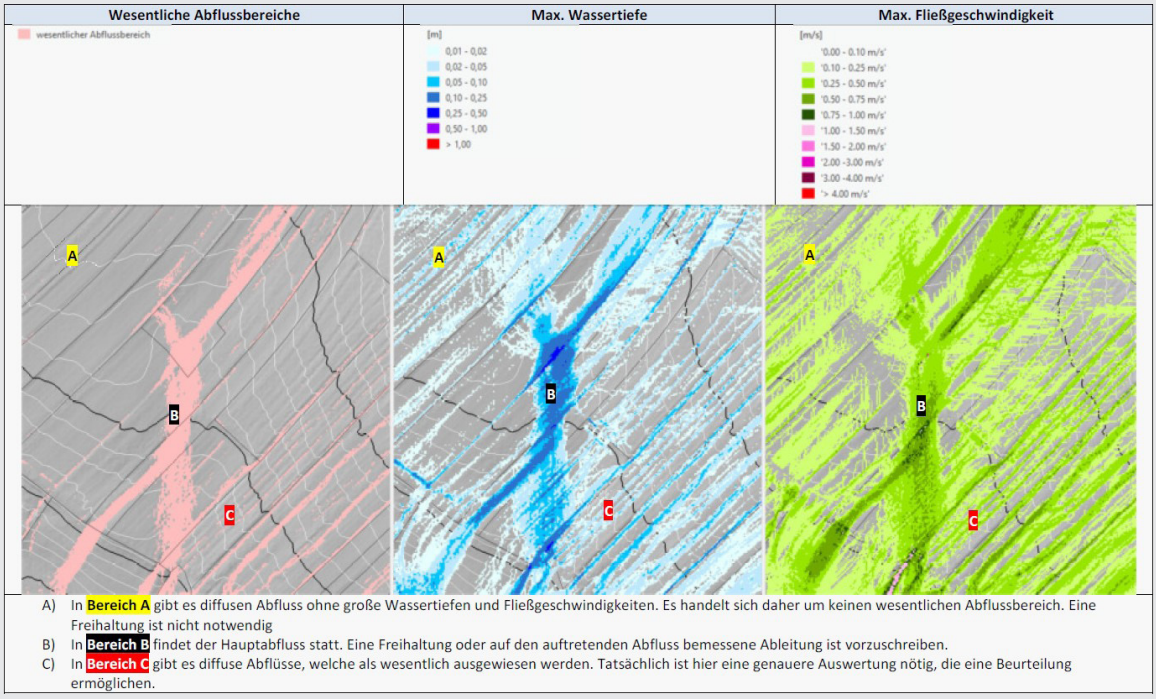

Figure 13: Slope water maps with significant drainage zone, maximum water depth and flow rate / speed.

5.1.2 WHAT HINDERS US TO DEVELOP STRENGTHS?

When using working and forecasting tools, it is necessary to collect and document event data. This makes it necessary for the individual institutions to cooperate. In most cases, however, effective collaboration is made considerably more difficult by the fact that much data is not passed on from one institution to another and no open access policy is applied. Working and forecasting tools are subject to constant development. Above all, a mobilization of the system is desired. The responsible personnel still prefer paper and pen, a mobile version and its application do not go hand in hand. Digital tools are currently not yet filled with activity. Many institutions do not enter their data into these tools. In addition, these tools are very difficult to use because they are created by IT specialists.

Making digital data available requires a structured processing of the existing (analogue) data. Often, the reference to and awareness of the event itself are no longer directly available until the analysis. The channelling of the existing digital information is also unstructured. New media such as Facebook or WhatsApp are making more and more information available. The distribution and availability of this information poses a problem.

In many communities, the distribution of tasks is often not clearly defined and no person has been appointed as a risk management officer. However, the origin of such problems is not a lack of interest or ability, it is a lack of financial resources. Similar problems are also evident in the processing of event data. There it often fails due to a lack of acting persons or the transfer of knowledge of past events and lack of one-stop-disaster management tools.

A challenge of the last few years is the relocation of extreme events. The typical flood areas are no longer affected. There is also an increasing number of new events, such as slope water, for which no plans or actions are available. The awareness of flood events also drops sharply in years when fewer events occur.

Human resources is a very big issue and this challenge is not easy, since mostly public authorities are involved. There is a prioritization of resource allocation and often there is a lack of risk awareness, especially among decision makers (resource allocation and demand planning).

5.1.3 HOW TO MASTER THE WEAKNESSES?

The use of existing work tools must be made easier and further developed for the local level. This can be achieved by improving cooperation between the various institutions involved in data collection. The user-friendliness of such tools and general mobilization should also be promoted. In addition to the benefits of digitization, an increase in user acceptance must also be achieved.

The simpler design of these tools requires a general standardized input mask that is comprehensible for all users. Due to the fact, that events are captured with varying degrees of accuracy, it should also be possible to carry out event documentation in accordance with the information content. The input depth should be adapted and the use for the different institutions (communities, districts, fire department, etc.) should be made accordingly interesting.

Figure 14: Results of the „Floods“ workshop on how to master the weaknesses.

In order to be able to record the data accordingly, a structured process is necessary. Risk management plays an important role here. The reference and awareness to events must be created. Acting persons must be assigned by the communities and districts to achieve a structured process and to be able to pass on knowledge. But the reason for not assigning such persons is the lack of resources, the financial means.

To improve warning systems, digital databases are necessary. Therefore, additional costs for the extension of measurement standards are necessary. The torrent cadastres are to be further expanded digitally too, but analogue maps are still desired by the users. The technical possibilities are available, only the willingness to learn is an obstacle to further digital expansion.

Important information can be obtained through online tools which document ongoing operations. Current problem areas can already be identified during the assignments. In case of frequent occurrences, it is possible to draw conclusions and also non-official data can be used.

In recent years, extreme events have increasingly occurred in non-typical flood areas. Slope waters are causing more and more problems. To this end, communities draw up slope water maps on their own. However, such processes cannot be localised spatially and occur over a wide area. With regard to these new extreme events, effective risk communication must be promoted with an additional focus on raising awareness. Information events are planned for the contact persons in planning and the communities. More frequent events and deployments of the fire brigade

have led to greater awareness among the population. Slope water as a result of heavy rainfall has been given more attention since then.

There is a need to raise awareness, not only among the population but, above all, among decision-makers. More priority must be given to the allocation of resources. Joint work is needed to raise awareness. Conscious communication and the passing on of information are also important at the interface between the administration and the executing institutions (fire brigade, hydraulic engineering office, etc.). Training should be offered for all responsible locals, and a special focus should be on training for the next generation. It must be promoted how a hazard zone plan is correctly read and understood, hazard zone plans must be able to be used correctly in spatial planning. The purpose of this would be to establish responsible experts for the correct deployment.

The statement that many things work very well, but can only be achieved through the great commitment of individuals, is a very important statement. People with commitment must be sought and found. There are highly motivated and committed people almost everywhere, but more structure is needed, especially in the state and federal departments. Often institutions do not feel addressed or a classification is often not possible because the context is not given. Functionality in the event of an incident is often only achieved by individuals. A better connection and a better, simpler cooperation between the institutions (State warning centre, fire brigade, ...) is desirable in the future.

Figure 15: Results from the discussion within the Floods-Workshop.

Summary of the Austrian Workshop – Floods

On the basis of the evaluation of the questionnaire, the Rapid Risk Appraisal shows that improvements in all five analysis categories relating to flood events are desirable. During the discussion, many important statements concerning the individual analysis categories emerged.

Digital (online) disaster management work tools must be made easier and must be applicable nationwide, regionally and above all locally. This requires a mobilisation and digitisation of the (still analogue) existing system and a readiness for acceptance by the users by hands-on training.

Digital tools require a good data basis. To create this, the structured creation of a database is necessary, which is accompanied by a structured processing of the (digitally) available information. For this purpose, awareness and reference to the events must be created. Through the application and use of these digital (online) tools, important conclusions can be drawn about future events (dimensions and recurrence frequency).

To improve warning systems and the digital databases, additional costs for their expansion and proper training how to use the tools are necessary. If the technical possibilities are available, it is necessary that the users are willing to learn and properly trained

An increase in the number of extreme events which occur all over the region has shown how important it is to have a well-functioning risk communication with a focus on hazard awareness. Increased operations have a very large influence on the promotion of awareness. Above all, the awareness of decision-makers must be increased in order to give greater priority to the allocation of resources (human resources and financial resources) in the preparation phase of the risk management cycle.

A very important aspect is the commitment of many individuals, many things work very well in practice. However, this is due to a high level of commitment from individuals. Highly motivated and very committed individuals must be found. But more structure is needed, especially in the state and federal departments. Functionality in case of an incident is often only provided by individuals. A better connection and better, simpler cooperation between the institutions (State warning centre, fire brigade, etc.) is needed in the future, also with regard to data exchange.

5.2 WORKSHOP RESULTS, AVALANCHES, UPPER AUSTRIA, AUSTRIA

Date of workshop: 06.10.2020

During the second workshop regarding the natural hazard “avalanche” the participants were again given time to submit a subjective assessment of the questionnaire on the five analysis criteria. These answers again resulted in an overall assessment. For the first analysis criterion “data availability” an assessment of “best practice” was given. The other four categories were assessed as “Average Case”, with some examples of best practice in the category “Material Resources”.

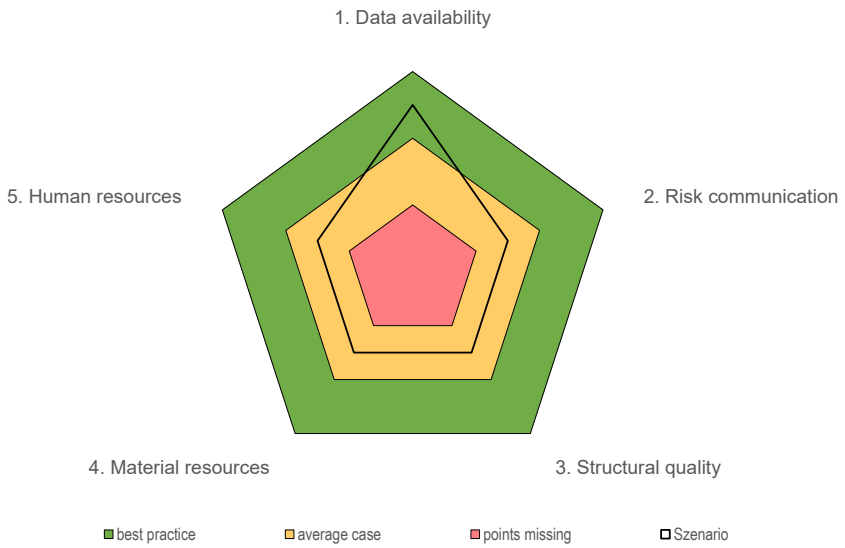

Figure 16: Rapid Risk Appraisal, avalanches, Upper Austria, Austria.

5.2.1 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS

In Austria there are already very good tools for the documentation of avalanches (the government of Styria, ZAMG, and local interested parties are also trying to refine the network) as well as a very good online network of weather and snow data which can be accessed via lawine.at. There are already a lot of weather stations and they are constantly being expanded due to the great interest of various institutions (the Federal State, the Austrian Federal Railways (ÖBB), ...). An excellent network and data provision via the internet exists. In the past ten years, a lot has been achieved through great technical leaps, but also major events have made it possible again and again to provide funding.

In recent years there has been a huge expansion, especially in the avalanche warning system. There are various platforms and snow profile analyses are also carried out. Here, the tourist influence of ski tourers or paragliders is particularly evident. It is shown that more than the natural hazard itself has an influence on the availability of data. Not only safety is in the foreground. Ski tourism requires more information (weather conditions, temperature, avalanche warning level, ...).

The focus has moved away from infrastructure protection to information for ski tourism. Therefore, there are many new weather stations and the information is available on a larger scale.

The documentation of the last years has been developed on collective catchment areas. There are up to 40 avalanche lines in a catchment area. Many small avalanches have been recorded and documented in this way. In recent years, these catchment areas have begun to be dissolved again and the events documented individually. The documentation covers the different types of avalanches in the region.

During the discussion, the question arose whether it is possible to build up an avalanche database with the collected data of all relevant institutions, which can be established in Austria and to which everyone has access and use. The forest fire database was used as an example. This was created by the University of Natural Resources and Life Sciences (BOKU), which has issued a mandate to all fire brigades for documentation. This system worked very well because the creators on the part of BOKU were very committed and interested in collecting the data as completely as possible. A lot of manual adaptation was done, which required critical questioning and personal validation of each event. In Eastern Austria all avalanche warning services use a uniform database for the documentation and logging of avalanche events.

Experience has shown that existing APPs or online tools do not work for event recording or documentation. However, a best practice example is the use of a WhatsApp group, even if this does not result in automatic inclusion in a database system. This option works very well in practice. It provides a very simple source of information, photos and brief information are transmitted quickly and easily. This system is easy to use and constantly / ubiquitously available. In addition, in the case described, immediate feedback is provided by reply and confirmation. As best practice, communication in both directions (two-way-communication) is experienced here.

In the workshop region, ten commissioned weather and avalanche detectors are questioned daily by telephone. The received information has consequently been transmitted and confirmed by qualified persons. Furthermore, current situations can be discussed directly. The information between the experts is clearly understandable.

In tourist or geographically interesting regions, the next generation of experts and avalanche observers or the composition of the avalanche commissions works well and is in demand. There are many interested people, especially ski tourism has a great influence.

5.2.2 WHAT HINDERS US TO DEVELOP STRENGTHS?

Experience has shown that in the commissions (upper levels) the current situation at local level is not always known. Small avalanches and events are not documented. It is difficult that events are correctly recorded as soon as they occur, because other topics are more relevant during the assessment period. There is also no current status of existing hazards. Event documentation is only available for major events that are relevant for the settlement area.

It is very difficult to build up an avalanche database that works, is merged from different sources and is documented independently of the extent of the event. This requires a complex adaptation of the data by critical questioning and personal validation of the individual events. A comparison with the forest fire database has shown that this system can only work with committed people and the necessary funding.

Existing databases provide a form for the documentation and logging of events. But not all avalanche warning services use a uniform database. There is also a lack of a uniform guideline or a law on the obligation to document events.

In Upper Austria, event documentation basically works very well. The transmission of information about avalanches that have already occurred is not very effective. This information is mainly passed on by telephone and hardly ever digitally (internet and portal). Also due to the weather conditions, people are often not aware of the avalanches that have already occurred.

Information regarding avalanche events is collected and passed on by experts and interested persons. But the information is handled differently, depending on the source of the data. Can the information be trusted from outside (from non-experts)? What is the quality of the data supplied? The sources of information must be questioned individually in each case. More information is obtained through Open Data, which is a gain for the overall assessment, but results in data filtering. Photographs, on the other hand, are experienced as a helpful source of information, as experts are able to assess the image data.

When data is passed on by phone, the situation is quickly and clearly understood between experts. With non-experts, there is a barrier to overcome first! Here, the information is often misconceived and misunderstood. It influences the management and an optimisation is very difficult. If information is passed on from expert to non-expert, barriers are created – different interest groups prevent the development of strengths. In the case of self-proclaimed experts, it is very difficult to explain and make clear the difference between the general avalanche warning level and a single slope assessment.

The avalanche commissions are very well staffed, especially in tourist areas, and young people are also encouraged to join them. But is the influence of tourism on the avalanche commissions positive? Hoteliers are involved in many commissions. Does this have an influence on the assessment of hazards? (Conflict between economic interests and safety).

With regard to the analysis point Material Resources, the discussion revealed that the measures taken (explosive masts) are in place and that there are no deficits from a material point of view. In ski resorts a lot has been invested and a safe and good infrastructure is given. The big problem is usually the request for helicopters, which is preceded by a complicated request. Also the weather often plays a determining role. Problems during the start (making available) of helicopters due to bad weather conditions have the consequence that they are not operational in the required areas.

5.2.3 HOW TO MASTER THE WEAKNESSES?

In order to improve the existing, very good tools for the documentation of avalanches by making more data available, a further expansion of weather stations is necessary. This is due to the fact that there are many different interested parties who benefit from these data (the federal state, ÖBB), and the promotion of rural development is being promoted. Networking and the availability of data via the Internet are also of great importance and should be promoted.

In order to improve event documentation and refine data availability, especially for small avalanche events, all events should be documented individually, regardless of their size and extent. The type and location of the avalanches should be recorded. An important aspect of this approach is a generally valid, uniform naming and description of avalanches (dust avalanche, etc.).

An important factor in the improvement of avalanche databases is the targeted mandate to the institutions concerned and the interest in data collection on the part of the processors. Personal commitment on the part of the processors is necessary. In order to guarantee the functionality of this system, the relevant financing must be available.

In Eastern Austria all avalanche warning services use a uniform database for the documentation and logging of events. But there is no uniform guideline or law on the obligation of documentation.

Guidelines and laws play an important role not only in the documentation but also in the working methods of the avalanche commission. These are laid down in the rules of procedure. Politicians have requested a legal basis for the work of the avalanche commission to protect it. The aim is to protect the avalanche commission as a whole and not just the individuals. This gave rise to a different motivation for the documentation work. Documentation on self-protection and the protection of the commission. The self-interest of the individuals helps to increase the availability of data. Self-protection is becoming increasingly important and written documentation is better for each individual. The only problem is the longer information path.

A system (e.g. WhatsApp) which is constantly and easily available and made accessible to everyone can work very well for information transfer. Moreover, this system represents a two-way communication and needs a standard for the transmission of information.

A major aspect of the work of avalanche commissions or avalanche experts in general is the influence of the media. Media interest strongly influences the work and the reaction to avalanche events. The influence is reflected in the faster reaction time of the avalanche experts and institutions concerned, as well as in the media's assessment of how the situation is handled. For this reason, media training is necessary for the commissions and all persons / institutions concerned. This is to protect the commission and to improve the structures (central office for media matters in the commission and the region, defined contact person on the part of the municipalities) in the affected offices of the municipalities and regions. In the opposite case, the media can also be used to present the functioning system and the situations can be presented in the best possible media. This has the consequence of obtaining subsidies and resources and emphasising the importance of the work done.

Summary of the Austrian Workshop – Avalanches

The well-functioning situation in Austria is due to the large community of interests by many different institutions (federal state, ÖBB, tourism). Existing weather stations are continuously expanded, and new ones are set up. In recent years, a huge expansion has taken place, especially in the avalanche warning system, which is primarily due to the influence of tourism. In the future, better networking and data provision by digital means will be promoted in these areas. This influence of tourism is also directly reflected in the composition of the avalanche commissions and in the generation of new talent at all the institutions concerned. In tourist areas there are many interested people who are willing to get involved.

At present, primarily major events are recorded and documented, as they have a great impact on the existing infrastructure. Regionally, more and more attention is devoted to the documentation of small events. All avalanche events are to be recorded individually, regardless of their size and the extent of the event in terms of type and location. Problems arise from the fact that there is no uniform naming and description of avalanche types.

When building up avalanche databases that are as complete as possible with information from all the institutions concerned, it is necessary to issue a specific mandate to those who are affected. Furthermore, a very high level of commitment on the part of the processors is necessary to question and validate all the information. In order to guarantee the functioning of such a system, an appropriate financing must be available.

In order to keep such avalanche databases as complete as possible in the future, a legal basis for documentation is needed. In Eastern Austria all avalanche warning services use a uniform database for documentation and logging of events. But there is no uniform guideline or law on the obligation of documentation.

In general, data collection is working very well. The data transfer, which mainly takes place remotely via telephone and hardly digitally, works moderately. When data is passed on by telephone, the situation is quickly and clearly understood between experts. If information is passed on from expert to non-expert, obstacles arise - different interest groups prevent the development of strengths.

Information transfer via other channels shows a very good functionality using the example of a WhatsApp group. This system is constantly and easily available and easily accessible to everyone. Another aspect of the best practice example is the personal background. Photographs and short texts can be sent quickly, and feedback is given on the receipt and acknowledgement of the information. Thus, this system represents communication in both directions.

Natural hazard events always attract media attention. This interest has an influence on the work of the avalanche commission and the institutions concerned (municipalities, regions, road services, rescue, etc.). For these institutions, media training is desirable in order to be able to react in the right way to the media in such situations. This should also result in an improvement of the structures in the institutions (contact persons must be defined and trained). The media exercise a control function so to speak. On the other hand, there is also the possibility for the individual institutions to appear in the media in order to present their functioning working methods and thereby obtain funding and demonstrate the importance of their work.

5.3 WORKSHOP RESULTS, FLOODS AND SOIL SLOPE FAILURES, BAVARIA, GERMANY

Date of workshop: 17.09.2020

The workshop was held in the administrative district of Upper Allgaeu with Oberstdorf, Bad Hindelang and Rettenberg chosen as representative communities. Apart from municipal representatives and staff members of the district administration, personnel of the water management office Kempten and the Department of Food, Agriculture and Forestry Kempten took part. The organisation and moderation of the workshop was carried out by the Bavarian State Ministry of the Environment and Consumer Protection and the Bavarian Environment Agency, which also acted as natural hazards experts for the contingency planners and experts. The workshop focused on the natural hazards "flood" and "soil slope failures". As the differences between the handling of floods and soil slope failures in contingency planning are minor, both topics are discussed together.

5.3.1 RAPID RISK APPRAISAL (RRA)

After the introduction and information phase, the rapid risk appraisal was undertaken on municipality level. Thereby the groups offered an initial assessment about their regional strengths and weaknesses. Minor differences between the two natural hazards but also between the municipalities could be recognized in their self-evaluation (RRA) of the five relevant challenges (Figure 17 to Figure 19).

Figure 17: Rapid Risk Appraisal, left: flood, right: soil slope failures, municipality of Oberstdorf, Bavaria.

Figure 18: Rapid risk appraisal, left: flood; right: soil slope failures, municipality of Rettenberg, Bavaria.

Figure 19: Rapid risk appraisal, left: flood; right: soil slope failures, municipality of Bad Hindelang, Bavaria.

The “Risk communication“ between contingency planners and natural hazard management experts was estimated as comparatively good, followed by the aspects “Structural quality” and “Data availability”. Concerning the latter point it came out, that event documentation and forwarding of data to specialized authorities is done more detailed and continuously in case of soils slope failure events – which occur more rarely, but also cause bigger damage – compared to flood events. The availability of “Material resources” is estimated quite good concerning the catastrophe management equipment but the protection measures and concepts are not or only partly implemented yet. At the moment the “Personal resources” are overall sufficient and training opportunities exist but could partly be improved concerning their quality. The willingness to learn of the personal is estimated as quite high.

5.3.2 GROUP DISCUSSION

In our focus groups we discussed the following questions in order to gain a deeper understanding of how regions develop strengths and how they master weaknesses.

5.3.3 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS?

Data availability

- Experience gained in the case of emergency is incorporated in future contingency planning.
- Technical foundations provided by the water authority are known and in use.
- There is a consciousness regarding importance and meaning of the existing data base and maps.
- Data exchange with water authorities works well due to good personal contacts.

Structural quality

- Decisions are made and responsibility is taken not by individuals but together as a group (experiences and special knowledge are taken into account).
- Especially in small municipalities, contingency planners and natural hazard managers often share their office.
- Interdepartmental cooperation works well due to good personal contacts.

Risk communication

- Municipalities are integrated in the process of determining torrential endangered areas.

Material resources

- High transparency concerning the priorization of technical protection measures and catastrophe management equipment.
- Strong support on the part of the municipalities especially when making land available for technical protection measures.
- The district Upper Allgaeu offers financial support for the municipalities’ share for technical protection measures.
- Intercommunal readiness to help in the case of emergency.

Human resources

- Most of the fire brigade members do not only have their centres of life in the near vicinity, but are employed locally as well. This leads to long-term local experience as well as the availability of personnel in the case of emergency.
- Willingness to learn exists fundamentally.

5.3.4 WHAT HINDERS US TO DEVELOP STRENGTHS?

Data availability

- Municipalities partly have problems to attract new emergency personnel, since there is no younger generation which the knowledge can be transferred to. This will lead to a loss of local knowledge.
- Difficulties of integrating external data in the municipalities’ and the civil protection’s geoinformation systems. Data are available as web map services, but the servers can collapse during a natural hazard event due to citizens’ requests. This can lead to the situation, that municipalities and civil protection also losing access to the data during an event.

- Sometimes results of investigations on the exposure of natural hazards, which were carried out on behalf of the municipalities, are not made public. For this reason, neither contingency planners, natural hazard managers nor water authorities are getting access to valuable information.
- Data exchange between parties involved is not regulated.

Structural quality

- Many emergency personnel work outside the local area and thus are not available during daytime. Employers are often not willing to release employees from work in case of emergencies. Further there is often a lack of commitment especially during the night and on weekends. Especially in times when insulting and impeding emergency personnel occurs more often, the willingness to get involved in the voluntary fire brigade or related organizations decreases.
- Though all emergency personnel involved know what to do in the case of an emergency, there is usually no documentation.
- Decision makers cannot rely on structured contingency plans. This is a problem especially when decisions have to be made by single individuals.
- Contingency planning and theoretical foundations are located at different departments, but interdepartmental cooperation is not regulated.

Risk communication

- Limited staff capacities sometimes stand in the way of an exchange of expertise.

Material resources

- It is common that acquisition of operational equipment need strong persuasive efforts. Sometimes it takes a natural hazard event to persuade decision-makers.
- Making land available often depends on the goodwill of individuals.

Human resources

- In younger generations, there is often a decline in local identification, as they often work outside the local area and lack the older generation's good integration. This may lead to a future loss of knowledge.
- Though awareness for the need of contingency planning exists, other work priorities often prevail.
- Willingness to learn depends if the meaningfulness of training courses is obvious or not.

5.3.5 HOW TO MASTER THE WEAKNESSES?

Data availability

- Successors in leading functions have to be thoroughly introduced into their new positions.
- Creation of two-directional interface between the software of municipal administrations, civil protection and water authorities.
- Data should be made available offline and on mobile applications.
- Check if Environmental Information Act can be applied to force municipal administrations to make results of investigations on behalf of municipalities can be made public.
- Passing event documentation data to water authorities on a regular base.

Structural quality

- Stronger political support for emergency personnel. Appreciation on its own is not enough.
- Increasing the transparency of processes.
- Better elaboration of contingency plans.

Risk communication

- Greater involvement of water authorities in the training of heads of operations.

Material resources

- Provision of information material by the Bavarian Environment Agency in order to raise awareness of municipalities, mayors and citizens.

Human resources

- Practical knowledge should be incorporated into training courses

Summary of the Germany Workshop – Floods and soil slope failures

The three municipalities in the district of Upper Allgaeu are generally well-prepared for the challenges presented by natural hazards. Shortfalls are mostly linked to the cooperation with other authorities. Thanks to good teamwork based on good personal contacts between all persons involved, this is currently not a problem. Nonetheless an organizational frame ensuring cooperation and exchange of relevant data in the future is missing. Such a legal frame further prevents the loss of information when generations of the persons involved change.

Emergency personnel as well as persons responsible in the municipal administrations would like to get more appreciation and support for their work from politics and society. The water authorities would like to see a growing acceptance for their measures especially from those who do not directly benefit from them.

As a possible approach to improve this, providing more information material was proposed. This would go hand in hand with rising the awareness of the public for the issues of flood and other natural hazards. Hopefully, a better acceptance of public measures will also lead to a higher willingness of the citizens to take measures themselves. In this context, the information campaign "Hochwasser.Info.Bayern[20]" (flood information Bavaria), which offers information material for municipalities, citizens and further players, was presented.

Currently contingency planning and hazard management on municipal level is mainly based on the emergency personnel's experience and hardly uses theoretical foundation data. The available data are considered useful nonetheless. Data availability is seen as a problem by the municipalities for two reasons: Interfaces between the municipalities' and the water authorities' geoinformation systems are available only as web map services (wms), which cannot be implemented into some of the municipalities's geoinformation systems. Additionally, the data should be available offline as well. Hence a specifically designed interface is considered desirable. Additionally, such an interface could also be used by the municipalities to submit event documentation to the water authorities. Political interests can also pose a problem as they can bar the way to making communally determined hazard maps public.

Documentation as well as systematic development of contingency plans is considered useful to share the existing knowledge. Nonetheless it is often disregarded due to other, more urgent tasks. Municipality representatives hence consider providing standardized procedures and documents for developing communal contingency plans helpful. The Bavarian State Ministry of the Interior already provides a practical working aid[21] for this purpose.

20 Hochwasser.Info.Bayern, 2020
21 LFU, 2020

5.4 WORKSHOP RESULTS, AVALANCHES, AUTONOMOUS PROVINCE OF BOLZANO, ITALY

In order to explore the strengths and weaknesses related to different steps of the risk management cycle, the expertise of the participants covered both the theoretical know-how (e.g. risk prevention and emergency planning) and the more practical fields (e.g. emergency management). Overall, 30 participants took part to the online workshop focussing on avalanches, four of which were observers and three moderators.

In a Rapid Risk Appraisal, the group offered an initial assessment about their regional strengths and weaknesses. The participants were asked to take part to this initial evaluation by answering the preliminary questions selected by PLANALP. Since the workshop was held online, this process was carried out using an online tool, Microsoft Forms. The questions were answered individually after a preliminary explanation of the main points touched by the questionnaire. The results were immediately presented and used as an input for discussion. In particular, the answers served as discussion starting points to analyse the current strengths and weaknesses and to discuss the way forward to adjust contingency planning to the practical needs of natural hazard management. 19 participants out of 30 filled in the initial evaluation on Ms Forms; therefore, all the graphs presented below show the difference in opinions of this specific group of participants: eight risk prevention and emergency planning experts/practitioners, three emergency management experts/practitioners and eight experts/practitioners in both aforementioned sectors. The discussion on the other hand involved all the participants connected to the online workshop.

Figure 20 summarises the results of the RRA by calculating the averages of the replies given individually through the online form by the different components of the focus groups. The main perceived strength in the fields of avalanche risk prevention and management is “data availability”. The overall number of points attributed for that theme falls indeed into the “best practice” section of the spider chart. The other themes recorder a similar but lower score, corresponding to the “average case” scenario. Overall, no theme scored low enough to fall into the “point missing” scenario. Nevertheless, points for improvement were pinpointed and addressed during the discussion.

The five challenges identified by the PLANALP working group were used to guide the discussion. However, in order to summarise all the relevant points, in the report these challenges were grouped to form three themes: data/information availability (1), structural quality and material resources (2) and finally risk communication, and human resources (3).

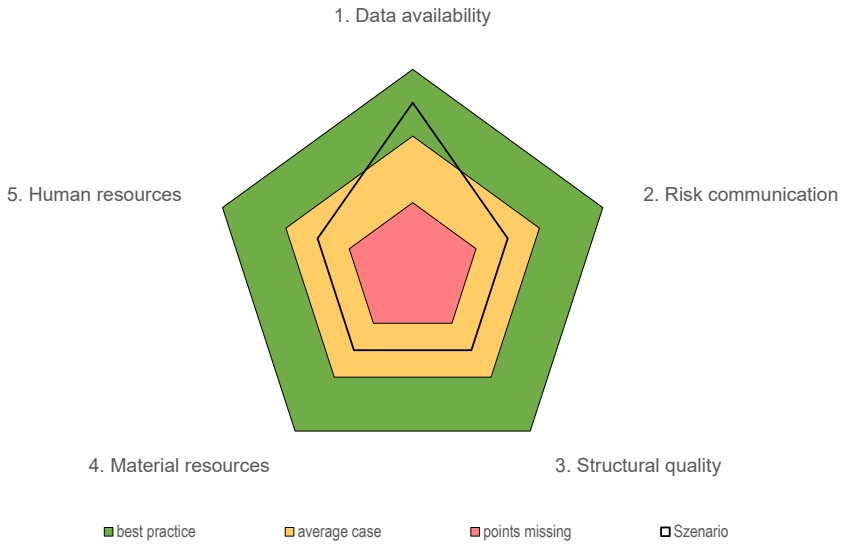

Figure 20: Rapid risk appraisal, avalanches, South Tyrol, Italy.

5.4.1 DATA AVAILABILITY

The first challenge addressed by the focus group was avalanche data regarding both, current and past damage causing events, their availability and accessibility. Most of the experts expressed high satisfaction with the quality and quantity of data available regarding both current and historical damage causing events. The majority of answers of the RRA questionnaire fell indeed under the first scenario of “best practice” (see Figure 11, green colour). Current event data acquisition was largely described as occurring in a continuous, systematic and digital way (Figure 11 a, b, c). Moreover, the majority of experts agreed that data on recent events are made available to contingency

planners, although as seen from the answer distribution the agreement on this point seems lower (Figure 11 d). The questionnaire answers suggest a slightly better quality and transfer of data regarding current events, compared to historical events. Nearly half of the participants partially know or don´t know/don´t agree that contingency planners can easily have access to the data of historical events.

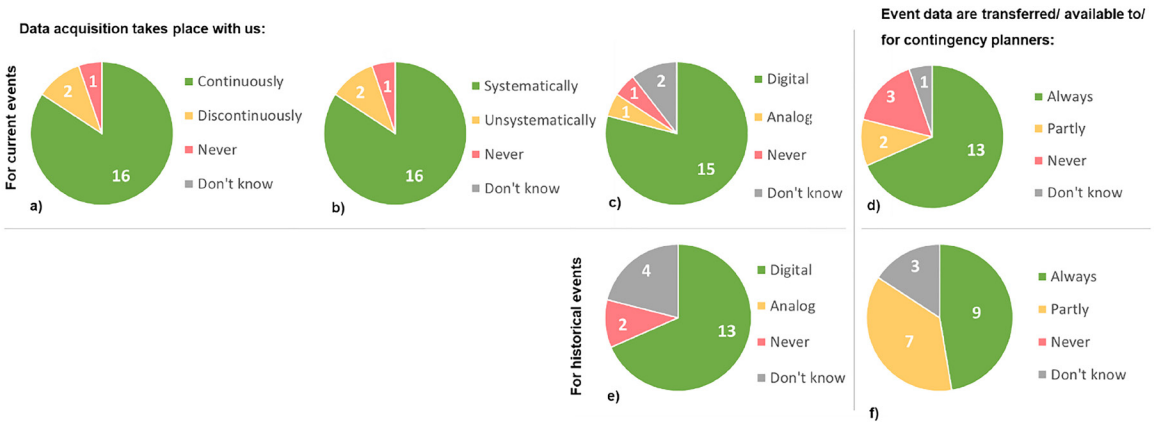

Figure 21: RRA answers regarding data on damage causing avalanche events. The first line illustrates the distribution of answers related to current events, while the second refers to historical events. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). Overall, the questionnaire was filled in by 19 participants and used as an input for discussion, reported below.

Overall data are considered by the focus group as a strength point. Nowadays, when an event occurs data are collected by foresters on the field through a systematic approach, following a standard set up by the Interregional Association for Coordination and Documentation of Snow and Avalanche problems (AINEVA). AINEVA is the association that gathers the regions and autonomous provinces of the Italian Alpine range, whose aim is to enable coordination of all the initiatives its several bodies carry out in terms of prevention and information in the snow and avalanche sector. Although there is a common standard for foresters to follow, some stations have been more diligent and systematic than others in following it. The quality of the avalanche cadastre is therefore dependent on the quality of the work carried out on the field in the forest stations. Overall, the quality of information reported was judged as high.

Once collected, data is transferred to the Warning Centre of the Agency for Civil Protection of the Autonomous Province of Bolzano who is responsible for the cadastre of avalanche events. Data are continuously recorded and uploaded to online web-browsers (e.g. the Provincial online hazard browser): for instance, the data related to the events of the past winter (2019-2020) are already part of the digital database. Before the winter of 2006-2007, event data were attributed to a certain number of polygons without any detailed reference to their single geographic information of extention. Since that winter, data are digitalised, not only reporting alphanumeric information describing the events' characteristics and related photos but also including the geographic information of extention of the single event. For each event, GIS data is publicly accessible through the web browser. The other types of information (alphanumeric information and photos) can be obtained through a specific request to the Provincial Warning Centre. The Provincial Agency for Civil Protection aims to further improve the accessibility of these types of data. In this regard, in the coming year, the Agency is planning to publish this data openly online in the framework of an EU INTERREG project they are leading, called RiKoST[22]. This will allow other experts such as planners and risk prevention officers to access data for their needs (i.e. as a basis to develop the Hazard Zone Plans).

In agreement to the answers given to the questionnaire (Figure 11 e), historical events are also digitally recorded, but less information is available for each event. Events recorded date back to 1916; however, for the events which occurred before 1975 more work is needed to obtain more details. This work is currently being carried out by the professionals in charge of producing the hazard zone plans which all the Municipalities of the Autonomous Province of Bolzano are required to develop by law. The historical research work they are carrying out in this context is usually integrated in the cadastre. Therefore, the municipalities which have not yet developed their hazard zone plans are still lacking more complete and systematic historical events data.

All the data are available through different browsers[23], among which the Civil Protection Browser[24], allowing experts within the Province to consult and use them consistently and systematically.

22 *Eurac research, 2020*
23 *Administrazione Provincia Bolzano, 2020*
24 *ZSBrowser, 2020*

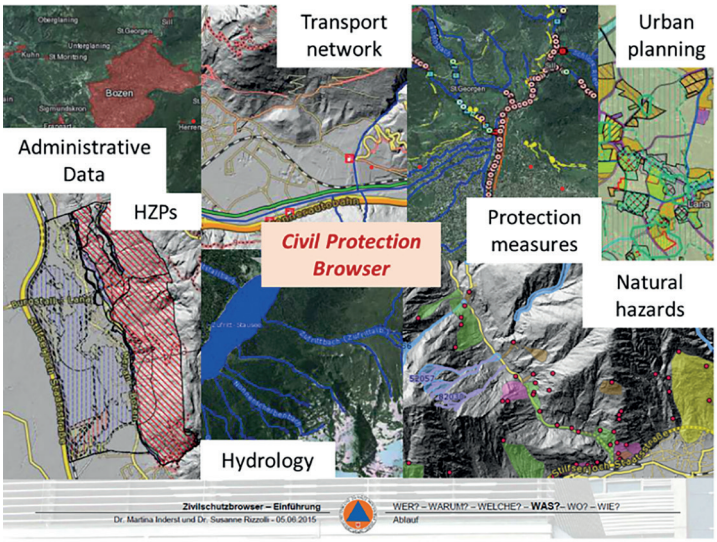

Figure 22: The Civil Protection Browser and examples of data provided for both monitoring and application uses (source: image adapted from Zivilschutzbrowser presentation by Inderst and Rizzolli, 2015).

Data on the hazard browser4 can also be consulted by other users. Although the data is officially available on online browsers, some participants questioned whether this data are practically used from different types of users acting on the field, e.g. emergency responders. Avalanche commissions and firefighters use the browsers in a heterogeneous way. It was reported that there is room for improvement in the training of avalanche commission members for the use of such browsers: this was indeed highlighted as future point to work on in the coming years. Moreover, the process through which these data are integrated in emergency management and in the development of civil protection plans should be refined and formalised.

All the municipalities of the Autonomous Province of Bolzano are required by law to develop hazard zone plans which include avalanches as a hazard. The law prescribes that the development of such plans is to be carried out by private consultants. Once the plans have been approved, they become part of the legal binding and integrative part of the land use plan; moreover, they become accessible to users through the online browsers previously mentioned. However, not all the hazard zone plans are already approved leading to a heterogeneity of available data. This is also reflected in the results of the RRA questionnaire (Figure 13).

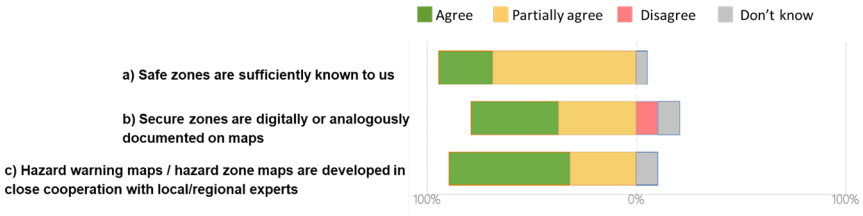

Figure 23: RRA answers regarding safe areas and hazard zone plans in the context of avalanches. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

According to the participants the location of safe areas is currently known, thanks to the works carried out nowadays for the development of natural hazard zone plans and before for the possible avalanche location maps (CLPVs), coordinated by the Office for Meteorology and Avalanche Warning of the Autonomous Province of Bolzano. However, areas exposed to natural hazards receive a greater attention compared to the areas considered as safe when it comes to decision-making and strategic choices. A participant underlined that among many experts a risk-centred culture is present. Future operations, logistic and management decisions could therefore follow a more "positive" approach also based on "safe areas" for operational, logistics and management needs and decisions.

5.4.2 STRUCTURAL QUALITY AND MATERIAL RESOURCES

The second and third challenges addressed by the focus group were the structural quality and the presence of structural measures and necessary equipment for addressing avalanches.

Following the presentation of the RRA results (Figure 14), the discussion regarding structural quality mainly focussed on two different tools: 1. hazard zone plans (HZP) and 2. municipality civil protection plans (MCPP) and their connections and interactions. Both plans are developed at municipality level, but they fulfil different functions within the risk management cycle. The first (HZP) is mainly considered as a land use planning instrument for the prevention phases, while the second (MCPP) is used to coordinate the operational management of the emergency phase.

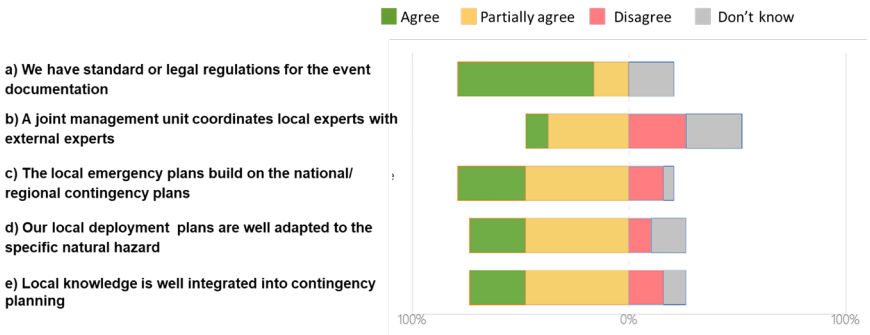

Figure 24: RRA answers regarding structural quality in the context of avalanches. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

The focus group agreed on the general high quality of the HZPs. While susceptibility maps rely on simpler methodologies to display the geographical distribution of hazards, HZPs are a punctual instrument developed to identify the potentially exposed assets and subsequently provide legally binding indications. The MCPPs were often developed earlier than the HZPs this is why some experts reported the need to update the MCPPs once the HZP is approved and based on the information acquired through the development of the HZPs. The lack of synchronization between the HZP and the MCPP was highlighted by the experts, showing a need to increase the connection between these two almost parallel projects.

This is especially important also considering that the responsibility for drawing up both the HZP and the MCPP falls on the municipalities. The two instruments have therefore the potential to operate in an interactive manner, generating an information flow in both directions.

Although the municipalities are responsible, the practical expertise lies with technicians, both from private companies and the province. Therefore, it would be helpful if after the preparation of the HZP and/or the MCPP, during the search for solutions, municipalities would be supported, advised and solutions proposed not only for building structures (technical protection measures) but also for more practical plans. This would help to better integrate these two tools to be used during the emergencies.

A useful instrument which is receiving increasing attention in the last five years is the local Intervention Maps. These are mainly constituted by a map accompanied by practical indications on the actions to be performed in case of the occurrence of an event. Being an experimental local tool, up to now its use is restricted to only a few municipalities. Local avalanche intervention maps have been developed, financed as pilot studies through a European project (one for avalanches and a couple for streams), in San Leonardo in Passiria/St. Leonhard in Passeier and in Pfitschtal/Val di Vizze. Based on this theoretical experience a "Handbuch", a Vademecum on how to develop these intervention maps, what they should contain, was developed. After this experience, in a very limited number of municipalities, following the approval of the Hazard Zone Plan, intervention maps have been also developed; for example, in San Candido (for flood and debris flow events) it has already been used to deal with an event that occurred. Although the event occurred before any practice tests had been carried out, the intervention map was adopted, and the local mayor gave a positive feedback regarding its use.

The development of future local intervention should be initiated by the municipality, encouraged by the Province. The plan is produced by a technician or freelancers who in this case act as moderators. Firefighters contribute to the generation of the plan by providing local practical knowledge. The focus group suggested that since most of the municipalities are in the conclusion phase of the development of the HZPs, it would be a good moment to begin

a more systematic implementation of such tool. Other measures such as protective structures or spatial planning measures require more time; intervention maps instead can be produced in a relatively short time and are of great help for the emergency services in limiting damage in case of an emergency.

The following discussion point addressed the material resources available in the Province to prevent avalanche damage causing events, mainly focusing on avalanche blasting. For ski slopes an active approach is usually adopted to reduce the avalanche danger, mainly based on permanent works. As also presented in Figure 15, experts showed different opinions regarding the use of temporary measures such as avalanche blasting.

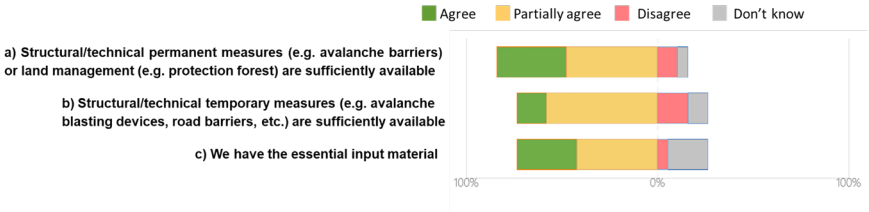

Figure 25: RRA answers regarding material resources for avalanches. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

Such a measure is usually coordinated by the road service department of the Province in agreement with the municipalities. The adoption of avalanche blasting is often limited by many different factors such as the weather, the visibility, the quantity and quality of snow but also by social factors such as the experience of the avalanche commission and bureaucratic delays. Avalanche blasting is therefore associated with a high degree of uncertainty; consequently, it is difficult to officially include this measure in a plan. However, acting timely is of great importance to obtain the desired results. Moreover, another challenge is represented by the fact that the municipalities receive only a partial contribution when blasting is carried out. Since they are not 100% covered for the costs, they are sometimes a bit reluctant before undertaking a blasting.

To solve these challenges, for 2 years, a manual for avalanche blasting is available, addressing the organisational issues to be considered. However, this manual is still not well known and should be given more attention and be better disseminated.

The focus group is also aware of best practices carried out abroad and suggested their adoption in order to have more efficient and planned methods for avalanche blasting. In Austria, for example, explosive poles are used instead of helicopters as in South Tyrol, allowing the operations to be carried out more smoothly. New methods and systems also include the use of drones (e.g. from Switzerland, see Gasex). Experts feel the need to dedicate more attention to new technologies, such as Geoprävent, which uses to continuously monitor slopes, thereby registering even the smallest avalanches. Such systems are still not well known in South Tyrol (e.g. avalanche commissions are said to be little informed).

5.4.3 RISK COMMUNICATION AND HUMAN RESOURCES

The last two challenges addressed by the focus group were risk communication and human resources to tackle avalanches.

From the RRA questionnaire (Figure 16), it emerged that contingency planners and operational managers generally trust and value each other. They mostly know each other personally; however, less participants stated that the two groups of experts have discussions or informal contacts among each other. It was reported that lately the two groups have been brought closer together, but being this a new development, the process should be encouraged through more practical exercises.

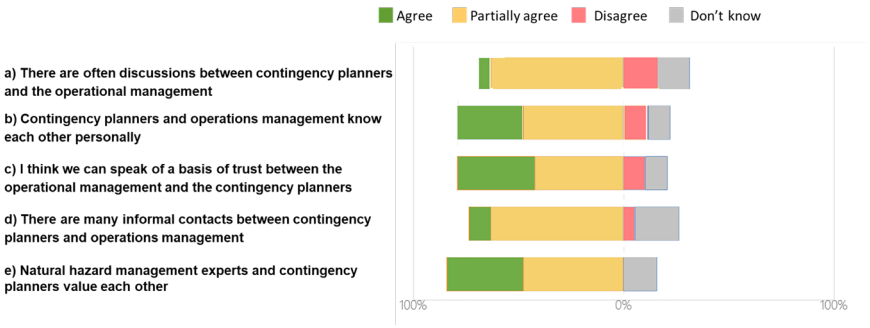

Figure 26: RRA answers regarding risk communication among different experts. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

The willingness of the participating experts to learn from good practises and experiences from other regions proved to be relatively high, as also shown from the answers of the RRA questionnaire (Figure 17 c.f.): almost all would like to learn from foreign best practices; the majority agrees also on the predisposition of contingency planners to learn from practical application experiences.

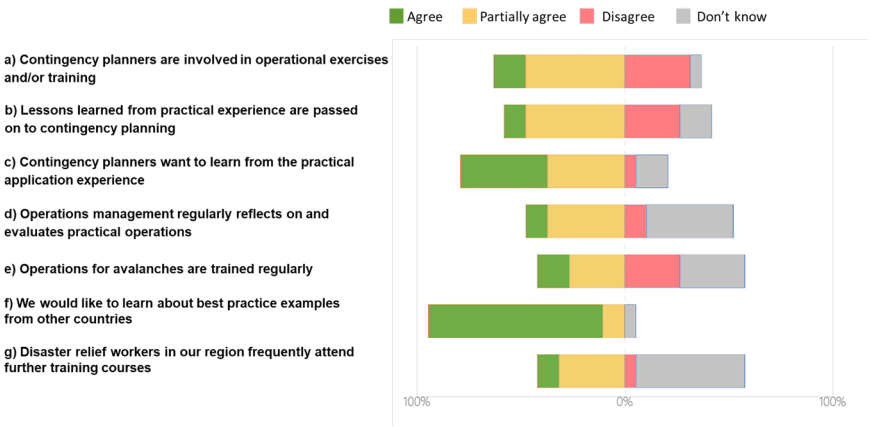

Figure 27: RRA answers regarding human resources, including willingness to learn of the different experts. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also availability (grey). The bars show the percentage for answers given per scenario.

According to most of the experts there is still room for improvement in terms of currently undertaken courses and exercises. There have been many exercises at local level, but the objectives of these exercises are not clearly defined nor coordinated. A proposed solution would be to develop specific objectives and strategies for the territory together (e.g. during an expert workshop).

The Province of Bolzano is part of the Albina project together with Tirol and Trentino. It was reported that such an experience helped to look beyond one's own experience, being inspired by how others work and learning new skills. In Trentino, for example, there is a plan for each ski area and a safety officer who must check the critical points and take measures; this is also checked by the avalanche warning service. In South Tyrol instead, it was reported that sometimes the way ski resort deals with the avalanche situation is left to its own discretion, underlining the absence of a practical control function on the part of the province. From a legal perspective laws and regulations are present, but they are not controlled. In Innsbruck, a member of an avalanche commission has to take part in a training course every few years (just like a member of the mountain rescue or the voluntary fire brigade). This was said to not exist in South Tyrol and represents a point that could be improved in future.

Training is provided but experts expressed the need of conducting trainings for specific scenarios relevant for civil protection (e.g. when avalanches hit hotels, buildings…) in which all actors participate, also with the use of practical exercises and simulations. The experience of a recent greater avalanche event in Langtaufers showed that several experts had to learn and practice during the emergency because the interaction between authorities and experts on site was not yet fully developed beforehand. Moreover, the importance of the event documentation was underlined, as a fundamental activity to conduct more realistic and useful exercises. Finally, it was also suggested to start a reflection among different experts on potentially new types of avalanches and extreme events linked with climate change.

Summary of the Italian Workshop – Avalanche

As highlighted by the Rapid Risk Appraisal, data availability was unanimously considered as a strength by the experts of the focus group. Data regarding avalanche damage causing events are continuously collected on the field by foresters using a systematic approach, following a standard set up by the Interregional Association for Coordination and Documentation of Snow and Avalanche problems (AINEVA). Data is then made available to contingency planners through web-browsers. Among these, the Civil Protection Browser, managed by the Provincial Agency for the Civil Protection, gathers different data from various sources in order to link risk prevention, land use planning and emergency management information.

Although the data field was undoubtedly considered as a strength, the Provincial Agency for Civil Protection aims to further improve its accessibility. In this regard, in the coming year, the Agency is planning to publish data (which currently requires to be requested) openly online in the framework of an EU Interreg V, I-A project they are leading, called RiKoST. Moreover, data about historical events will be gradually expanded by the private consultants who are currently responsible for the development of the Hazard Zone Plans (HZPs). All the municipalities of the Autonomous Province of Bolzano are indeed required by law to develop such plans. Some municipalities already possess approved, while others are still in the process, leading to a heterogeneity of available data. The focus group agreed on the general high quality of the HZPs: once approved, they become part of the legal binding and integrative part of the land use plan; moreover, they become accessible to users through the online browsers previously mentioned.

Nevertheless, there is still a need for the valorisation of such plans, especially regarding their integration with other instruments such as the Municipal Civil Protection Plan. The responsibility for drawing up both the HZP and the MCPP falls on the municipalities; however, the MCPPs were often developed earlier than the HZPs. Through an update of the MCPPs, the two instruments have the potential to operate in an interactive manner and reach their potential in application.

The current work on the HZPs was also considered as a good trigger to further implement another tool, the local Intervention Maps. This is an experimental local tool in which a map accompanied by practical indications on the actions to be performed in case of the occurrence of an event. Other measures such as protective structures or spatial planning require more time to be implemented; intervention maps instead can be produced in a relatively short time.

Finally, the participants demonstrated a general willingness to learn from foreign practises and practical exercises. There have been many exercises at local level, but the objectives of these exercises are not clearly defined nor coordinated. A proposed solution would be to develop specific strategies for the territory together (e.g. during an expert workshop).

5.5 WORKSHOP RESULTS, SOIL SLOPE FAILURES, AUTONOMOUS PROVINCE OF BOLZANO, ITALY

Date of workshop: 07.10.2020

In order to explore the strengths and weaknesses related to different steps of the risk management cycle, the expertise of the participants covered both the theoretical know-how (e.g. risk prevention and emergency planning) and the more practical fields (e.g. emergency management). Overall, 29 participants took part to the online workshop focussing on soil slope failures, two of which were observers and three moderators.

In a Rapid Risk Appraisal (RRA), the group offered an initial assessment about their regional strengths and weaknesses. The participants were asked to take part to this initial evaluation by answering the preliminary questions selected by PLANALP. Since the workshop was held online, this process was carried out using an online tool, Microsoft Forms. The questions were answered individually after a preliminary explanation of the main points touched by the questionnaire. The results were immediately presented and used as an input for discussion. In particular, the answers served as discussion starting points to analyse the current strengths and weaknesses and to discuss the way forward to adjust contingency planning to the practical needs of natural hazard management. 17 participants out of 29 filled in the initial evaluation on Ms Forms; therefore, all the graphs presented below show the difference in opinions of this specific group of participants: seven risk prevention and emergency planning/management experts/practitioners, six emergency planning/management experts/practitioners and four experts/practitioners in both aforementioned sectors.

The discussion on the other hand involved all the participants connected to the online workshop.

Figure 18 summarises the results of the RRA by calculating the averages of the replies given individually through the online form by the different components of the focus groups. The main perceived strength in the fields of soil slope failure risk prevention and management is “data availability”. The overall number of points attributed to this topic falls indeed into the “best practice” section of the spider chart. The other topics show a similar but lower score, corresponding to the “average case” scenario. Overall, no topic scored low enough to fall into the “point missing” scenario. Nevertheless, points for improvement were pinpointed and addressed during the discussion.

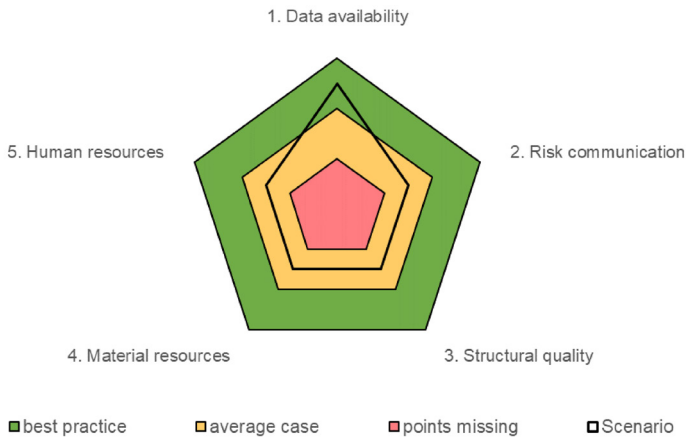

Figure 28: Rapid risk appraisal, soil slope failures, South Tyrol, Italy.

The five challenges identified by the PLANALP working group were used to guide the discussion. However, in order to summarise all the relevant points, in the report these challenges were grouped to form three themes: data/information availability (1), structural quality and material resources (2) and finally risk communication, and human resources (3).

In our focus groups we discussed the following questions to gain a deeper understanding of how regions develop strengths and how they master weaknesses:

- What are the reasons for developing strengths (best practice) in terms of data/information availability, risk communication, structural quality, material resources and human resources?
- What hinders us to develop strengths (best practice)?
- How to master the weaknesses (points missing) through measurements at the interface between contingency planning and natural hazard management?

The discussion on these three points is reported below following our grouping of the challenges.

5.5.1 DATA AVAILABILITY

The first challenge addressed by the focus group was soil slope failures data on current and past events, in terms of their availability and accessibility. Most experts showed high satisfaction with the quality and quantity of data available regarding events causing damage (Figure 19). Namely, data availability for recent and historical events causing damage was quite unanimously acknowledged as a strength, being data on recent events collected in a systematic, digital and continuous way, and data correlated with historic events mostly collected in a digital way (Figure 19 e). Furthermore, the majority of experts agreed that data on recent events are available to contingency planners, but less than one third partially or didn´t know/agree that contingency planner can easily have access to the data of historic events.

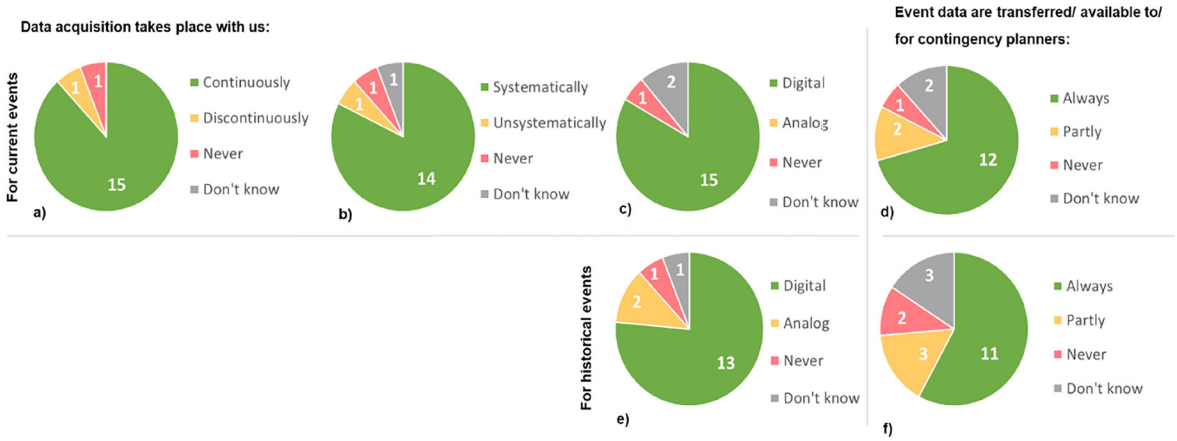

Figure 29: RRA answers regarding data on damage causing soil slope failure events. The first line illustrates the distribution of answers related to current events, while the second refers to historical events. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). Overall, the questionnaire was filled in by 17 participants and used as an input for discussion, reported below.

When an event occurs, the Provincial Geological Office systematically collects data and makes them available to the Provincial Agency for Civil Protection, the Municipality affected and, eventually, the deputy body for road management. A standardized and shared way to collect, report and also share data with externals is in place since 2000. Even if the so called "Alpine" approach has been adopted and the database is an internal one, every six months the data are transmitted to the national ISPRA database IFFI (Inventario dei Fenomeni Franosi in Italia), which provides an online and standardized database at national level since 2005. The limit of the internal database has been overcome by both providing updated geo-referenced data through online browsers (e.g. the Provincial online hazard browser) and by sending geo-referenced database on request (including geo-technical reports or inspections reports). Furthermore, a current EU INTERREG project (the RiKoST project[25]) will help to have published online pdf reports of events or of clusters of events for each Municipality, so that any kind of risk prevention experts (including private companies or collaborators) could access data for any kind of purposes – first of all for the needs of local Hazard Zone Plans (HZPs), acknowledged as a relevant tool in terms of risk prevention.

Therefore, though a strong availability and accessibility of data, the accessibility has been improving both to overcome the peculiar data format and to make data more usable than possible to all categories of experts and contingency planners. The possibility for the public to report events real-time has been also taken in consideration, and a way to validate it has been discussing at present.

The percentage of experts who agree that data on historic events are fully available to contingency planner is lower (65% always, 18% sometimes 12% never, Figure 19 e) than the one related to recent events (71% always, 12% sometimes, 6% never, Figure 19 f) due a more structural lack of information of past events. As a consequence of a technological gap, less information is available because only big events were reported on local news or parochial archives and no digitally collected elements of local knowledge (i.e. the use of smartphones since the 2000s) were available. This was overcome by recently digitalizing all these data.

It was also reported a double fold consequence of this sort of bias: the statistically-based appearance of a biggest frequency of events nowadays and a supposed claim to cover every event in the whole deputed area: it was put forward the lack of a perfect homogeneity between event documentation and planning, because the approach at

25 *RiKoST project : http://www.eurac.edu/en/research/projects/Pages/projectdetail4479.aspx*

stake is based on risk, not on hazards, due to a cost-benefit ratio, too. For instance, small interventions by farmers or firemen, or due to road maintenance are not documented. This perspective has been reported as consistent from a risk perspective both from a documentation and a risk prevention and management perspective, especially since it is based on documented real events and not on scenarios.

As showed in Figure 20, the collaboration with external experts for the elaboration of HZPs was unanimously acknowledged (Figure 20 c). The collaboration of private consultants without conflicts of interest is legally prescribed by this planning tool. Alternatively, the knowledge of safe areas is partially reported (Figure 20 a, b), also due to the prevalence of a sort of "risk culture" within experts: as reported in the discussion about avalanches, a "positive" approach based on "safe areas" for operational, logistics and management needs should be promoted, among decision makers, too. As final note, susceptibility maps aren't seen a proper tool for risk analysis in a geomorphological area like South Tyrol.

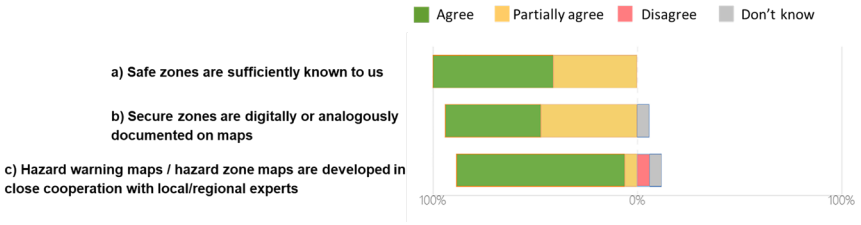

Figure 30: RRA answers regarding safe areas and hazard zone plans in the context of soil slope failures. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

5.5.2 STRUCTURAL QUALITY AND MATERIAL RESOURCES

The second and third topics addressed by the focus group were the structural quality (Figure 21) and the presence of structural measures and necessary equipment (Figure 22) for addressing soil slope failures.

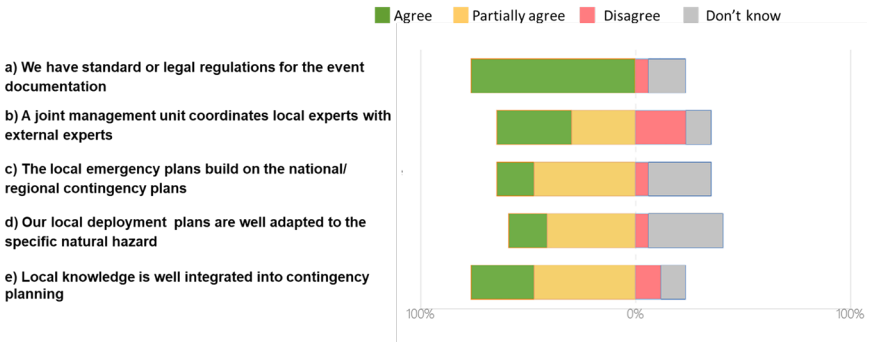

Figure 31: RRA answers regarding structural quality in the context of soil lope failures. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

About structural quality we considered the integration of local knowledge in contingency planning (Figure 21e), again the collection of data (consistent with the previous section, Figure 21 b) and some aspects of the Intervention Plans (Figure 21 c, d).

Local knowledge is partially integrated in risk prevention and emergency planning. To what previously discussed two key issues were added: in terms of emergency management, local citizens have the chance to report issues by calling 24h the emergency number 112; in terms of risk prevention, the limits of knowledge on past events were addressed by integrated historically collected information (for events before 1998) and through ad hoc local inspections, also with the help of external consultants while elaborating the legally binding HZPs.

Same as for the focus group on avalanches, we found contrasting opinions on Intervention Plans. Primary reason is that the use of this tool only in a few Municipalities as experimental local tool. Therefore, cooperation between risk prevention experts and emergency management experts/practitioners should be improved. In terms of emergency management, it came out from the debate that operational managers (above all volunteer fire brigades) knows very

well local contexts and are used to a very practical knowledge, which is hard to translate into risk planning documents: the challenge should be to transfer local practical knowledge into more flexible and adaptive planning tools.

During the debate, the Municipal Civil Protection Plan (MCPP) was also mentioned as a valuable tool for the municipalities, and for a joint collaboration with fire brigades and other rescue organisations. This plan includes technical scenarios, or very large scenarios, such as Covid as a pandemic. Indeed, civil protection scenarios are not everyday scenarios, and it is good to be able to look somewhere, e.g. overlaps between municipalities, or big events. The Provincial Civil Protection Plan, which will be adopted shortly, would also have to be coordinated with the MCPP, therefore all actors should be informed about it.

Furthermore, in terms of planning, as for avalanches, a better coordination between two kinds of plan, the Municipal Civil Protection Plan (MCPP) and the Hazard Zone Plan (HZP), both at local level should be fostered. As relevant non-structural prevention and emergency management tools, they should be made more operational, intertwined and dynamic. Risk communication, the internal one between the two groups of experts and the external one towards the public could also be improved through a better coordinated use of these two instruments. Furthermore, being HZP a recent tool, the MCPP was usually developed without properly having a risk prevention perspective in terms of planning. Sometimes not updated and well known, the MCPP includes a wider knowledge base than local or historically collected forms of knowledge (e.g. how to face a pandemic or cooperation among Municipalities). Alternatively, the HZP is based on reported single events, simulations of the processes and historical events, referred to single hazards: while they are then very informative for more exposed and critical areas, they consider fewer peripheral areas or possible multi-hazard/multi- risk impacts (including climate risk).

A high and qualified experience and competence in emergency management by local practitioners in the whole Province (namely the numerous associations of volunteer fire brigades and the Provincial body) were instead reported as a great strength in contingency planning. For instance, unofficial intervention plans are daily used by the fire department, drawn on their field experience and local knowledge, but these are not systematically part of official risk prevention or emergency plans, like the MCPP. This is definitely an issue to be addressed to boost coordination in contingency planning and to optimize the use of plans as dynamic governance tool.

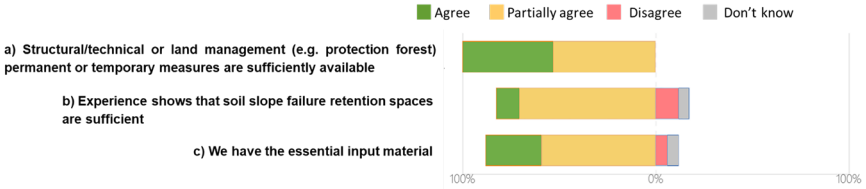

Figure 32: RRA answers regarding material resources for soil slope failures. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

Concerning the presence of temporary and permanent structural measures to prevent soil slope failures, almost exactly half of the invited experts agreed, and the other half partially agreed, but nobody disagreed (Figure 22).

The awareness that different kinds of structural measures have been sufficiently adopted goes hand in hand with the extent to which non-structural ones are necessary, too: a risk culture seems to be equally spread among the different experts/practitioners, who, contrarily, complain the reassurance that structural, visible and big measures provide to local communities. The behaviour from members of rescue organizations or sometimes even Municipalities are also put forward as a constraint for being more effective in terms of risk prevention and management and for doing more exercises and simulations.

5.5.3 RISK COMMUNICATION AND HUMAN RESOURCES

The last two topics addressed by the focus group were risk communication and human resources in addressing soil slope failures. In terms of risk communication, it emerged first that the two groups of experts generally trust each other and do generally recognize their reciprocal value (Figure 23).

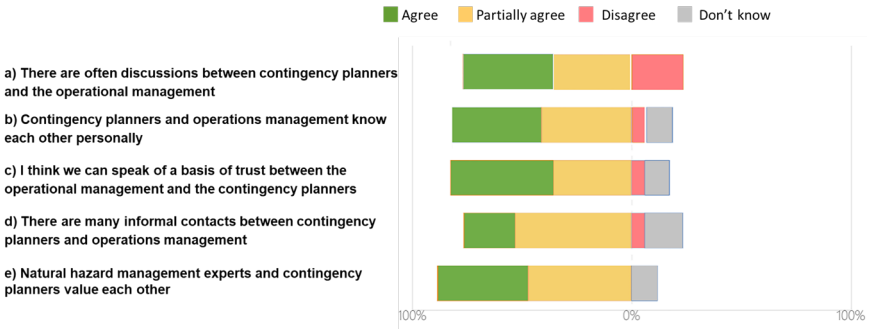

Figure 33: RRA answers regarding risk communication among different experts. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

Contingency planners and operational managers and practitioners have some informal contacts (23% agree, 53% partially agree), they sometimes personally know each other (6% disagree, 40% partially agree, 40% agree) and have from time to time discussion together or any type of exchanges one to another (23% disagree, 35% partially agree, 40% agree). If we compare these results with the section on human resources (Figure 24) we can assume that there is great respect (a point came out from the debate), trust, and dialogue among experts of different fields and a strong willingness both to learn and incorporate best practice and to learn by practical experience. As already mentioned, the fire department and volunteer fire brigades are highly trusted and valued by all other experts: their local knowledge of the areas is highly considered and supported. What can be improved is the coordination among risk prevention and emergency management experts and practitioners at different governance level, and the assessment of their joint/non-joint collaboration. Indeed, sometimes the provincial scale does not know very well the local one. Moreover, there is little chance to experience big coordination efforts at different scales, since greater disastrous events –which would need a joint provincial-local effort – have not occurred in recent times. Furthermore, evaluation of emergency management experts is partially or not undertaken, therefore it could be improved and made more systematic (e.g. rescue services are a good example, where each operation is discussed and evaluated afterwards)

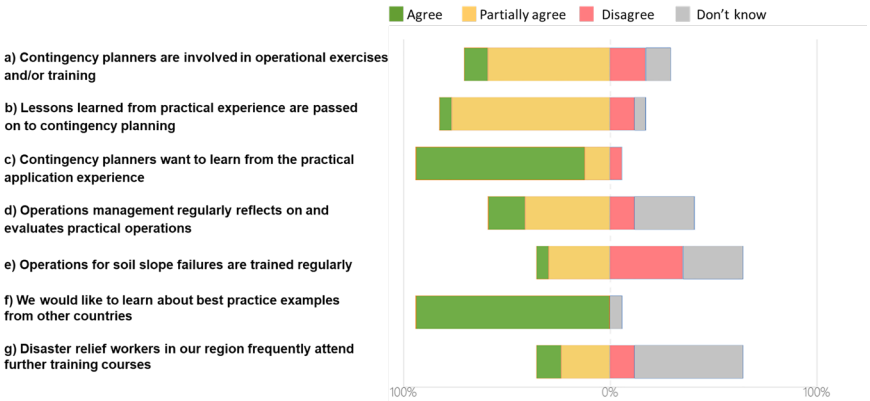

Figure 34: RRA answers regarding human resources, including willingness to learn of the different experts. The colours reflect the three RRA scenarios (green for best practice, orange for average case and red for missing points. The option "I don't know" was also available (grey). The bars show the percentage of answers given per scenario.

Namely, weakest points reported in the discussion and highlighted in Figure 24 are the lack of simulations/operational exercises and extra-training courses for both kind of experts/practitioners, and the partial transfer of practical lessons from experience to risk prevention experts. On the latter point, communication of successful emergency management operations to contingency planners and an ad-hoc reflection on results and emergency management operation should be improved. On simulations and training, different issues are at stake: there are many exercises at local

level, which depends on local firemen bodies, but the aims of the exercises are not clearly defined or coordinated at Provincial level, with previously defined shared targets and scenario. Alternatively, experience is passed on within the fire brigades. All age groups, all generations are represented within the fire brigades. The young firefighters learn a lot from the experienced and older members. A uniform training is provided by the fire brigade school, where a unit on natural hazards was introduced two years ago. During the training courses, the larger events are dealt with, and experiences and existing knowledge are passed on.

Although the provincial fire department school plays a positive role, being each firemen brigade different and made of volunteers, there is no homogeneity of operational training: exercises are usually held on evenings or weekends, when possible. A sort of "operational culture" (Übungskultur) to be strengthened was therefore also evoked to improve the knowledge transfer from experiences.

Summary of the Italian Workshop – Soil slope failures

Data availability for recent and historical damage causing events is quite unanimously acknowledged as one of the major strengths, being data on recent events collected in a systematic, digital and continuous way; moreover, data related to historic events is mostly collected in a digital way. The accessibility of such data has been improving to make data more usable to all categories of experts and contingency planners.

Another major strength acknowledged is the high and qualified experience and competence in emergency management of local practitioners in the whole Province (namely the numerous associations of volunteer fire brigades and the Provincial body). Local knowledge is however partially integrated in risk prevention and emergency planning, as this is not systematically part of official risk prevention or emergency plans, like the Municipal Civil Protection Plan (MCCP). This was pinpointed as an aspect to address to boost coordination in contingency planning and to optimize the use of plans as a dynamic governance tool.

Alternatively, the Hazard Zone Plan (HZP) is generally acknowledged as a relevant tool in terms of risk prevention, also thanks to the collaboration with external experts for its elaboration. In terms of planning, a better coordination between the MCPP and the HZP, both at local level, should be fostered. As relevant non-structural prevention and emergency management tools, they should be made more operational, intertwined and dynamic. The current work on the HZPs was also considered as a good trigger to further implement another tool, the local Intervention Maps, in order to improve the cooperation between risk prevention experts and emergency management experts/practitioners.

Concerning structural quality, the awareness that different kinds of structural measures have been sufficiently adopted goes hand in hand with the extent to which non-structural ones are necessary, too: a risk culture seems to be equally spread among the different experts/practitioners, who, contrarily, complain the reassurance that structural, visible and big measures provide to local communities.

In terms of risk communication, it emerged first that risk prevention experts and emergency management experts/practitioners generally trust each other and do generally recognize their reciprocal value. There is considerable respect, trust and dialogue among experts of different fields and a strong willingness both to learn and incorporate best practice and to learn by practical experience. What can be improved is the coordination among risk prevention and emergency management experts and practitioners at different governance level, and the assessment of their joint/non-joint collaboration.

Weakest points reported in the discussion resulted in the lack of simulations/operational exercises and extra-training courses for both kind of experts/practitioners, and the partial transfer of practical lessons from experience to risk prevention experts. Operational experience is usually passed on within the volunteer fire brigades through direct experience, but exercises are not clearly defined nor coordinated at Provincial level, with previously defined shared targets and scenarios. Furthermore, there is little chance to experience larger coordination efforts at different scales, because greater disastrous events – which would need a joint provincial-local effort –have not occurred in recent times.

5.6 WORKSHOP RESULTS, FLOODS & FLASH FLOODS, SLOVENIA

Date of workshop: 06.10.2020

During the workshop, each participant was given time to submit their subjective assessment of the five analysis criteria in the form of a questionnaire. Based on this, an overall opinion was formed from all the participants' subjective individual evaluations. The overall assessment of four of the analysis criteria was that they are classed as average, and for data availability they are classed as best practice. A more detailed analysis of the review of the responses of the individual participants showed that with the challenges of "structural quality" and "human resources" very little was missing to turn the overall assessment to excellent. On the other hand, the discussion also showed that despite the high average assessment of "best practice" in the "data availability" challenge, the participants later pointed out some shortcomings and opportunities for improvement in this area. The overall assessment was that we need to address and seize all opportunities for improvement in all areas, and that all aspects can be even better.

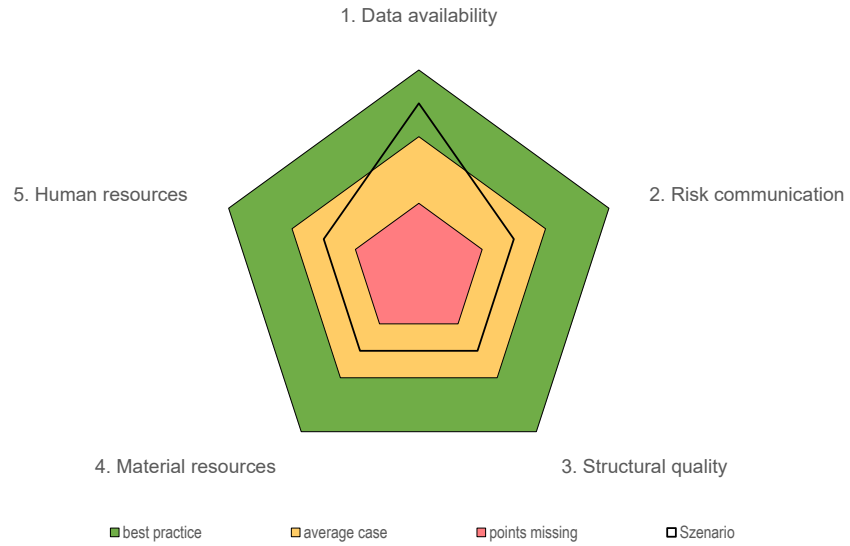

Figure 35: Rapid risk appraisal, floods & flash floods Slovenia

In our focus group, participants from national, regional and local levels discussed the following questions to gain a deeper understanding of how stakeholders develop strengths and how they master weaknesses.

5.6.1 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS?

The participants agreed that Slovenia has a very advanced and functioning system of protection against natural and other disasters (VNDN system). The existing organization of the VNDN system is the most appropriate and financially sustainable for the country.

The VNDN system is based on voluntary and professional organizations, units and services; for management functions and specialized areas of work, Civil Protection units and services are organized. The system is also characterized by high connectivity with faculties, research institutes, ministries, government services, local communities, the police, and the Slovenian Armed Forces. The VNDN system is tested daily, with a short response time by services and units and the ability to activate a large number of rescuers in a short time. From the point of view of continuous improvement of the system, it is important to conduct regular analyses/studies of past disasters/damage events.

Slovenian disaster protection and rescue plans[26] (in context of this report "contingency plans") are based on a risk[27] assessment of natural or other disasters (hereinafter referred to as "disasters") and on other scientific documents

26 In Slovenian practice, "Načrt zaščite in reševanja" is most often translated either literally as "Disaster Protection and Rescue Plan" or as "Disaster Emergency Response Plan", and less often as "Contingency Plan".

27 The "risk assessment", which is the first step in planning (made based on the 1995 regulations), is a mandatory basis and part of the content of protection and rescue plans. The similarly named "flood risk assessment and risk maps", which are prepared in Slovenia according to the water legislation from 2007, are primarily intended for spatial planning and planning of flood risk reduction measures.

and facts relevant to protection, rescue and relief, and on the assessment of needs for protection, rescue and relief forces and resources to rescue and protect people, animals, property, cultural heritage and the environment during disasters, or to restore basic living conditions after disasters. Plans are made based on the "Decree on the content and elaboration of protection and rescue plans".[28]

Disaster protection and rescue plans are itemized concepts of carrying out protection, rescue and relief operations in the event of a disaster. The concepts specify in detail the necessary protective measures and tasks of the bodies responsible for implementing the plan, depending on their responsibilities defined by the law, thus enabling organized, coordinated and effective performance of protection, rescue and relief operations aimed at mitigating the consequences of a disaster, or the earliest possible establishment of basic living conditions following a disaster.

Disaster protection and rescue plans are prepared separately for each type of disaster or collectively for several disasters. Depending on the concept of carrying out protection, rescue and relief operations, either only individual parts of disaster protection and rescue plans, or only documents for performing protection, rescue and relief tasks and protective measures may be prepared, instead of full disaster protection and rescue plans. In Slovenia, the coverage of disaster protection and rescue plans is high at all levels (national, regional, local and industrial site disaster protection and rescue plans). The plans are regularly updated. Most of the plans are prepared for floods, which are assessed as a natural disaster with very high risk (Figure 123).

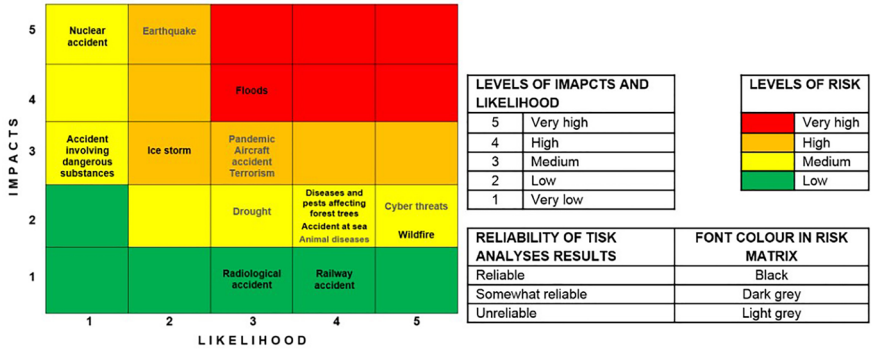

Figure 36: Slovene National Disaster Risk Matrix 2018 – overall overview of likelihood and impacts.

Slovenian disaster protection and rescue plans for floods generally by rule contain response concepts for two types of floods: 1. "Floods" as slowly and regularly evolving regular flood events (slow stepwise-onset flood hazards) and 2. "Flash floods"/ "Sudden floods" as rapidly and irregularly evolving events (sudden-onset flood hazards), mainly as torrential floods. The specificities of these two types are reflected in the plans, in particular in the fields of monitoring, notification, warning and activation activities.

The quality of services and the method of cooperation with all stakeholders by the meteorological and hydrological forecasting service at the Environmental Agency of Slovenia is constantly improving from year to year and is currently at a very high level. Transparency is also very important in cases of the extreme difficulty of predicting small but potentially very intense torrential outbreaks, where the supporting technological possibilities for forecasting are limited. In this case, a good understanding and constant contact between forecasting services and response units in the field during the development of events are all the more important. They both learn from each other.

With regard to the system of regular education and training in the field of protection against natural and other disasters, the participants emphasized that it is good; however, it should be organized even more systematically for all stakeholders in the VNDN system.

5.6.2 WHAT HINDERS US FROM DEVELOPING OUR STRENGTHS?

It was found that in the Republic of Slovenia we already have many different, good and useful applications (AJDA – system and application for damage assessment; SPIN – system and application for reporting emergency responses and accidents; UJMA – a geoinformation support system; Water Where You Are, MASPREM – warning system for the risk of triggering soil slope failures). Nevertheless, for some users, both the abundance and parallelism of these and

28 *Uradni list, 2020.*

other support systems are difficult to manage. In terms of greater transparency, coherence and a more user-friendly experience, most of the applications could be combined into a common system/platform for all users (local, regional and national level).

Due to a lack of staff and resources, flood event documentation is often not carried out sufficiently and systematically – especially in terms of properly documenting different phases of event developments and the consequences of events. Most efforts are focused on the response, but after the event, there is some lack of more reliable bases for a more effective expert analysis of past responses, correlated to development and the characteristics ("silent witnesses") of natural phenomena. The Environmental Agency of the Republic of Slovenia would benefit from more data from field measurements and observations of various professional services during flood events (not only from automatic measurement stations), and experts would like to have the event documented more consistently, including for better understanding of natural processes. In documenting the consequences of a natural disaster, it is understandable that the work focuses on damage assessment, but greater systemic support for other topics of "event documentation" would be desirable.

It was pointed out that a high added value that the national level could contribute to a more effective flood response would be to provide information to the local level by establishing rapid and systematic monitoring of the development and final scale of the flood event through aerial photography. It was pointed out that in the case of bad weather (clouds), satellite images are not of good quality and do not show the real situation; besides this, there are excessive delays in the images.

It was pointed out in the discussion that the confirmation of changes in flood hazard maps by the competent national authorities (according to the actual situation on the ground; changes for example after the implementation of protection works in a certain part of the river basin at the municipal level) should be faster. More maps should be prepared on the river basin district and not only at the municipal level.

In Slovenia, the challenge is the dispersion of stakeholders at the national level. There is still an opportunity to improve coherence between them, which would be very important due to their different responsibilities in the field of water/flood management.

The participants in the discussion believed that more attention should be paid to the participatory approach of all involved stakeholders who have their place and roles in the disaster protection and rescue plan (cooperation between different actors, coordination, weighing solutions, etc.).

The visual appearance and tools used to display the content of the disaster protection and rescue plans could be even more advanced and user-friendly. Particularly great opportunities for improvement are in the field of e.g. more modern incident response maps for several different scenarios, including those that are not yet officially required. Perhaps the usefulness of such more advanced bases is underemphasized – maybe partly because of positive assessments of the response to past events. When emergency response teams from other local areas are involved in the management of a natural disaster in a certain local area, their rapid acquaintance with the local environment and the concept of local response is essential. It was also mentioned to make the disaster protection and rescue plans more user-friendly.

It was pointed out that in the field of urban and spatial planning there is well-advanced legislation in place; however, flood hazards maps and flood areas are still too often disregarded. It is necessary to invest additional efforts in this field.

5.6.3 HOW CAN WE MASTER THE WEAKNESSES THROUGH MEASUREMENTS AT THE INTERFACE BETWEEN CONTINGENCY PLANNING AND NATURAL HAZARD MANAGEMENT?

The consideration of further adaptation of the Slovenian SPIN and AJDA systems would be welcome, from the point of view of even greater usefulness of these databases in the planning process and updating the disaster protection and rescue plans.

The concept of flood response is based on hydrological reports and hydrological warnings by the Environmental Agency of the Republic of Slovenia (hereinafter: ARSO), predicted water levels and watercourse flows, measured or actual water levels and watercourse flows, and the estimated and actual extent of flood consequences for people, animals, buildings, cultural heritage and the environment. ARSO has also established a colour-based cartographic display of hazard/risk levels according to hydrological warning levels. The system is working, and confidence in ARSO is at a very high level. In the future, the population should be further continually educated and aware that the levels of risk can change several times during the day in some cases, especially when torrential floods are forecast.

It was found that there could be a possibly useful solution to strengthening horizontal cooperation related to flood issues and information exchange. The participants agreed that dedicated organization at the national level could manage a set of information/a single display of floods, water levels, measuring stations, flood hazard maps, the extent of past river overflows, etc. in one place, which would be useful in disaster protection and rescue planning for floods. There are still some gaps between the national and local levels. Consideration needs to be given to how to use and display the data available in the registers. The municipalities themselves often use their own application to follow the development of the event and its management.

The disaster protection and rescue plans should be the result of a planning process and should involve all actual stakeholders. Higher quality and more useful municipal disaster protection and rescue plans are generally achieved when the process is led by or very actively involves representatives of local CP staffs, and when the majority of the representatives of response and other agencies are actively involved in the planning process, with the emphasis on the development of the response scenario. Once the plan is completed, it should be ready for different response levels and intended for practical use by users.

Incident commanders want even more “user-friendly” plans (also in terms of shape, design, colours, transparency, pocket/digital versions etc.). Experience has shown that it is useful for disaster protection and rescue plans to be available in both physical (paper) and digital form. When an accident occurs, there is “no time to read”, but short and clear “reminders” of the procedure and “user-friendly” and clear “visualizations” of individual protection, rescue and assistance measures (e.g. location photo of the implementation of certain CP measures) are (could be) very useful.

The overall harmonization and adequacy of the disaster protection and rescue plans are achieved by the legally obligatory periodic updating and upgrading of the plan. In the Slovenian case, the disaster protection and rescue plans contain many mandatory and optional annexes/supplements to the plans; most of these must be subject to constant checking and updating – such as a list of all contractual relationships/external contractors that may be needed and involved in responding to a natural disaster (e.g. the availability of private contractors with heavy machinery). This can help to ensure that the response is as optimal as possible, with as few improvisations as possible.

Both the risk assessment and the disaster protection and rescue plans are publicly available documents, and should also be presented to the public at live events, not only published on websites.

This should be presented to them periodically at specially organized “awareness-raising” events; this contributes to greater population readiness/resilience and more optimized operation of the VNDN system.

Repairs of damage to watercourses and regular water management maintenance work must be carried out on time and to the appropriate/required extent. This is of key importance in Slovenia, which is a torrential country, as even such a good system of responding to natural disasters cannot replace everything that may have been missed in the prevention phase.

Informing and raising the awareness of the population of Slovenia about flood measures and early warnings, and information about flood-endangered entities in the area of significant flood impact must be a continuous process. The purpose is to ensure the timely alerting and notification of flood-prone entities in the area of significant flood impact by a public alarm system, and to contribute to effective management and action before, during and after a flood, by informing and raising public awareness, for personal and mutual protection. A target audience-oriented approach is required. Based on the positive response to the 2020 didactic film “Better prepared than flooded” for the general public, accompanied by Slovenian sign language, the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief should continue with a similar multimedia and multisensory approach.

The specific target group is young people. Special attention should be paid to them. Slovenia should benefit from the good experience with innovative school youth’s awareness-raising workshops based on new physical interactive natural hazard models. We must promote adequate self-protection and self-responsibility in a child/youth-friendly, functional and effective way as part of the continual process of natural hazards risk governance. From the point of view of the possible and forecast consequences of climate change, in increasingly unpredictable conditions with more and more unexpected and also intense events, this is good preparation of individuals and communities of special importance.

The participants of the workshop agreed that the importance of people who are either professionally or voluntarily involved in the system of protection against other natural disasters should not be neglected. Although their importance and value in public opinion polls are extremely high, this should not be taken for granted, and the conditions of their work should be further improved, both for more experienced members and for young staff who are still being introduced and gaining experience.

The level of stress and physical and psychological strain on the response staff carrying out planned response measures – at all levels of the organization – could be extremely high in certain cases. Adjustments to the disaster protection and rescue plans to reduce this stress (e.g. by improving support tools for up-to-date event situation assessments) and further improvements to the systemic psycho-social assistance support services should be made.

Summary of the Slovenian Workshop – Floods and flash floods

One of the major strengths in emergency planning in Slovenia is the systematic approach in this field, in accordance with the legislation, which clearly defines the planning process, obligations of different stakeholders, scope and levels of plans, their regular update, checks through exercises, and also through regular inspection. The disaster management system in Slovenia functions effectively also because there is high coverage of disaster protection and rescue plans, harmonized at the national, regional and local levels.

Based on the evaluation of the questionnaire and during the discussion at the workshop, additional findings and proposals for improvements in the individual five analysed categories through the Rapid Risk Appraisal emerged.

The key basis for good disaster protection and rescue plans are the risk assessments, which in Slovenia are elaborated for all major risks in close cooperation with the responsible ministries and other stakeholders, and regularly updated in line with the EU legislation, taking into account new data and the achievements of the profession and technology.

There is a need for consideration of development; how to further adapt the results of the officially regulated flood hazard/risk analysis (mainly for the purpose of spatial planning) to the needs of disaster protection and rescue planning, and how to integrate them more systematically into the regular updating process. With regard to the design of protection and rescue plans, users wish a more user-friendly design and tools and modern digital solutions in terms of, for example, more manageable digital support and simplified field personal reminders (checklists).

The planning process is as important as the final “product”, the disaster protection and rescue plan. In Slovenia the process is led by civil protection planning experts, and in smaller communities with the assistance of external experts while ensuring the participation of all stakeholders. Incorporating local knowledge and experience is crucial. Higher quality and more useful disaster protection and rescue plans are generally achieved when the majority of the response and other organizations are actively involved. Additional attention needs to be paid to the incident commander’s role and their involvement in the development of the protection and rescue plans. There is also the challenge of the dispersion of stakeholders with different responsibilities in the field of water and flood management at different governance levels, and there is a need to improve their cooperation.

In terms of risk communication, planning experts and emergency management experts/practitioners generally know and trust each other. There are lessons learned opportunities through analysis and meetings after disasters. What can be improved is to ensure a process of systematic integration of recognized “lessons learned” into further planning, training and response activities.

Application-oriented information about the situation from the normal to the level of alarm and disaster are the keys for operational use of disaster protection and rescue plans. A reliable, timely and useful overview of the current situation is crucial for effective response management and efficient use of disaster protection and rescue plans. We have, therefore, further support and develop monitoring and prognostic capabilities.

5.7 WORKSHOP RESULTS, FLOODS, NIDWALDEN, STANS, SWITZERLAND

Date of workshop: 16.10.2020

5.7.1 INTRODUCTION OF THE CASE STUDY

Toni Kaeslin, the cantonal fire inspector introduced the case study of the contingency planning Lielibach. The participants have been instructed to focus their answers on that case study.

5.7.2 RAPID RISK APPRAISAL

The group had time to quickly get familiar with the questions of the rapid risk appraisal. They were informed that the rapid risk appraisal is an initial assessment of the group about their regional strengths and weaknesses. Discussion should be avoided – it would follow after.

General observations:

The group answered homogenously most of the questions.

Some questions did not really well apply to the participant's role/responsibilities, because the principle applies that contingency planning is prepared by the natural hazard manager themselves. The contingency planning group contains always at least of the members of the municipal level the GFS und from the cantonal level (at least one member of the KFS – Kantonaler Führungsstab – and one member of the natural hazard experts).

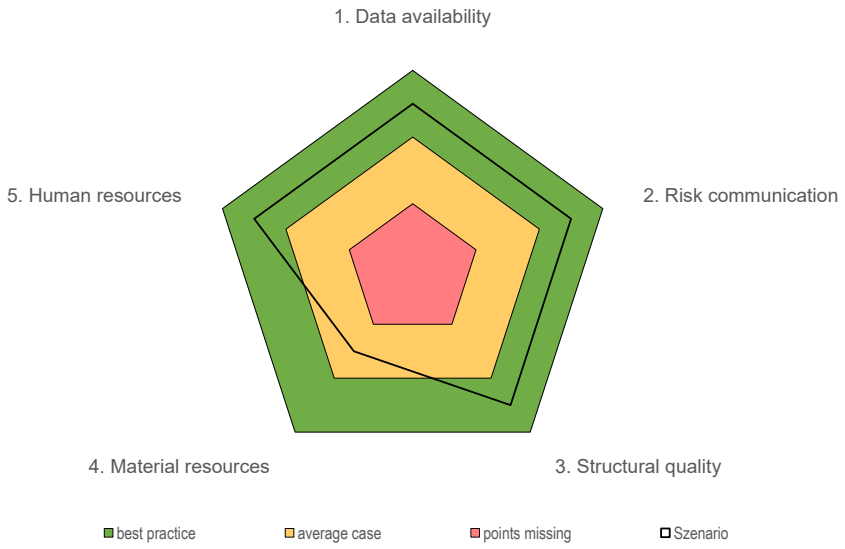

Figure 37: Rapid risk appraisal, flood, Lielibach, Canton Nidwalden, Switzerland.

Four out of five areas have been classified as best practice. Where only the area of "material resources" was classified as "average case".

5.7.3 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS?

The region is very frequently affected by various natural hazards, including floods. Therefore, more or less all inhabitants are aware and concerned regarding the impacts of natural hazards. Even more of course the persons which deal with natural hazards in a professional or voluntary basis. Regular emergencies help to keep the topic of natural hazards present with involved persons and processes are therefore regularly applied "trained". Over the years, a wealth of experience how to handle the emergency situations and the joint elaboration of the contingency planning after a cantonal wide Method, has been built up within the group.

Regarding the five analytical categories, in the field of "reasons for developing strengths" risk communication and human resources, including the willingness to learn were identified as key factors.

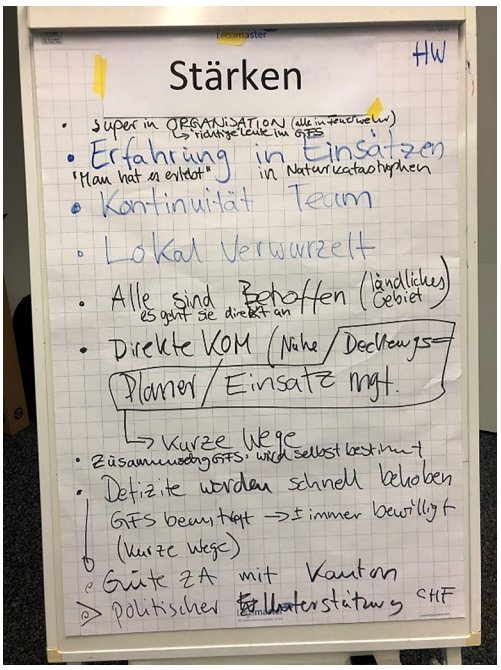

Figure 38: List of strengths from the „Floods“ workshop.

Risk communication:

- good cooperation with the cantonal authorities
- political support at all levels (municipal, cantonal, federal) for the topic of natural hazard
- communication is very direct, requirements to overcome deficits are in almost all cases addressed quickly.

Human resources, including the willingness to learn:

- Two main factors have been mentioned in that area. The “right” people are in the team and there is a long lasting continuity in the team. It is an honour to be part of the GFS.
- The motivation of the team is very high. Everybody is from the region, and aware more or less from childhood onwards about the importance/existence of natural hazards. They are deeply rooted in the region and identify themselves with the regional challenges.
- Emergency planning and natural hazard management are often undertaken by the same people. A core group (see Chapter 3 case study Nidwalden) established the contingency plan. Most of those people are still on board and know the challenges of the region.

5.7.4 WHAT HINDERS US TO DEVELOP STRENGTHS?

Regarding the five analytical categories, in the field of “what hinders to develop strengths” mainly aspects of the category structural quality and personal resources have been addressed:

- The group leaders are well trained and communication among them is very well established. However, the people at the ground (e.g. the average fire fighter) could be involved and informed more, as well as more specific trainings would be necessary to establish on each level the same knowledge for the various topics.
- As mentioned above, there is a stable “core team” established which is very well on top of things. However, over time people are replaced, or new deputies are nominated, which are less aware and trained as the original core team (which established the contingency plan together). Additionally, some of them didn’t participate in the establishment of the contingency plan and are missing all the information discussed during that time.
- The infrastructure and equipment of the various emergency management sites are not all at the same level. Some lack for example easy to handle printing possibilities.
- Document usability: It has also been mentioned that adaptable/user-friendly templates are missing e.g. PDFs are not easy to adapt or to edit.
- Simple barriers such as missing / unknown user logins or passwords do still exist.

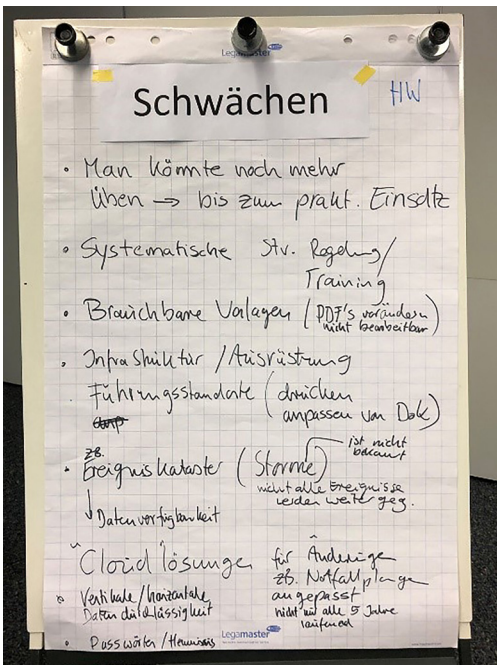

Figure 39: List of weaknesses from the „Floods“ workshop.

- Document adaptability: “Cloud solutions” could help to easily adapt documents (of course respecting protocols) to the latest knowledge (e.g. after emergencies new findings appear). Up today adaption to the contingency plan is a bit complicated and slow (vertical and horizontal data flow)
- Knowledge transfer: Certain knowledge about tools is not at all levels available and is therefore not applied. In terms of “data availability” it could imply that e.g. not all events are recorded as it should be (e.g. in the “Event cadastre” storms).

5.7.5 HOW TO MASTER THE WEAKNESSES?

Regarding the five analytical categories, in the field of “how to master weaknesses” mainly aspects of the category structural quality and personal resources have been addressed:

The intervention plan is part of the contingency plan. The adaptation of the intervention plan is more often necessary e.g. new insights after interventions need to be included or the “Postenblätter” (which gear, how many people are needed at which specific location “posten”) need to be updated also very frequently. The process to adapt/update these documents is defined but still not easy to handle. Modern digital (cloud solutions and strict protocols (who is in charge/authorised to adapt which documents) could help to support this updating process. However, a control mechanism needs to be in place that all changes are tracked and approved by the authority appointed for this purpose.

- Better communication between construction sites and emergency managers at the ground would help to have all the necessary information in case of emergency available.
- The revision of the contingency plan must involve (again) the/a core team to ensure that the knowledge is either refreshed or training among the relevant people. Up to now it was not clear if the revision is only undertaken by an engineering office.
- Trainings should specifically also address new topics / challenges. Special “introduction” trainings should be applied with all new people. It would help if there would be a clear order from superior that trainings are mandatory.
- Knowledge transfer: Certain knowledge about tools is not at all levels available and is therefore not applied. In the case of the „event cadastre“ the community transfers information about events to the canton and the canton would register the events in the database. It should be considered if also at community level events will be recorded.

5.8 WORKSHOP RESULTS, SOIL SLOPE FAILURES, NIDWALDEN, STANS, SWITZERLAND

Date of workshop: 16.10.2020

5.8.1 INTRODUCTION OF THE CASE STUDY

Josef Eberli, the former cantonal engineer of canton Nidwalden introduced the case study of the contingency planning landslides and torrents in Beckenried. The participants have been instructed to focus their answers on that case study.

5.8.2 RAPID RISK APPRAISAL

The group had time to quickly get familiar with the questions of the rapid risk appraisal. They were informed that the rapid risk appraisal is an initial assessment of the group about their regional strengths and weaknesses. Discussion should be avoided – it would follow after.

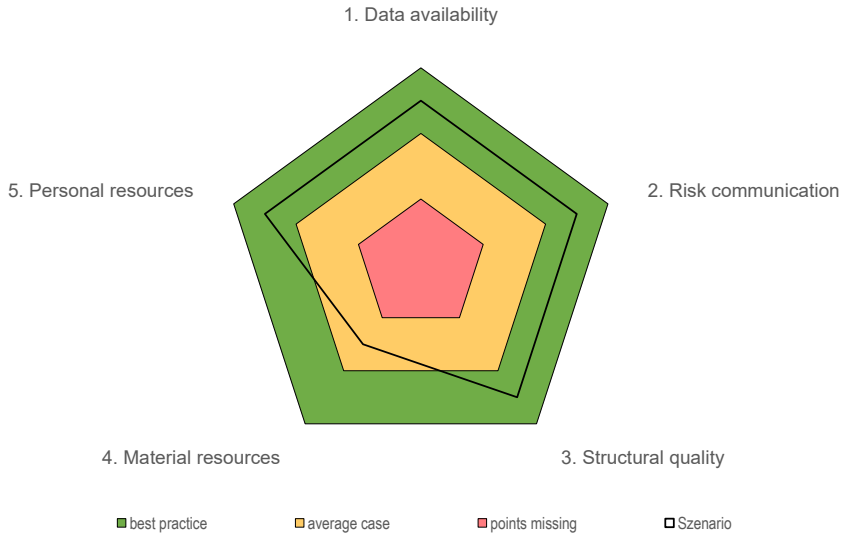

Figure 40: Rapid Risk Appraisal, soil slope failures, Canton Nidwalden, Switzerland.

General observations:

- The group answered homogenously most of the questions.
- Some questions did not really well apply to the participants' role/responsibilities, since some of the participants had both roles united in one person: natural hazard manager and contingency planner.

Four out of five areas have been classified as best practice. Whereas only the area of "material resources" was classified as "average case".

5.8.3 WHAT ARE THE REASONS FOR DEVELOPING STRENGTHS?

The region is very frequently affected by various natural hazards, including floods. Therefore, more or less all inhabitants are aware and concerned regarding the impacts of natural hazards. Even more of course the persons which deal with natural hazards in a professional or voluntary basis. Regular emergencies help to keep the topic of natural hazards present with involved persons and processes are therefore regularly applied "trained". Over the years, a wealth of experience how to handle emergency situations, has been built up within the group.

Local knowledge is respected and included in the discussion and establishment of documents, guidelines and contingency plans.

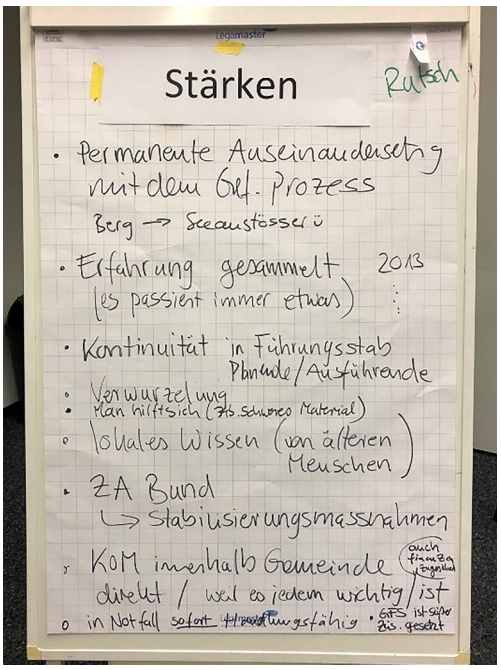

Figure 41: List of strengths from the „soil slope failures“ workshop.

Regarding the five analytical categories, in the field of “reasons for developing strengths” risk communication and human resources, including the willingness to learn were identified as key factors.

Risk communication:

- good cooperation with the cantonal authorities
- political support at all levels (municipal, cantonal, federal) for the topic of natural hazard
- communication is very direct, requirements to overcome deficits are in almost all cases addressed quickly.

Structural quality

- Good cooperation between (some entities) at the federal and cantonal level and (therefore) generous support for the implementation of various protection measures (stabilizing measures) from the federal and cantonal level.

Material resources

- High commitment also at municipal level. Almost no restriction to procure necessary (heavy) equipment. Also due to the fact, that financial responsible persons are part of the GFS (belongs more to next point – human resources – the “right” people are in the team).
- In case of an emergency, when there might be the urgent need of any additional special equipment, there is a very high commitment e.g. of local building contractors – to help and provide their engines for the emergency management.

Human resources, including the willingness to learn:

- Two main factors have been mentioned in that area. The “right” people are in the team and there is a long lasting continuity in the team. It is an honour to be part of the GFS.
- The motivation of the team is very high. Everybody is from the region, and aware more or less from childhood onwards about the importance/existence of natural hazards. They are deeply rooted in the region and identify themselves with the regional challenges.
- Because the GFS is a volunteer (militia)-system, the people participating in the group are technical experts (on the job).
- Emergency planning and natural hazard management are often undertaken by the same people. A core group (see case study in chapter 3) established the contingency plan. Most of those people are still on board and know the challenges of the region.
- The emergency management volunteers are well trained and in case of emergency immediately ready for deployment.

5.8.4 WHAT HINDERS US TO DEVELOP STRENGTHS?

Regarding the five analytical categories, in the field of “what hinders to develop strengths” mainly aspects of the category structural quality and personal resources have been addressed:

- Communication with external authorities (e.g. federal authorities) is sometimes difficult.
- Lack of reliability and continuity with some external partners.

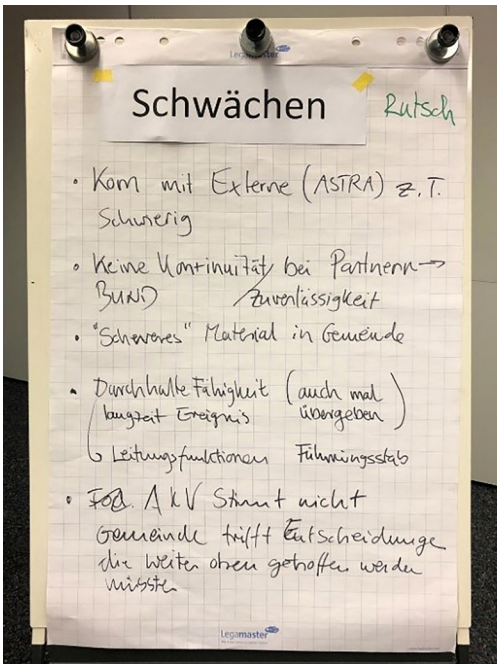

Figure 42: List of weaknesses from the „soil slope failures“ workshop.

- Business continuity: there is a tendency not to admit that the local people might not be able to handle longer lasting event/emergency operations.
- Tasks, Authority and Responsibilities (TAR) not always applied correctly. Sometimes decisions are taken at local level, even if the canton would be in charge.
- The group leaders are well trained and communication among them is very well established. However, the people at the ground (the average fire fighter) could be involved, informed more and more specific trainings would be necessary to establish on each level the same knowledge for the topic.
- As mentioned above, there is a stable “core team” established which is very well on the top of things. However, over time people are replaced, or deputies are newly nominated, which are less aware and trained as the core team. Additionally, some of them didn’t participate in the establishment of the contingency plan and are missing all the information discussed during that time.
- The infrastructure and equipment of the various emergency management sites are not all at the same level. Some lack easy to handle printing possibilities.
- Document usability: It has also been mentioned that adaptable/user-friendly templates are missing e.g. PDFs are not easy to adapt or to edit.
- Simple barriers such as missing / unknown user logins or passwords still exist.
- Document adaptability: “cloud solutions” could help to easily adapt documents (of course respecting protocols) to the latest knowledge (e.g. after emergencies new findings appear). Up today adaption to the contingency plan is a bit complicated and slow (vertical and horizontal data flow)
- Knowledge transfer: certain knowledge about tools (such as the ”event cadastre”) is not at all levels available and is therefore not applied.

5.9 HOW TO MASTER THE WEAKNESSES?

Regarding the five analytical categories, in the field of "how to master weaknesses" mainly aspects of the category structural quality and personal resources have been addressed:

- Improve personal contact with responsible persons at federal level. Invite them for personal meetings, field excursions to raise their awareness for the local conditions and local needs.
- Develop a concept for BCM, including the aspect of how to convert a militia system into a professional system during a longer operation to guarantee a business continuity.
- Coaching for local head of emergency operations („head of emergency operations") to train, that it is ok to hand over the leadership e.g. to a professional team or to cantonal authorities.
- More training in the field of digitisation to build up a certain routine.
- The possibility of using your own computers in the emergency situation should be checked. This would reduce problems with the application. In addition, the devices would be equipped with the appropriate software, which people could test more regularly on their own devices.
- The intervention plan is part of the contingency plan. The adaptation of the intervention plan is more often necessary e.g. new insights after interventions need to be included or the "Postenblätter" (which gear, how many people are needed at which specific location "Posten") need to be updated also very frequently. The process to adapt/update these documents is defined but still not easy to handle. Modern digital (could-) solutions and strict protocols (who is in charge/authorised to adapt which documents) could help to support this updating process. However, a control mechanism needs to be in place that all changes are tracked and approved by the authority appointed for this purpose.
- Better communication between construction sites and emergency managers at the ground.
- The revision of the contingency plan must involve (again) the team to ensure that the knowledge is either refreshed or training with the relevant people. Up to now it was not clear if the revision is only undertaken by an engineering office.

Summary of the Switzerland workshops – Floods and soil slope failures

Key factors for success:

Good cooperation between cantonal and municipal level.

Clear procedural guidelines determined by the canton, which are the same for all processes (natural hazards or technical hazards, for example) to ensure structured procedures for contingency planning.

Contingency planners and natural hazard/emergency managers have to be one "team".

The selection of the group composition is crucial: technical experts, local knowledge of the natural hazard situation and local specialties, mix of administrative levels (cantonal and municipal) and fields of responsibilities (financial, natural hazards, emergency management), including political representation.

Today it is a kind of prestige to be part of the team. Therefore, the motivation and the commitment of many individuals is very high, what leads also to a continuing consistency of the group. However, this is due to a high level of commitment from individuals. Highly motivated and very committed individuals must be found also for the future generation.

Participation (everybody is heard, and brings something valuable to the table) helps to maintaining the motivation of the group and of the active individuals.

Regular/frequent trainings are necessary and ensure that also new people achieve the level of knowledge which is needed.

Digitisation must be used more often and application should be simplified.

6. WORKSHOPS: CROSS-COUNTRY COMPARISON

In the regional workshops, not all five categories were always discussed, but rather those categories that showed striking results in the RRA, meaning they were rated particularly good or bad. With an average RRA score, workshop members decided which category they wanted to discuss. Thus, the discussion focused more on characteristics of best practice examples and the possibility for optimisation in case of missing points. Italy and Austria addressed the topic of avalanche. Soil slope failures were discussed by Italy and Switzerland and experiences in the field of floods were recorded in Austria, Switzerland, Slovenia and Germany. In the following section, a transnational but natural hazard-specific analysis is presented.

6.1 WORKSHOPS AVALANCHES

In the avalanche workshops held in Austria and Italy, data availability was considered as a best practice. The following characteristics underlie the good data availability in both countries.

- Continuous expansion of weather stations although data availability is already good.
- The availability of and demand for data increases with tourism. In winter it is ski tourers and in summer paragliders who transmit local snow and/or weather data to experts. At the same time, tourist areas are pushing the expansion of the data network to increase security in ski resorts.
- Major incidents result in risk prevention measures that provide increased protection for local transport infrastructure.
- Event recording and documentation is carried out in complete form, regardless of the size of the event and the extent of damage. This makes the data more heterogeneous, but the overall picture is more varied. This makes it easier to assess upcoming events.
- Avalanche damage events are documented by people who are already working in this area (e.g. foresters or hut keepers).
- Interregional agreement standards help to systematically collect data and make it comparable.
- Data distribution is fast (e.g. via online access).
- The data sources and types of data are diverse: planners and forecasters receive local data and information from many sources. Thus, situation assessment and the preparation of prevention measures are underpinned by a variety of data and sources. In Austria, for example, a constant weather and avalanche warning team transmits local data for a small financial compensation. These transmitters are experienced local experts. However, numerous ski tourers also transmit their local observations. In this case, the data is provided by laypersons; experts first have to verify the data.

Although this point of analysis is already regarded as best practice, the competent authorities are still striving to improve data availability at the interface between planning and management. To this end, the following measures are considered necessary by the workshop participants in both countries:

Data distribution and clarification of who should have free access to which data must be optimised.

The collection of historical data should be accelerated.

The recording of small events should be accelerated. In Italy this aspect is already much more strongly promoted than in Austria. Austrian experts want to improve this point.

Experts from both countries advocate a legal obligation to document avalanche events and to draw up hazard zone plans. This legal basis already exists in Italy. Experience shows an increase in data availability. The hazard zone plans will also become part of the legally binding land-use plan and are also available online.

Updating and linking of hazard zone and civil protection plans: There is a further need to upgrade hazard zone plans by using them with other instruments of the civil protection plan. Civil protection plans were often planned before hazard zone plans were prepared. By updating disaster control plans and hazard zone plans, the two systems should work together. The revision of the Hazard Zone Plans triggered the adaptation of local emergency plans in Italy. Local intervention maps have been drawn up, considering all current data. The maps were provided with local indications and necessary actions to be taken in case of an incident. Corresponding intervention maps were not very time-consuming, especially in their preparation.

One obstacle to further improving data availability is the transfer of information, or more precisely the problem of risk communication. Information is often exchanged by telephone between local and national experts. Communication between experts works very well and situations are quickly and clearly understood. Experts speak the same language. Obstacles arise when data is passed on from laypersons to experts. Experience shows that photos/pictures of local conditions or events can help to overcome this language barrier.

An example from Austria shows how modern communication systems can be successfully used to transfer local data, especially between experts and laypersons. Laypersons transmit local snow and weather data or information on avalanche events to forecasters and planners via WhatsApp. Bidirectional communication systems are particularly advantageous here, as experts can confirm the arrival of the data, ask questions and express their gratitude for contributions. This feedback has a motivating effect on laypersons, with the consequence of further data transfer.

6.2 WORKSHOPS SOIL SLOPE FAILURES

In the Italian and Swiss workshop on the natural hazard “soil slope failures, channelized debris flows and soil slides”, as well as from the results of the floods and avalanches workshops, it became apparent that best practice scenarios exist above all in the area of “data availability” and the associated “risk communication”.

The increase in the number of soil slope failure events has made the population and, above all, professional staff aware of the hazards. Over the years, a wealth of experience has been gained in dealing with this natural hazard. Furthermore, local knowledge is respected and included in discussions, guidelines and planning.

The following points are also mentioned as precondition for developing a best practice situation:

- Good cooperation with the regional authorities
- Political support at all levels (local, regional and national)
- Direct communication
- Support by authorities when implementing local protection measures
- Special equipment is urgently needed in the event of an emergency, there is a high level of commitment from local building contractors to provide support in the event of an incident
- High data availability for current and historical damage-causing events
- Accessibility of data has improved greatly, with data of all categories available for experts and emergency planners
- Local knowledge is integrated into risk prevention and emergency plans

In order to reduce the remaining weaknesses, the strengths will be used and the experience and knowledge gained will be integrated into the measures to be taken

- Improving coordination in emergency planning and optimising the use of plans as a dynamic control instrument – Integration of local knowledge
- Improving communication with external authorities – The results of the Italian workshop showed that the experts trust each other and mutually recognise each other’s information. There is respect, trust and dialogue between the planning and management experts. But what needs to be improved is the communication between risk prevention and emergency management experts at different levels of government. This includes coordination between risk communication and emergency management experts and practitioners at different levels and the assessment of joint and non-joint cooperation. Furthermore, an improvement of the personal contact with responsible government officials is to be promoted. The Swiss workshop showed that communication with cantonal authorities works very well; communication with external authorities is difficult. Therefore, personal contact should be improved, e.g. through staff meetings or excursions.
- Group leaders are well trained and communication between them is well established. However, the people on site (volunteer fire brigade) should be involved and informed and should be specifically trained for this natural hazard
- The Hazard Zone Plan is recognised as an instrument of risk prevention, thanks to cooperation with external experts. In terms of planning, better local coordination between the municipal civil protection plan and the hazard zone plan should be encouraged
- Modern digital solutions and strict protocols should support the development and adaptation of the emergency plans. A control system should monitor all changes and be approved by certain persons in authority
- The revision of contingency plans should be designed within the team to ensure that knowledge is refreshed or the team is trained.

As in the avalanches and floods workshops, important obstacles were identified regarding data availability and transfer, which hinder the development of strengths. These include:

- Infrastructure and equipment of the institutions concerned are not on the same level
- Use of the documentation facilities is not user-friendly
- Possibilities for easy adaptation of documents are to be generated (cloud solutions)
- Knowledge transfer and knowledge of the tools is not available at all levels
- More practice in handling digital databases to create a routine

Training: A very important aspect of the measures needed for strengthening the local risk prevention is the local risk prevention. There is a lack of simulations or operational exercises and training for the experts (managers, planners) and practitioners (fire brigade, etc.). There is also a lack in the transfer of practical lessons from the experience of dealing with local mudflows.

6.3 WORKSHOPS FLOODS

The results of the floods workshops in Austria, Switzerland, Slovenia and Germany have shown that improvement is desirable in all five categories of analysis despite best practice scenarios.

Best practice scenarios are found above all in the area of data availability. However, important examples and reasons for best practice scenarios can also be found in the other analysis points.

- There are very advanced and well-functioning systems of protection against floods (e.g. the VNDN system in Slovenia - system of protection against natural and other hazards)
- Experience gained in the event of an incident has so far been well integrated into further emergency planning
- Disaster and rescue plans are drawn up comprehensively. Slovenia, for example, has a very high percentage of coverage of the danger zones with these plans, which are also constantly updated. Floods represent a very high risk in Slovenia.
- Good data exchange is based on good personal/informal contacts
- Frequent flooding events increase the attention and concern of the local population. Awareness of the impact of such events is high.

Despite this very good situation, there are, of course, improvements that are urgently desirable:

- Digital tools for data collection and distribution need to be made simpler and to be applicable nationally, regionally and above all locally – users want a more user-friendly design and tool solutions. In order to integrate local data into the system in a timely manner, the systems must be made mobile (mobile phone compatible). Different databases should become compatible and digital checklists should become available for local emergency management. Corresponding checklists only make sense if they have integrated current knowledge, i.e. are continuously updated.
- Experience shows that the platform must be stable, i.e. available offline, for example. This is urgently required in order to be able to obtain and import all data during the event of an incident.
- Previous tools also remain partly unused because the respective technical development lacks acceptance by the users.

Improve interaction: The results of the officially regulated flood hazard/risk analysis must be adapted more closely to the needs of contingency planning. In addition, the hazard and risk analyses must be integrated more quickly and systematically into the regular process of updating local contingency plans.

Involve the local population more closely in the prevention process: Collective responsibility as a basic attitude. Decision-making and assumption of responsibility for risk prevention is the responsibility of the group, not of individuals: Increasingly frequent extreme events can increase risk awareness, but it is particularly important to raise the awareness of decision-makers so that they also make resources (personnel / financial resources) available for flood risk prevention.

The willingness to learn how to use digital tools from local users must be encouraged

Systematic inclusion of more local observers and local information in the process of planning and response management for future events

Integration of the younger local community in risk prevention (e.g. contribution to the collection and documentation of local data, etc.) and emergency management in order to pass on knowledge across generations and to ensure the availability of competent local people.

The process of emergency planning should increasingly involve local managers and supraregional disaster control planners. Coordinated action by all actors is important for a successful response.

Experience has shown that the planning process is almost more important than the resulting emergency plans. This joint (emergency) planning process between local knowledge carriers and emergency managers on the one hand and supra-regional experts/planners on the other, leads to

a) a common language, the contact persons in the respective groups are known to each other,
b) a common understanding of the local challenges regarding natural hazards,
c) to develop new knowledge, by bringing together local knowledge and supra-regional expertise.

The above points lead to better coordination in case of emergency.

Training: The practical experience of local flood experts should be incorporated into training courses for all new people and for the further training of already trained personnel (fire brigade, etc.).

The next table presents a quick overview of the most important reasons for developing best practices in terms of data availability. Support or supporter, completeness and good communication are categories that are mentioned to be important for developing best practices in all forms of natural hazards.

REASONS FOR BEST PRACTICE - Data availability			
REASONS	**AVALANCHES**	**SOIL SLOPE FAILURES**	**FLOOD**
CONTINUITY	continuous expansion of weather stations		
SUPPORT	tourism as both, data collector and data requester	good cooperation with regional authorities	frequent flooding events increase attention and concern of the local population
	major incidents	political support at all levels	
	data transfer and documentation by locals	local construction companies support in case of an event with heavy equipment	
COMPLETENESS	complete event documentation, regardless of the size of the event	data of current and historical damage causing events are documented	well-functioning protection systems are existing in most vulnerable zones
		local knowledge is integrated in risk prevention and contingency plans	disaster and rescue plans are drawn up comprehensively
STANDARDS	systematic documentation/ standards exist		
TEMPO	fast data distribution (online access)		
DIVERSITY	a variety of data and sources are collected		
COMMUNICATION		direct	successful integration of experience gained from former events in future contingency planning
			personal and informal contacts

Figure 43: Reasons for developing best practices – data availability.

As above visualized workshop participants assessed data availability as best practice example. Per definition, this means that there is a high expert satisfaction. Nevertheless, interviewees also mentioned remaining weak points: incomplete data collection, a lack of communication, a lack of knowledge transfer and missing implementation of modern technical tools. The following table summarizes actions for further optimization, recommended by the workshop participants.

MASTERING WEAKNESSES / Actions for continuing in the best practice category - Data availability			
WEAKNESSES	**AVALANCHES**	**SOIL SLOPE FAILURES**	**FLOOD**
INCOMPLETE DATA COLLECTION	recording of small events also	make documentation facilities user-friendly, thus improve data collection	make the data collection platform stable. This is important to obtain and import all data during the event of an incident
	legal obligation for documentation of events		make data collection tools user friendly and applicable at all levels
LACK OF COMMUNICATION	using photos to overcome language barriers between laypersons and experts	staff meetings or excursions could help to improve communication between emergency management expertes and external authorities	
LACK OF KNOWLEDGE TRANSFER	updating and linking hazard zone and civil protection plans	special trainings for preventing and managing soil slope failures for people on site (e.g. volunteer fire brigade)	integrate the younger local community in risk prevention (e.g. for data collection) in order to pass on knowledge across generations
		revise contingency plans within the team to ensure that knowledge is refreshed and the team is updated	integrate different forms of knowledge and increase trust between different actors. Therefore, involve local managers and supraregional disaster control planners for contingency planning
		increase coordination between civil protection plan and hazard zone plan	
MISSING IMPLEMENTATION OF MODERN TECHNICAL TOOLS	data distribution must be optimized. Define who should receive what kind of data and apply new digital solutions	contingency plans need always an adaption. Use digital solutions and strict protocols that monitor all changes	integrate hazard and risk analysis systematically in the updating process of contingency plans
			encourage local users to use digital tools

Figure 44: Weaknesses and how to master them – data availability.

7. RECOMMENDATIONS

a) General investment in digitization and the creation of a central natural hazard database

would be desirable. The qualitative workshops as well as the quantitative survey showed that the demands on a central database for the collection of floods / avalanches / soil slope failures relevant data and their distribution are diverse. A central database must be:

- usable for all levels (local, regional, national).
- easy and user-friendly to handle. Current solutions sometimes overwhelm the target groups. The challenge here is that the user groups are very heterogeneous in the case of a central solution.
- available online. Data must be available and importable on the move (e.g. via mobile phone).
- available offline in order to be able to access data independently from the internet in the case of an incident and also to be able to feed in local event data.
- have good logistics behind it, where it is controlled, which target group gets access to which data, providing the availability for analyses that serve political or scientific purposes.
- filled with both current and historical data. The database should have historical data entered, filled in as completely as possible (see legal recommendation) and, in the case of avalanches, also record small events. These points make the overall picture more complete and optimize the possibilities for preventive measures
- a merge of several already existing databases, provided by different institutions all over the countries, could be a first step to create a central solution
- follow international standards and best practices for the documentation of different natural hazards

A technical system that records data must be centrally coordinated and systematically structured. It is advisable to pursue transdisciplinary approaches in technical development, where users are involved in the development process. Only in this way a central database can be designed to be user-friendly and achieve a high level of acceptance.

Another challenge in terms of documentation is that hazardous events are often documented by different institutions according to their pursued goal or purpose. The depth of content for recording events therefore differs depending on the purpose of the documentation. A documentation scheme that allows to be filled by all actors with a uniform minimum input would be an advantage! In the sense of an international unification, standardized recording procedures should be available.

Experience has shown that a legal obligation to document events also significantly improves the data situation. Therefore, a corresponding change in the legal situation is recommended regardless of natural hazards. MORE data requires MORE data validation by experts. The latter requires a lot of commitment and time, which must be paid for.

b) Interface management – Knowledge transfer

Planner supraregional – local

In all workshops (soil slope failures, avalanches and floods) and the online survey, the necessity for closer cooperation between those who draw up a local emergency plan and those who work on higher-level hazard zone plans became apparent. Italy has presented a best practice example on how, after the hazard zone plans have been revised, further local emergency plans could be adapted. One can orientate oneself on their experience.

Planner – Manager

The next interface, namely the emergency planner and those who carry out an emergency response at the local level, requires an improved coordination. More local knowledge must be integrated into the emergency plans and the natural hazard warning maps. Plans can become a dynamic control tool if they are kept well updated and local field experience is integrated. Modern digital solutions and strict protocols should support the development and adaptation of emergency plans. A control system can monitor changes, which can then be approved by certain persons in authority. Local emergency plans should be continuously renewed and always drawn up in a team between local knowledge carriers, emergency managers and supraregional experts (e.g. planners). It turned out that the coordination process itself is central. It promotes relationships of trust as well as the quality and accuracy of the contingency plans at the local level. Good data exchange is based on personal contacts.

Authorities – civilian population

Focus on the aspect of regional risk governance. That means, promote local self-responsibility and participation in risk prevention and at the same time ensure the quality and the external framework conditions. Create a basis for solidarity risk prevention between civil society and the state.

Promote risk awareness among the population as well as personal responsibility and self-efficacy. Civil society groups, not individuals, who share responsibility for local risk prevention and crisis management, distinguish best practice examples. Comprehensive training courses are required for this, both data collection and the use of data systems, as well as of professional training taking into account practical experience.

Intergenerational

The interface to the next generation must also be continuously renewed at the local level. The young local population must be integrated into prevention and emergency management at an early stage. It is important to train, inspire and intrinsically motivate the local population, especially the young, such that they can and want to make their social contribution to risk prevention and crisis management.

c) Risk communication

For improving information exchange between contingency planning and disaster management as well as the relation between those experts a yearly meeting/training between planner and manager would be recommended to encourage the development of maps in close cooperation and to communicate lessons learned from practical experience. A joint training on emergency cases would reveal gaps in communication as well as in the digital solutions used and can then be better implemented in existing disaster control plans. More exchange of data and information is not just wanted between contingency planning and disaster management, but also between the Alpine countries.

Risk communication between laypeople and experts

If local data is transmitted from laypeople to the subject matter experts, validation is required. There is not only a certain language barrier, but also a difference in specialist knowledge, which is why some methods have proven themselves here. Since local data can only be collected comprehensively with the help of local lay observer, it is advisable to pay attention to a few points:

- A stable lay network transmits local data to experts (planners, forecasters, etc.). These experts are able to assess the competence of the transmitter and thus the transmitted data well. (e.g. best practice example: avalanche Austria so-called weather and avalanche observer)
- Unknown laypeople transmit additionally visual material for the linguistic description so that the experts can check the local dangerous situation more comprehensively.
- A bilateral communication channel should be used, where further local information can be requested and misunderstandings can be clarified. In addition to data transfer, such channels can also be used to convey recognition, which ultimately has a motivating effect. Volunteers are intrinsically motivated, i.e. they want to feel they belong and know that their data matters.

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LIST OF FIGURES

ANNEX

LONG VERSION OF THE QUESTIONNAIRE FOR THE INTERNATIONAL ONLINE SURVEY

Dear participants!

The aim of this survey is to bring **contingency planning** and **disaster management/operations management** closer together in the field of natural hazards.

To learn from similarities and differences, we compare between the member states of the Alpine Convention "PLANALP" as well as between different natural hazards.

It takes about 20 minutes to fill in the questionnaire on a natural hazard. Please first select the natural hazard for which you are most familiar with the system in your country. We are interested in your subjective perspective and experience!

1. PERSONAL INFORMATION

Country

- ☐ Austria
- ☐ France
- ☐ Italy
- ☐ Germany
- ☐ Liechtenstein
- ☐ Switzerland
- ☐ Slovenia

Region

_____

My areas of responsibility are located at

- ☐ local sphere
- ☐ regional scale
- ☐ national level

I am an expert in

- ☐ Avalanches / Ice avalanches
- ☐ Floods
- ☐ Soil Slope Failures
- ☐ Forest fire
- ☐ General expert on natural hazards

Planning or management?

My area of responsibility is mainly

- ☐ in natural hazard management
- ☐ in natural hazard planning

Please select the natural hazard with which you are most familiar with the underlying risk management system in your country / region.

- ☐ Avalanches / Ice avalanches
- ☐ Floods
- ☐ Soil Slope Failures
- ☐ Forest fire

The following questions now relate to the natural hazard you have selected!

2. REGIONAL INFORMATION / AREA OF PERSONAL RESPONSIBILITY

	very	moderate	hardly	don´t know
In your opinion, how much is the area for which you are responsible affected by natural hazard xy?	☐	☐	☐	☐

	many	some	none	don´t know
Are there hot spots for natural hazard xy in your area of responsibility?	☐	☐	☐	☐

	high	medium	low	don´t know
How high do you estimate the probability of a damaging event due to natural hazard xy in the area for which you are responsible?	☐	☐	☐	☐

	high	medium	low	don´t know
How high do you estimate the damage potential by natural hazard xy in the area for which you are responsible?	☐	☐	☐	☐

3. DATA AVAILABILITY

	yes	no	don´t know
Do you have a standard or legal requirements for event documentation for natural hazard xy?	☐	☐	☐

	yes	no	don´t know
Do you have a local database of loss events specific to the natural hazard xy?	☐	☐	☐

The data acquisition for current damage events takes place

☐ continuously	☐ discontinuously	☐ don´t know
☐ systematically	☐ unsystematic	☐ don´t know
☐ digitized	☐ analog	☐ don´t know

Which parameters are collected when documenting the damage events of natural hazard xy?
(multiple answers possible)

- ☐ volume
- ☐ trigger factors
- ☐ date of the event
- ☐ length
- ☐ wide
- ☐ replacement area
- ☐ space parameters
- ☐ water level / height
- ☐ start of the event (time)
- ☐ duration
- ☐ other: (keywords only)

_____

Historical events are

- ☐ digitized
- ☐ analog / handwritten
- ☐ not registered
- ☐ don´t know

Please mark with a cross or add the <u>data and information</u> that are important for your work and let us know how well these are available for you

	easily available	difficult to obtain	not available
☐ Spatial information GIS data	☐	☐	☐
☐ Technical infrastructure information	☐	☐	☐
☐ Current satellite images	☐	☐	☐
☐ Weather data	☐	☐	☐
☐ Measuring water withdrawal points by means of GPS	☐	☐	☐
☐ Other: _____	☐	☐	☐

We have hazard warning maps / hazard zone maps for natural hazard xy

- ☐ yes
- ☐ no
- ☐ don´t know

If there are hazard warning maps / hazard zone maps for natural hazard xy, the following statements apply:

	strongly agree	agree	disagree	strongly disagree	don't know
Our hazard warning maps / hazard zone maps for natural hazard xy are out of date	☐	☐	☐	☐	☐
Our hazard warning maps / hazard zone maps for natural hazard xy contradict the locally observed hazard zones	☐	☐	☐	☐	☐
The hazard warning maps / hazard zone maps for natural hazard xy take into account all locally observed hazard zones	☐	☐	☐	☐	☐
Our hazard warning maps / hazard zone maps for natural hazard xy are used in practice as a basis for emergency planning	☐	☐	☐	☐	☐
Our hazard warning maps / hazard zone maps for natural hazard xy are developed in close cooperation with local / regional experts	☐	☐	☐	☐	☐
Our hazard warning maps / hazard zone maps for natural hazard xy are prepared in an understandable way	☐	☐	☐	☐	☐

Our hazard warning maps / hazard zone maps for natural hazard xy are

- ☐ analog available
- ☐ digitally available
- ☐ not available
- ☐ don´t know

We have hazard zone plans for natural hazard xy

- ☐ yes
- ☐ no
- ☐ don´t know

If hazard zone plans are available, please answer the following questions:

Current hazard zone plans for natural hazard xy

- ☐ analog available
- ☐ digitally available
- ☐ not available
- ☐ don´t know

Hazard zone plans should be available online via GIS

- ☐ agree
- ☐ disagree
- ☐ don´t know

Safe zones in case of natural hazard xy are (multiple answers possible)

- ☐ sufficiently well-known
- ☐ documented on digital or analogue maps
- ☐ the informations are easily accessible
- ☐ the recordings are easy to interpret

There is a combination map that simultaneously identifies hazards zones and safe evacuation zones in case of natural hazard xy

- ☐ agree
- ☐ disagree
- ☐ don´t know

I think a combi-map for hazard zones and safe evacuation zones makes sense

- ☐ agree
- ☐ disagree
- ☐ don´t know

Information on the early warning system:

	strongly agree	agree	disagree	strongly disagree	don't know
False alarms for natural hazard xy are frequent, we must minimize them	☐	☐	☐	☐	☐
Warnings of natural hazard xy do not currently reach all consumers. The network needs to be updated	☐	☐	☐	☐	☐
Input data for natural hazard xy early warnings must be optimized	☐	☐	☐	☐	☐
Natural hazard xy early warnings must be available earlier	☐	☐	☐	☐	☐
We have functioning early warning systems for natural hazard xy	☐	☐	☐	☐	☐

4. RISK COMMUNICATION

	strongly agree	agree	disagree	strongly disagree	don't know
There are hardly any discussions between contingency planners and the operational management	☐	☐	☐	☐	☐
Contingency planners and operations management do not know each other personally	☐	☐	☐	☐	☐
I think one can speak of a basis of trust between the operational management and the contingency planners	☐	☐	☐	☐	☐
There are many informal contacts between contingency planners and operations management	☐	☐	☐	☐	☐
I respect our contingency planners, they really know what they're doing.	☐	☐	☐	☐	☐
I respect our operations management, they're very competent	☐	☐	☐	☐	☐
Local knowledge is well integrated into contingency planning	☐	☐	☐	☐	☐

Causes for the quality of communication

	strongly agree	agree	disagree	strongly disagree	don't know
Time and/or financial resources do not allow good cooperation between contingency planners and operational managers	☐	☐	☐	☐	☐
I observe interpersonal difficulties that prevent good cooperation between contingency planners and operational management	☐	☐	☐	☐	☐
We do not know how local knowledge could be integrated into contingency planning. Methods are missing.	☐	☐	☐	☐	☐
Planners and managers speak a different language. We do not understand each other.	☐	☐	☐	☐	☐
There is a lack of contact between contingency planners and the operational management	☐	☐	☐	☐	☐

5. STRUCTURAL QUALITY

	agree	disagree	don´t know
The various areas of responsibility in emergency management are clearly regulated	☐	☐	☐
The various areas of responsibility in contingency planning are clearly defined	☐	☐	☐
In my experience, bureaucratic hurdles hamper			
	agree	disagree	don´t know
the cooperation between emergency management and contingency planning	☐	☐	☐
the cooperation within the disaster management team	☐	☐	☐
the cooperation between those responsible for planning at different levels	☐	☐	☐
Overview of the personnel and material infrastructure			
	agree	disagree	don´t know
We have a clear inventory management for material (from protective equipment to heavy machinery) that is needed in case of natural hazard xy disaster management	☐	☐	☐
There are contact lists that list all experts who are important for coping with the event	☐	☐	☐
In our company, a joint management unit coordinates local experts with external experts	☐	☐	☐
I am in favour of a central coordinating body between local and external experts	☐	☐	☐
	agree	disagree	don´t know
We have specific emergency plans for natural hazard xy	☐	☐	☐
The local deployment plans build on the national/regional contingency plans	☐	☐	☐
The local deployment plans are very well adapted to the specific natural hazard	☐	☐	☐
Between contingency planning and operational management is			
	improvable	good	don´t know
the communication	☐	☐	☐
the data and information transfer	☐	☐	☐
the organisational effort	☐	☐	☐
the speed of cooperation	☐	☐	☐

	agree	disagree	don´t know
We have defined protection goals in the region/community	☐	☐	☐
Protective measures are already planned	☐	☐	☐

6. MATERIAL RESOURCES

Avalanches / Ice avalanches

	agree	partly agree	partly disagree	disagree	don't know
Structural/technical or land management (e.g. protection forest) permanent measures (avalanche barrier) for protection against avalanches/ice avalanches are sufficiently available in the area of my responsibility	☐	☐	☐	☐	☐
Structural/technical temporary measures (avalanche dispersion system, road barriers) for protection against avalanches/ice avalanches are sufficiently available in the area of my responsibility	☐	☐	☐	☐	☐

We lack the following input material (in keywords)

_____

Soil slope failures

	agree	partly agree	partly disagree	disagree	don't know
Structural/technical or land management (e.g. protection forest) permanent or temporary measures for protection against soil slope failures are sufficiently available in the area of my responsibility	☐	☐	☐	☐	☐
In our region there are retention areas for soil slope failures	☐	☐	☐	☐	☐
Experience shows that the soil slope failure retention spaces are sufficient	☐	☐	☐	☐	☐
We have the necessary input material in case of damage	☐	☐	☐	☐	☐

We lack the following input material (in keywords)

_____

Floods

	yes	no	don't know
Do permanent structural/technical measures (eg. retention basins, river bank walls/dam), land management measures (eg. Flood retention areas) or construction measures in water (expansion, deepening) exist in the area of your responsibility?	☐	☐	☐
If yes, are the measures sufficient?	☐	☐	☐
Despite permanent measures also temporary measures (e.g. mobile flood protection, protective hose dam, sandbags, mobile dam constructions) are needed in order to protect the area of my responsibility against flood	☐	☐	☐
If yes, are these input materials sufficiently available in the area of your responsibility?	☐	☐	☐

We lack the following input material (in keywords)

_____

Forest Fire

	agree	partly agree	partly disagree	disagree	don't know
We have the necessary technical firefighting resources (fire engines, helicopters, ...) in case of forest fire events	☐	☐	☐	☐	☐
We have special forest fire brigades	☐	☐	☐	☐	☐
We have a special protective equipment for forest fire events	☐	☐	☐	☐	☐

We lack the following input material (in keywords)

_____

7. HUMAN RESOURCES

	strongly agree	agree	disagree	strongly disagree	don't know
Our disaster response teams in the region have a great deal of expertise in the processes of natural hazard xy formation	☐	☐	☐	☐	☐
In our region we have extensive knowledge of the handling of disaster relief operations	☐	☐	☐	☐	☐
In our region we have extensive knowledge about natural hazard xy prevention measures	☐	☐	☐	☐	☐

	annually	every 5 years	5 – 10 years	10 and more years	don't know
How often are the disaster relief personnel in your area of responsibility deployed during a natural hazard xy event?	☐	☐	☐	☐	☐
How often do the disaster relief personnel in your region practice emergency response?	☐	☐	☐	☐	☐
How often do disaster relief personnel in your region attend training courses?	☐	☐	☐	☐	☐

	agree	disagree	don´t know
Contingency planners are involved in operational exercises and/or training	☐	☐	☐
Lessons learnt from practical experience are passed on to contingency planning	☐	☐	☐
Contingency planners want to learn from the practical experience	☐	☐	☐
Operations management regularly reflects on and evaluates practical operations	☐	☐	☐
There are trainings for special teams adapted to different hazard scenarios	☐	☐	☐
Operations for natural hazard xy are trained regularly	☐	☐	☐
I know best practice examples of how to train missions	☐	☐	☐
I would like to get to know best practice examples from other countries	☐	☐	☐
In my area of responsibility there is a need for cross-border operations in the event of natural hazard xy	☐	☐	☐
In my area of responsibility cross-border trainings for natural hazard xy take place	☐	☐	☐

Human resources for missions

	agree	disagree	don´t know
We do not have enough personnel for natural hazard xy operations?	☐	☐	☐
Do you have special teams for the implementation of emergency plans in case of natural hazard xy?	☐	☐	☐

Are there natural hazard xy specialists who can be called upon in the event of an incident?

- ☐ yes
- ☐ no
- ☐ don´t know

Many thanks for answering the questions!

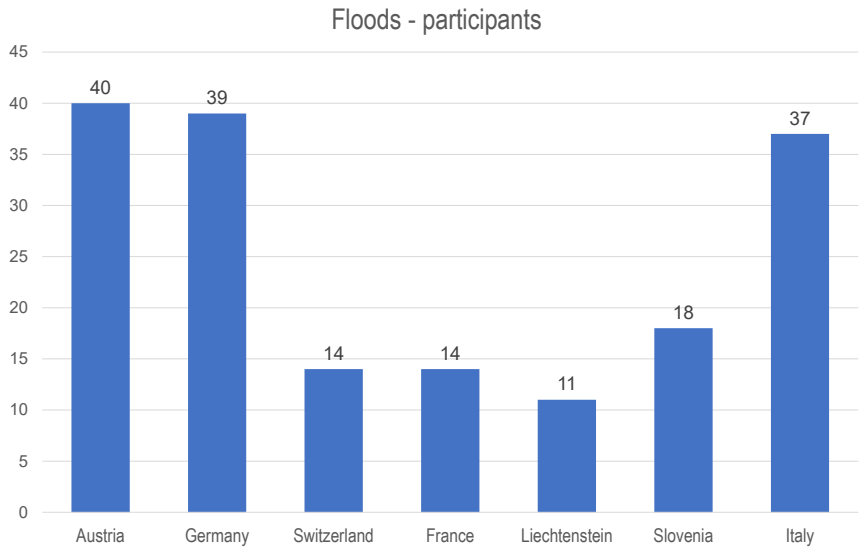

Figure 45: Participants with focus on floods by countries. Total number = 173.

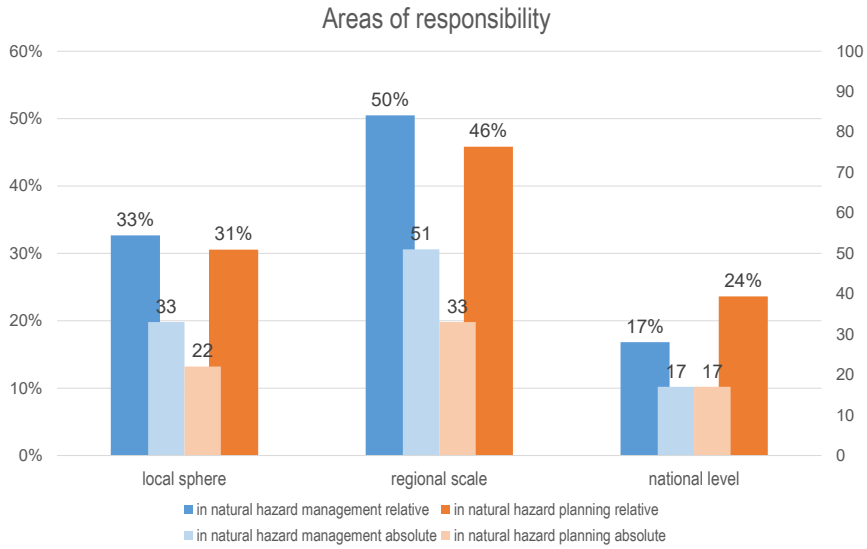

Figure 46: Categorization of the areas of responsibility of experts in floods.

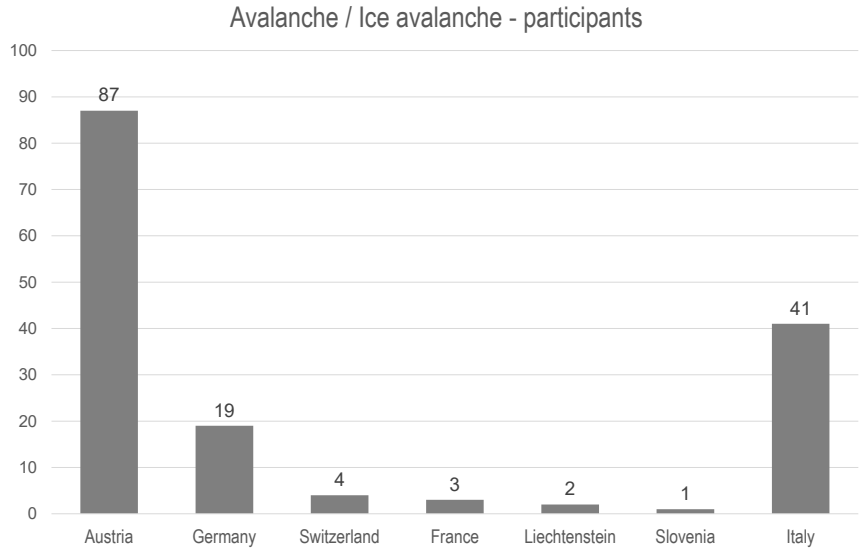

Figure 47: Participants with focus on avalanches / ice avalanches by countries. Total number = 157.

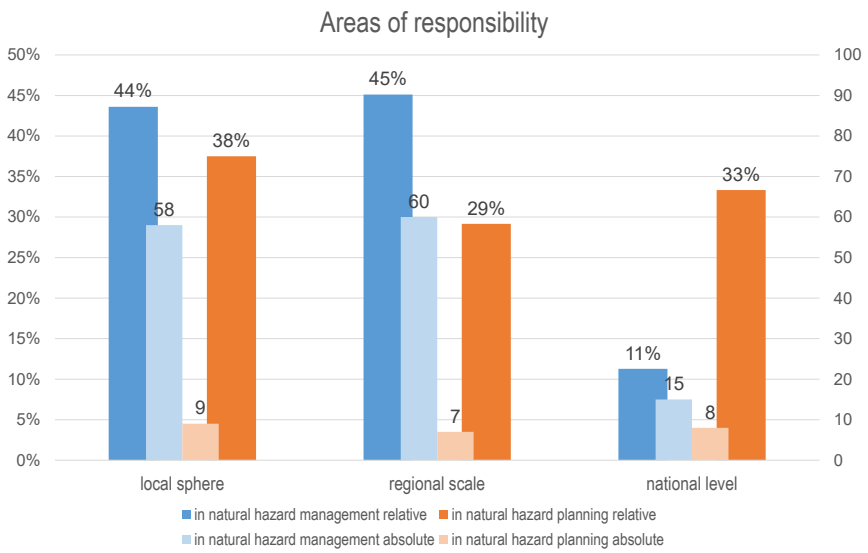

Figure 48: Categorization of the areas of responsibility of experts in avalanches / ice avalanches.

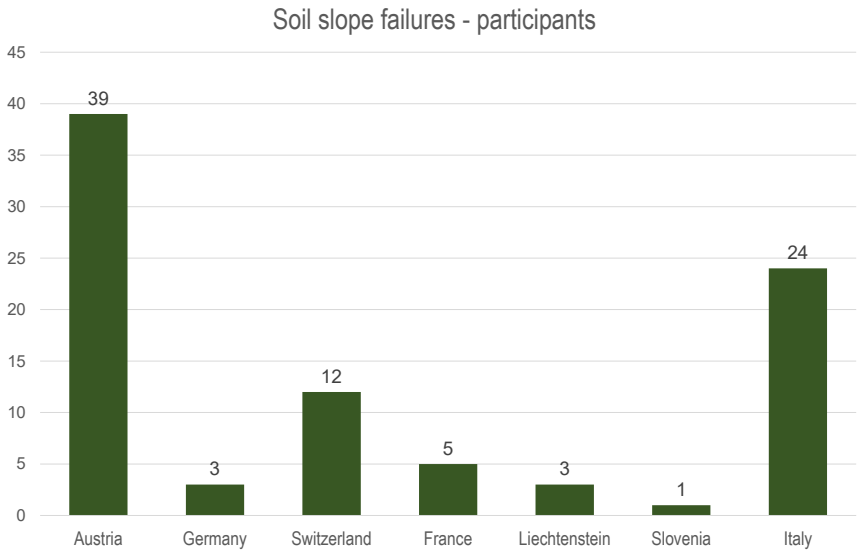

Figure 49: Participants with focus on soil slope failures by countries. Total number = 87.

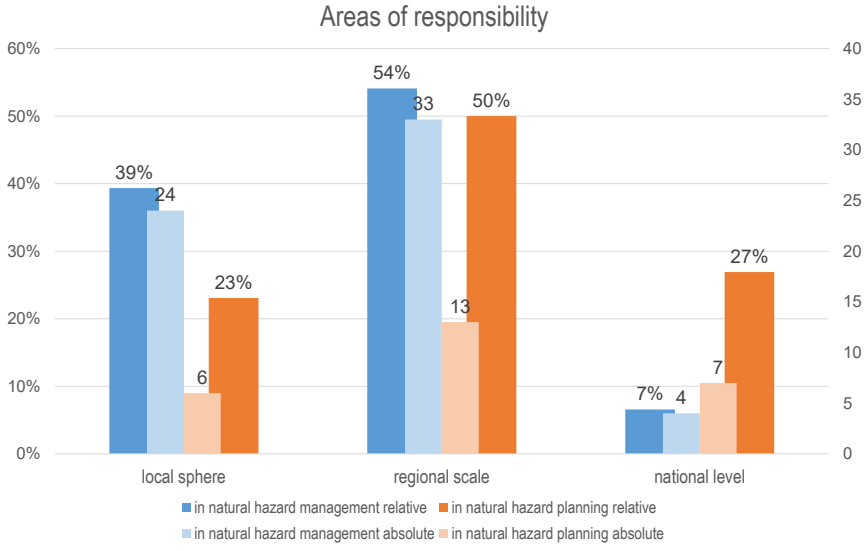

Figure 50: Categorization of the areas of responsibility of experts in soil slope failures.

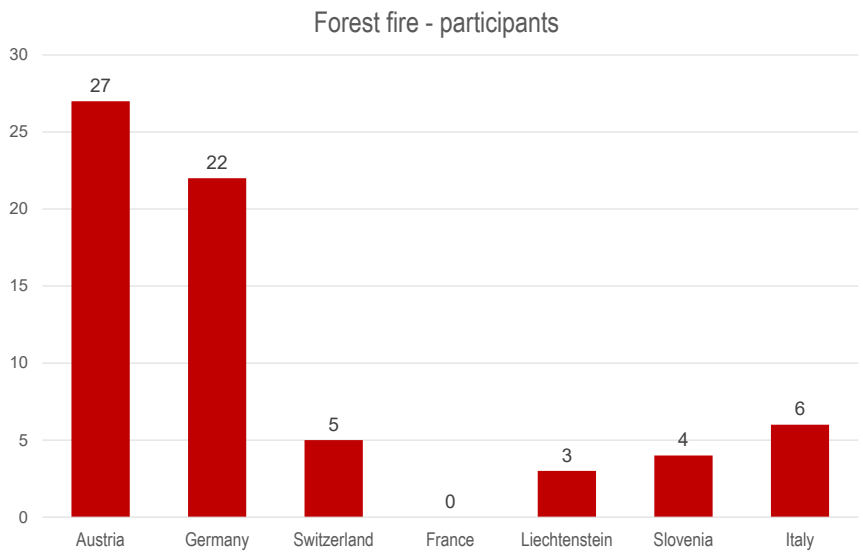

Figure 51: Participants with focus on forest fires by countries. Total number = 67.

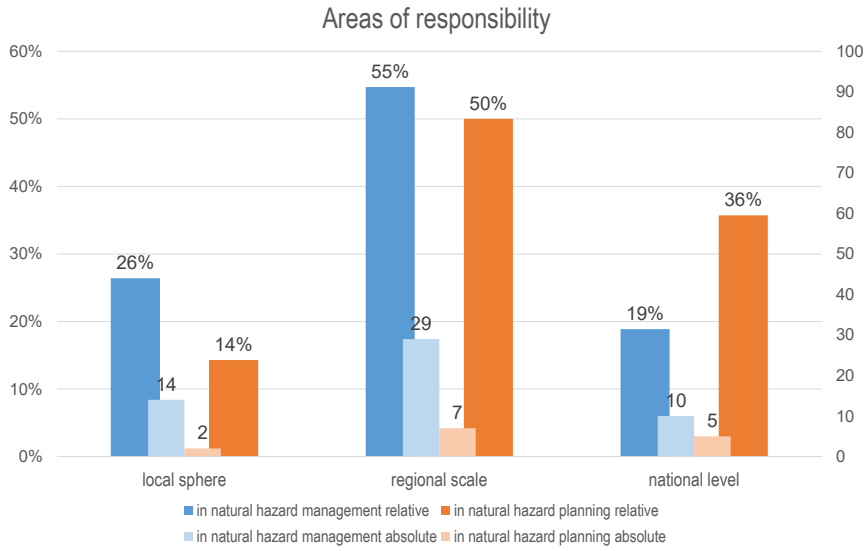

Figure 52: Categorization of the areas of responsibility of experts in forest fires.

REGIONAL INFORMATION / AREA OF PERSONAL RESPONSIBILITY

When evaluating the regional information, the four questions asked on this topic (nos. 7-9) were summarized and evaluated according to the following criteria: If 4 or 3 of the answers were very/many/high, the information was classified as “very affected”, with 2 very/many/high answers it was classified as “moderately affected”, with 1 very/many/high answer it was classified as “hardly affected” and with zero very/many/high answer it was classified as “not affected”.

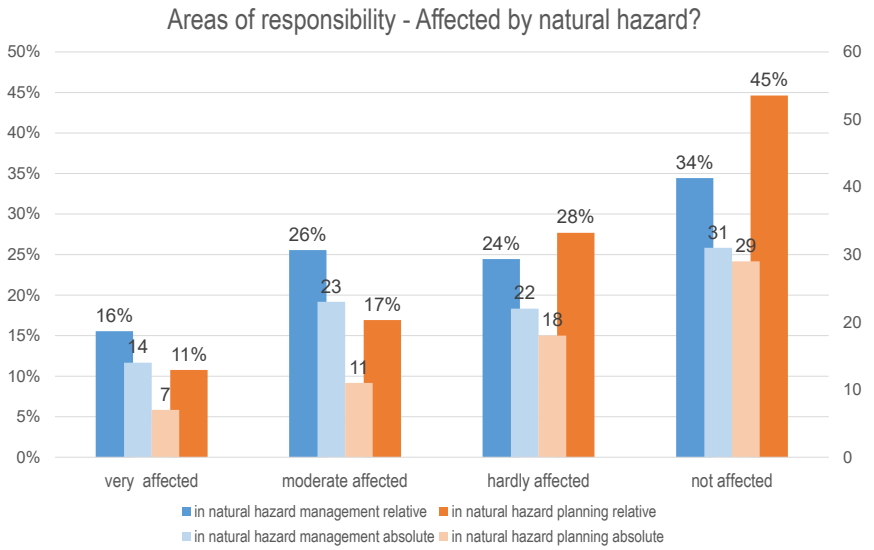

Figure 53: Figure showing how affected the areas of responsibility are by the natural hazard floods.

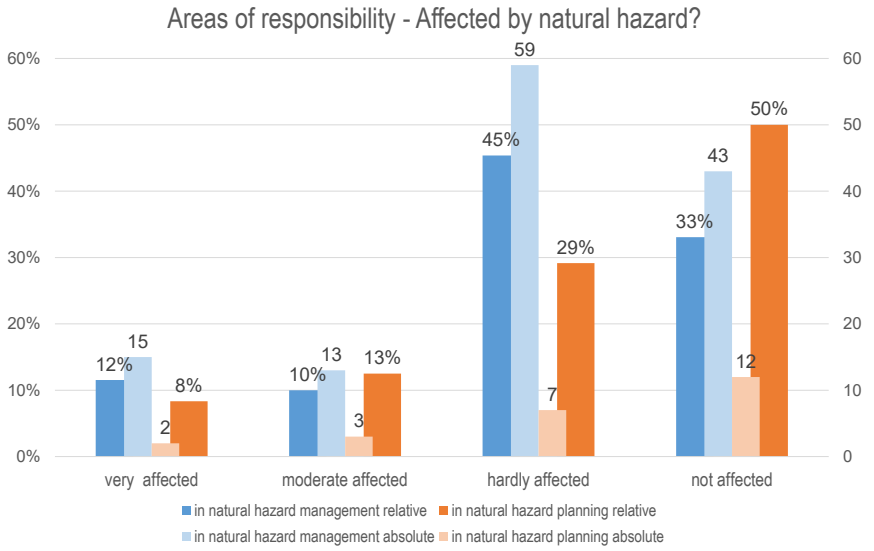

Figure 54: Figure showing how affected the areas of responsibility are by the natural hazard avalanches / ice avalanches.

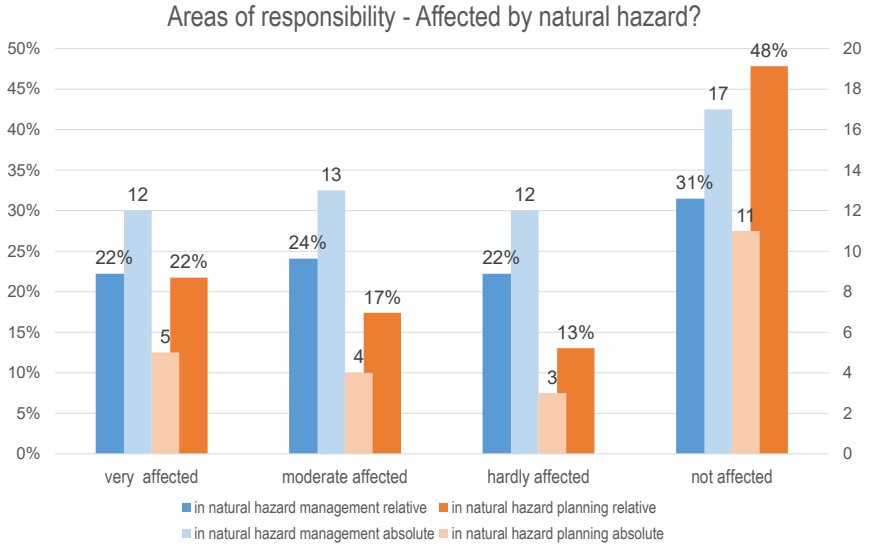

Figure 55: Figure showing how affected the areas of responsibility are by the natural hazard soil slope failures.

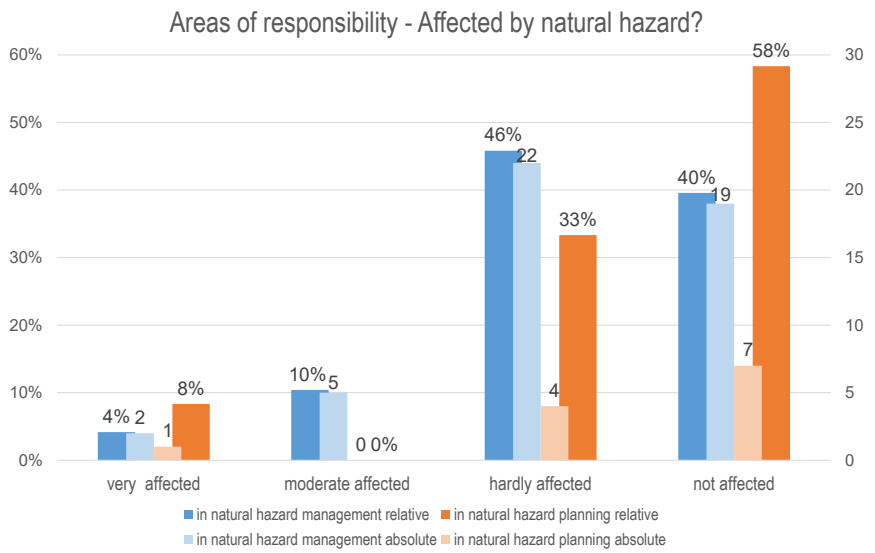

Figure 56: Figure showing how affected the areas of responsibility are by the natural hazard forest fires.

DATA AVAILABILITY

DOCUMENTING DAMAGE EVENTS

For the data type documenting damage events, questions 10B, 11, 12 and 13 were combined. It was rated as positive feedback if 12-16 of the 16 possible answers were positive, as moderate feedback if 7-11 answers were positive and as negative feedback if there were six or less positive answers. The questions asked about an existing local data bank of damage events, how the data is recorded and which / how many parameters are recorded.

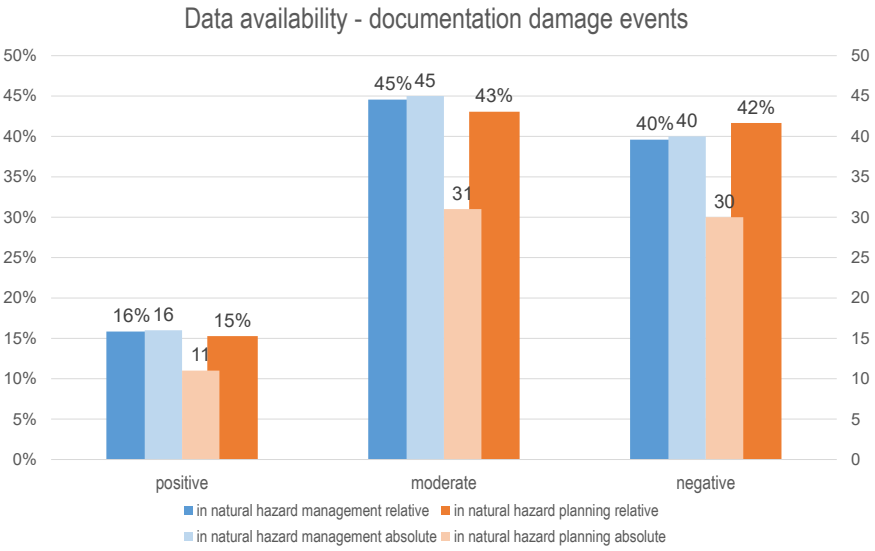

Figure 57: Evaluation of damage events documentation in connection with floods.

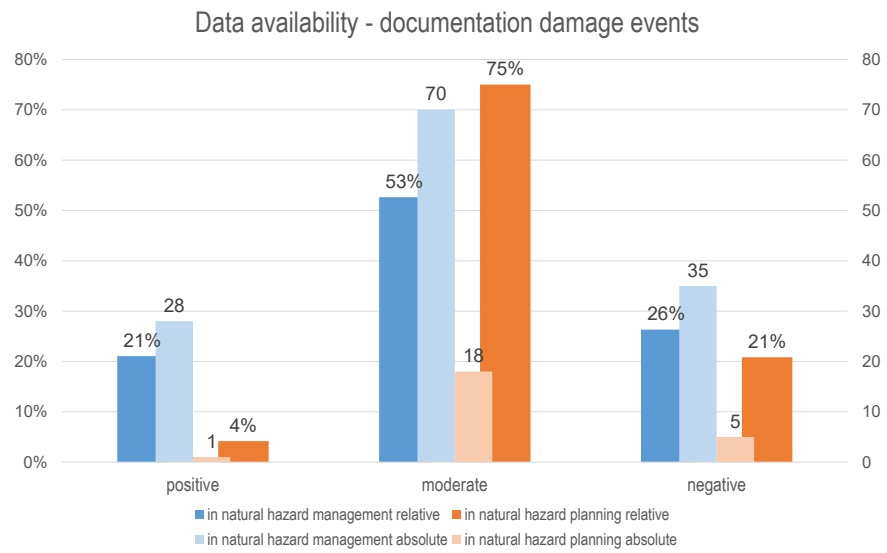

Figure 58: Evaluation of damage events documentation in connection with avalanches / ice avalanches.

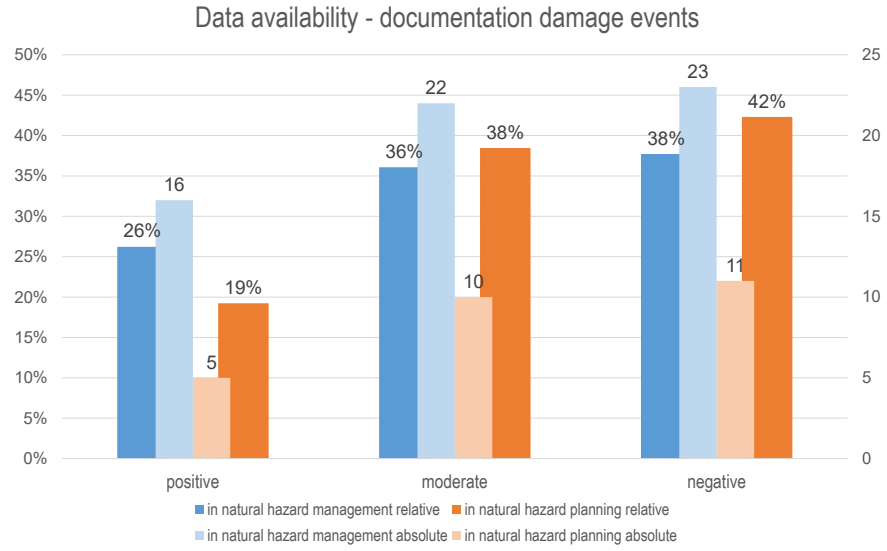

Figure 59: Evaluation of damage events documentation in connection with soil slope failures.

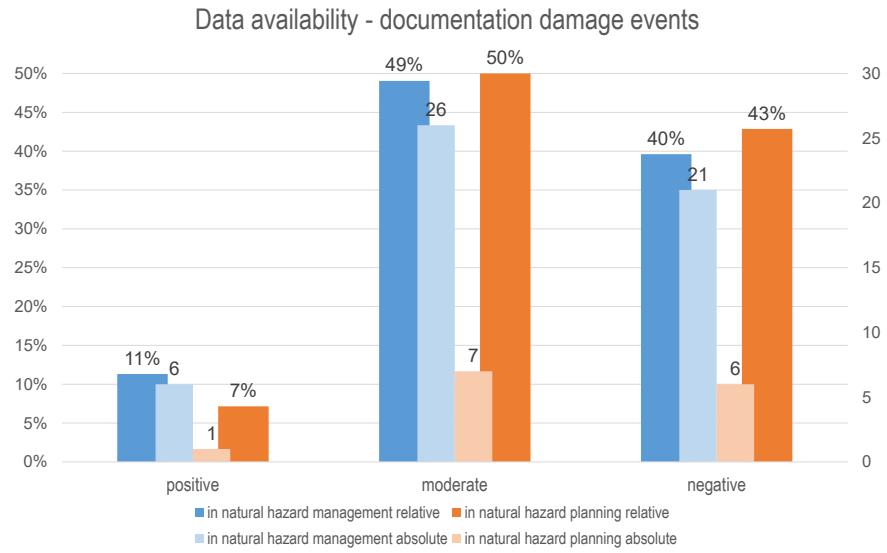

Figure 60: Evaluation of damage events documentation in connection with forest fires.

HAZARD SUSCEPTIBILITY MAPS

For the evaluation of hazard susceptibility maps, the existence of such maps was asked in question 15. For a statement about the quality of the hazard susceptibility maps the bundle of questions 16a to 16F and 17 was categorized: 5-7 positive answers indicate positive feedback, 2-4 positive answers indicate moderate quality and one or no positive answer indicate negative feedback on hazard susceptibility maps.

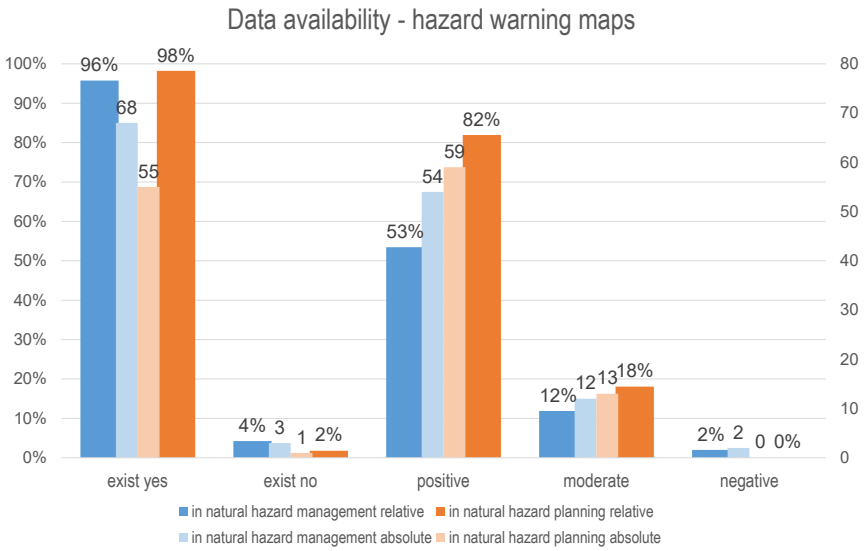

Figure 61: Evaluation of the existence and quality of hazard susceptibility maps for floods.

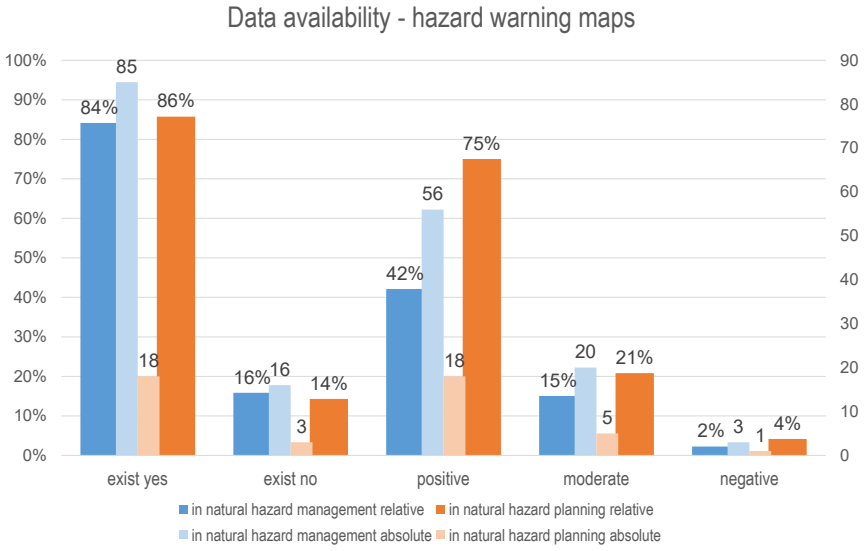

Figure 62: Evaluation of the existence and quality of hazard susceptibility maps for avalanches / ice avalanches.

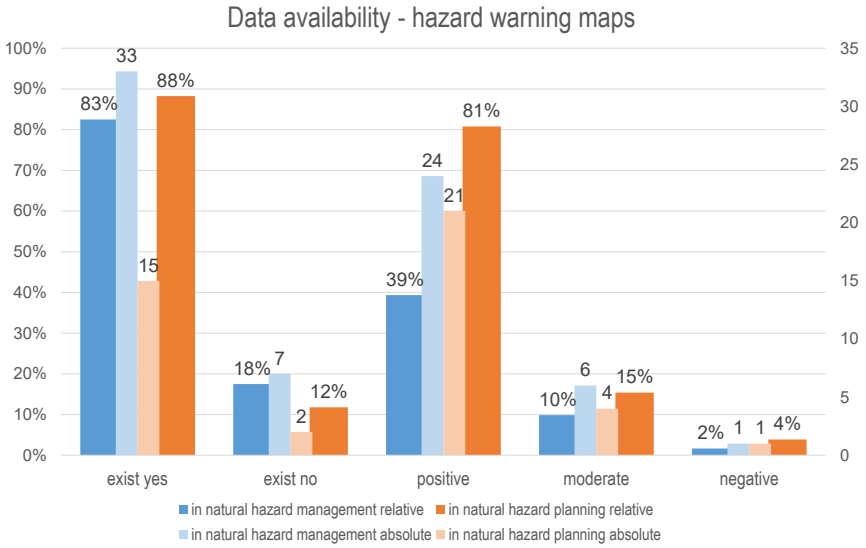

Figure 63: Evaluation of the existence and quality of hazard susceptibility maps for soil slope failures.

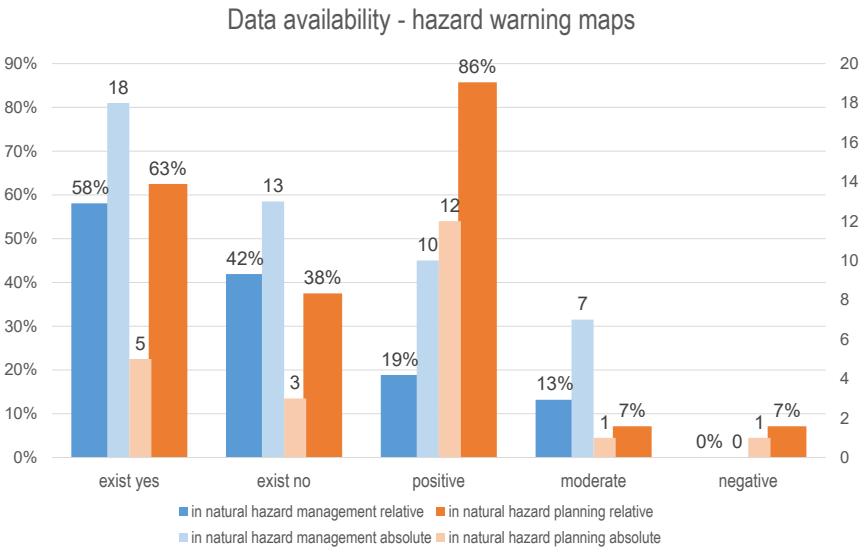

Figure 64: Evaluation of the existence and quality of hazard susceptibility maps for forest fires.

HAZARD ZONE MAPS

For statements about the data type hazard zone plans the questions 18, 19 and 20 were looked at. From questions 18 and 19 the following categorizes where defined: “exist and are available” when hazard zone plans exist and are analogue or digital available, and “exist but are not available” when hazard zone plans exist but are not available or the participant didn’t know. Question 20 asked if hazard zone plans should be available online via GIS.

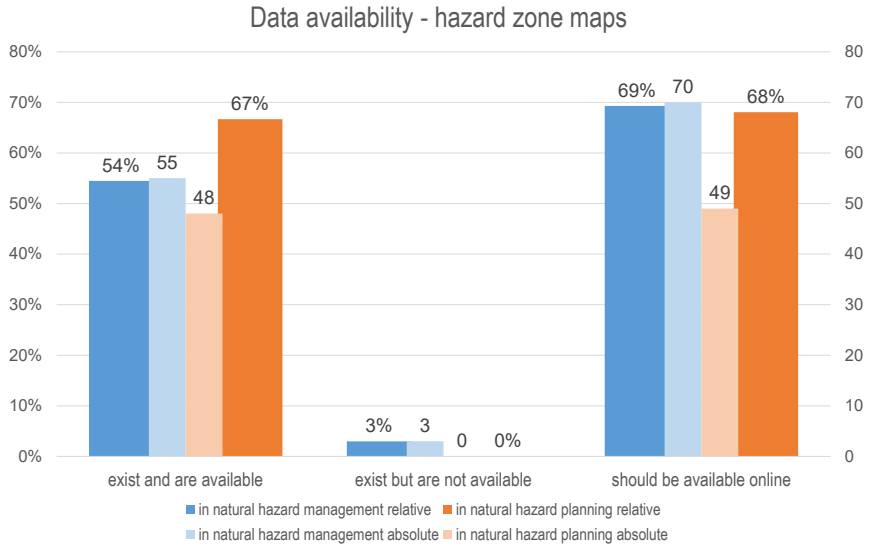

Figure 65: Availability of hazard zone maps current and in future for floods.

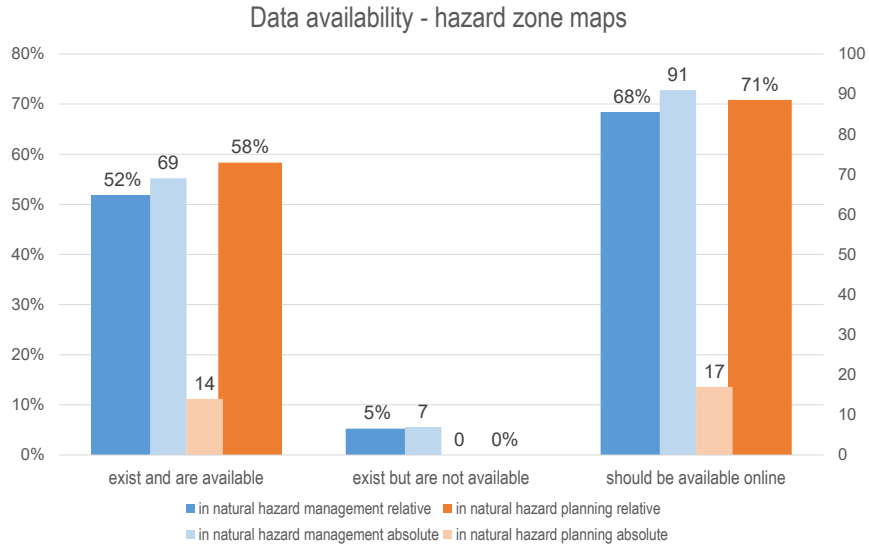

Figure 66: Availability of hazard zone maps current and in future for avalanches / ice avalanches.

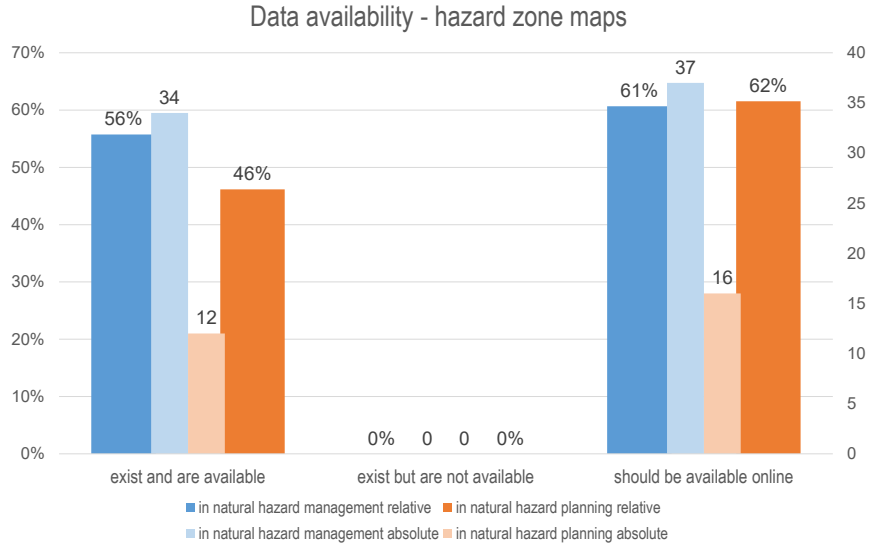

Figure 67: Availability of hazard zone maps current and in future for soil slope failures.

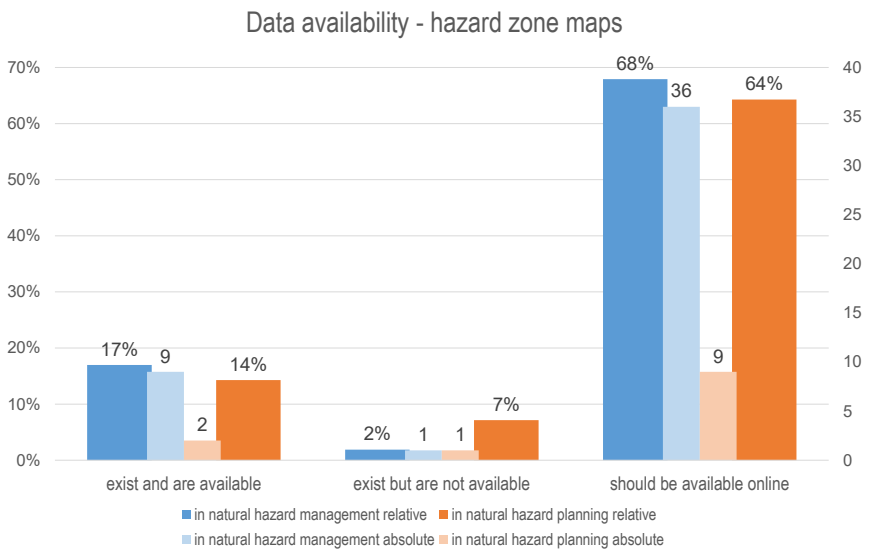

Figure 68: Availability of hazard zone maps current and in future for forest fires.

SAFE ZONES

Question 21 asked about the availability of safe zone documentation.

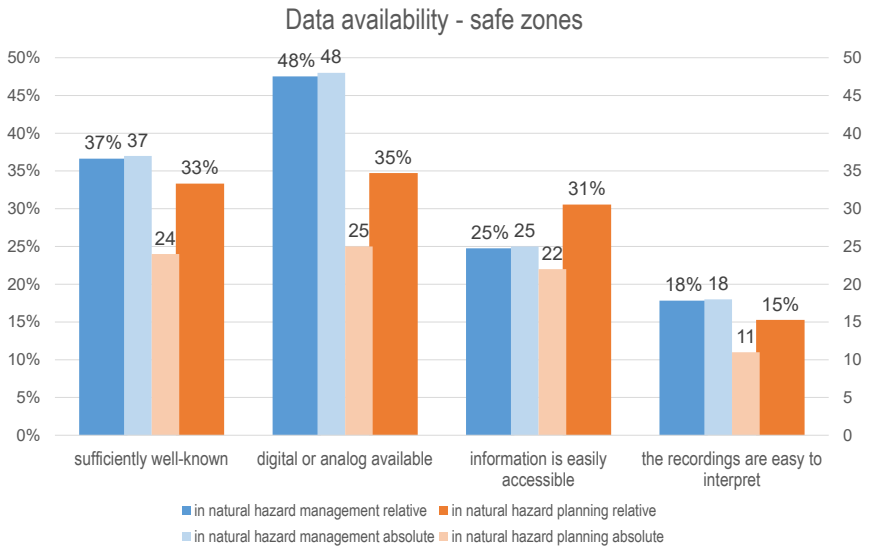

Figure 69: Evaluation of information about safe zones in connection with floods.

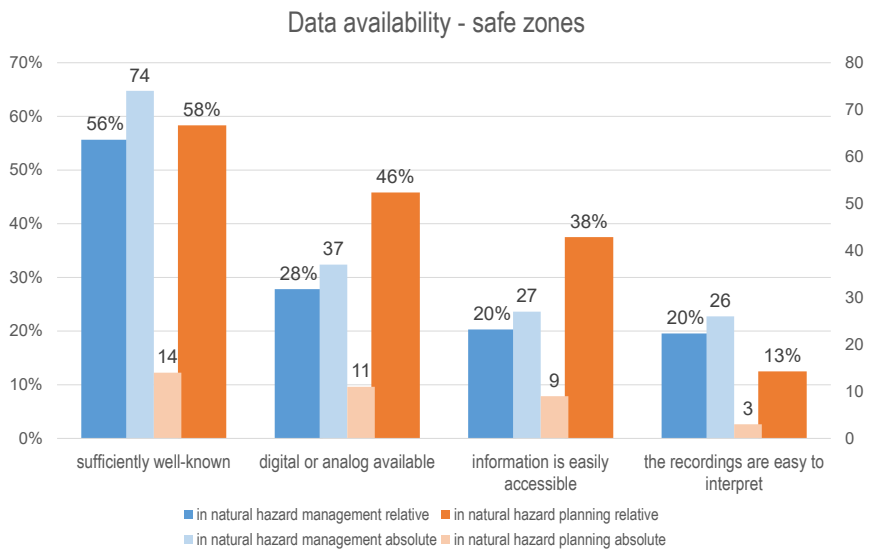

Figure 70: Evaluation of information about safe zones in connection with avalanches / ice avalanches.

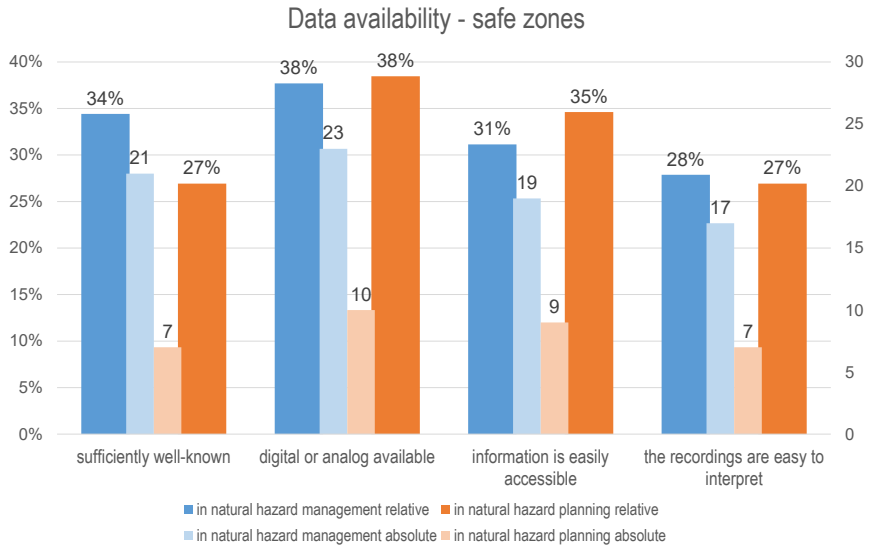

Figure 71: Evaluation of information about safe zones in connection with soil slope failures.

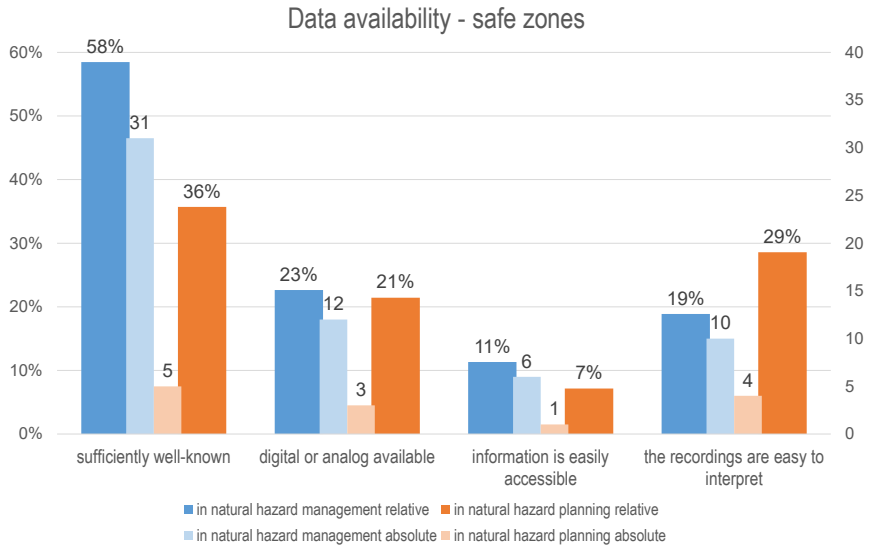

Figure 72: Evaluation of information about safe zones in connection with forest fires.

EARLY WARNING SYSTEM

For a statement about the quality of the early warning systems, questions 24A to 24E were summarized and evaluated as follows: positive statement on the quality if 4 or 5 positive answers were given, moderate quality of the warning systems if 2 or 3 positive answers were given and negative statement, if 1 or less positive answers were given.

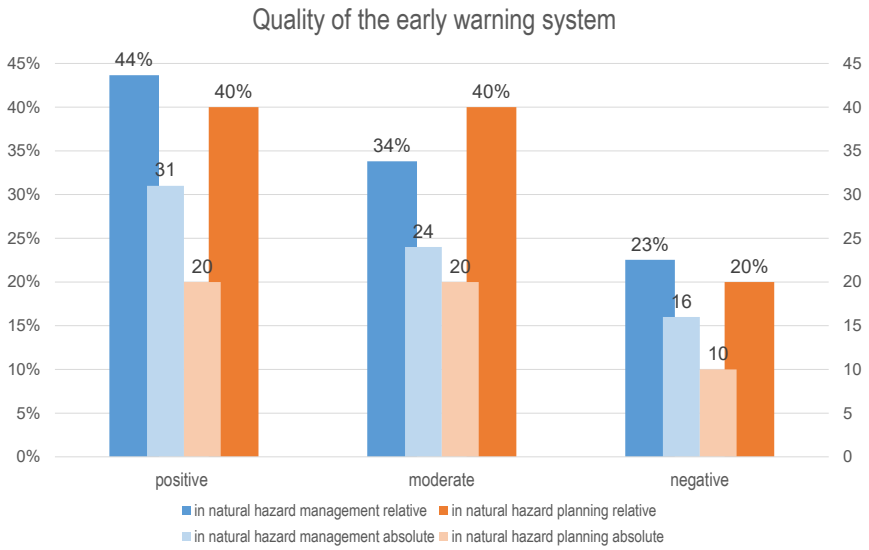

Figure 73: Quality of the early warning system for floods.

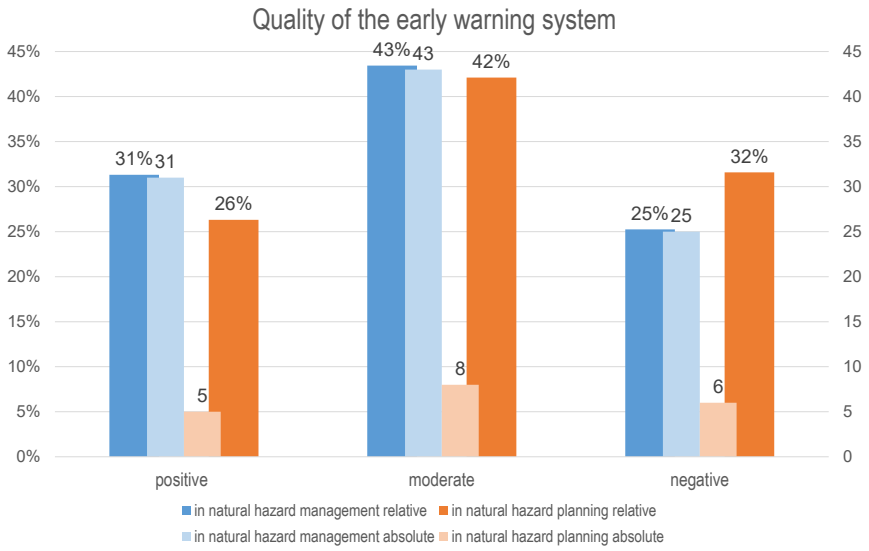

Figure 74: Quality of the early warning system for avalanches / ice avalanches.

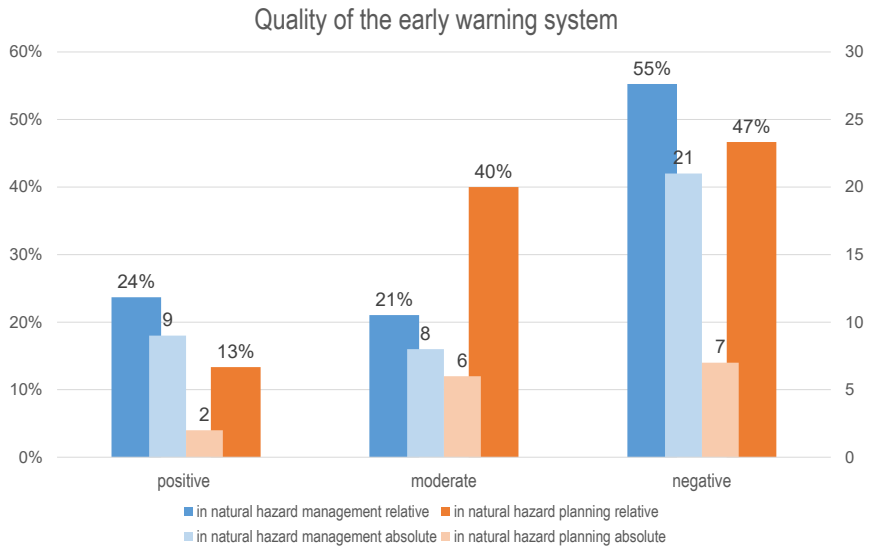

Figure 75: Quality of the early warning system for soil slope failures.

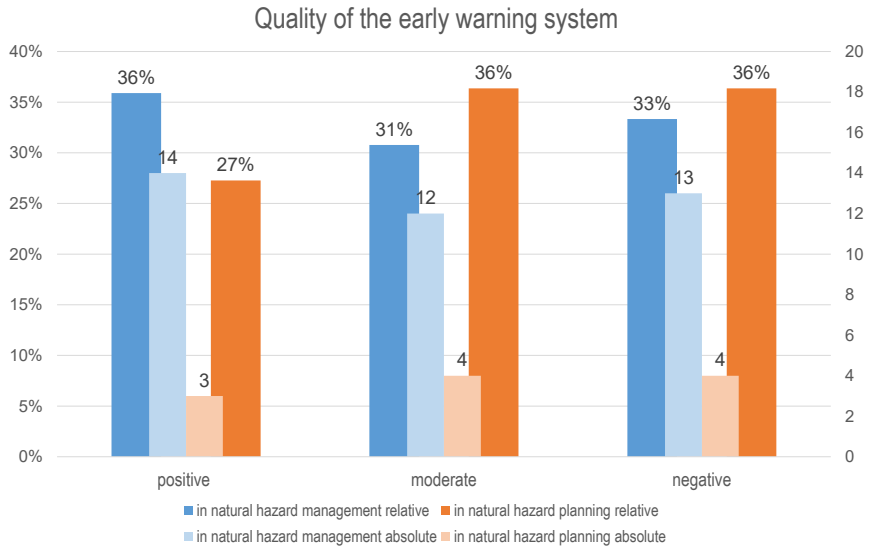

Figure 76: Quality of the early warning system for forest fires.

SPECIFIC DATA AND INFORMATION

The data availability of very specific information was asked separately in question 14. The graphics show the results once from natural hazard manager and once from natural hazard planner.

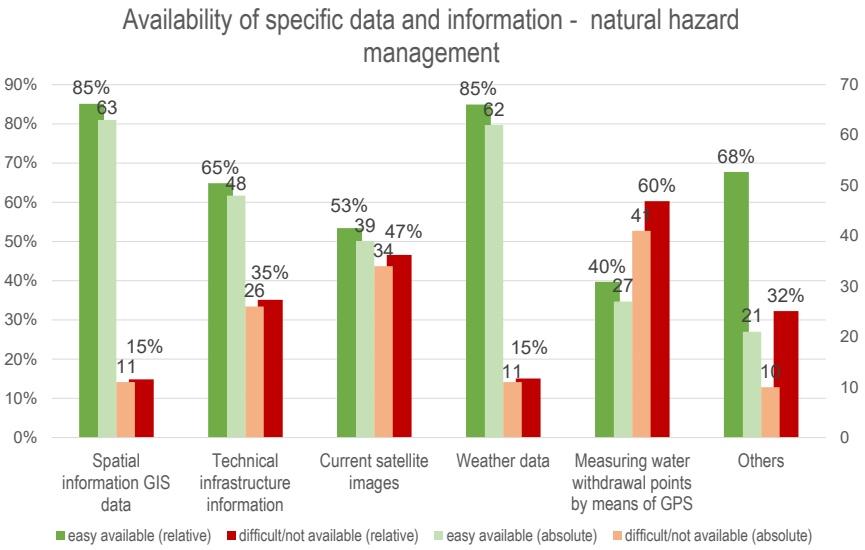

Figure 77: Availability of specific data and information form a flood management perspective.

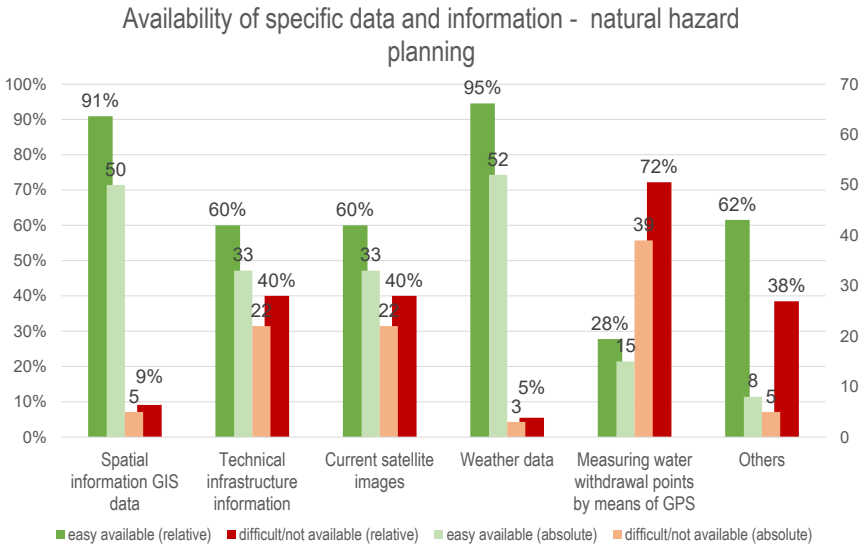

Figure 78: Availability of specific data and information from a flood planning perspective.

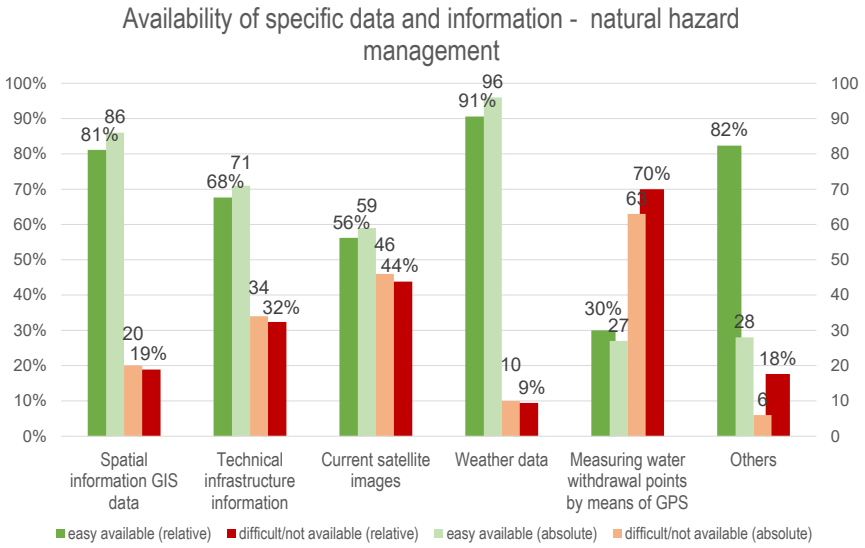

Figure 79: Availability of specific data and information from an avalanche / ice avalanche management perspective.

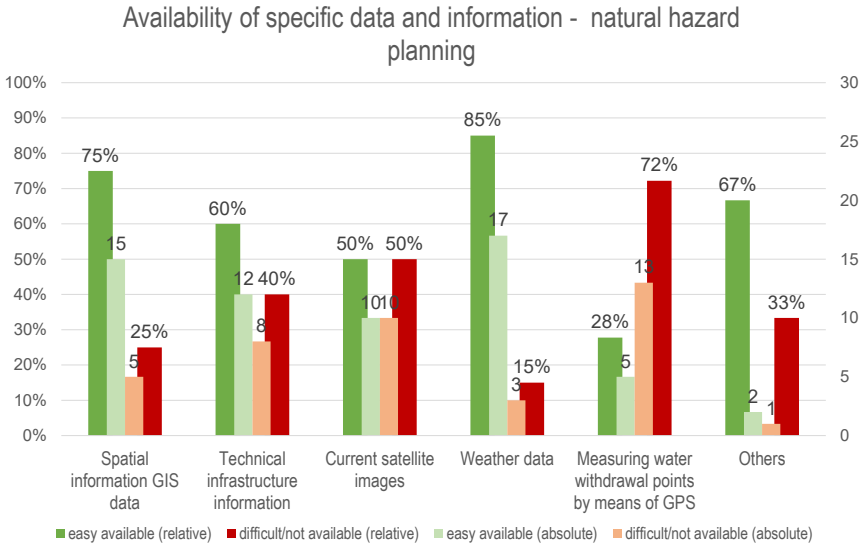

Figure 80: Availability of specific data and information from an avalanche / ice avalanche planning perspective.

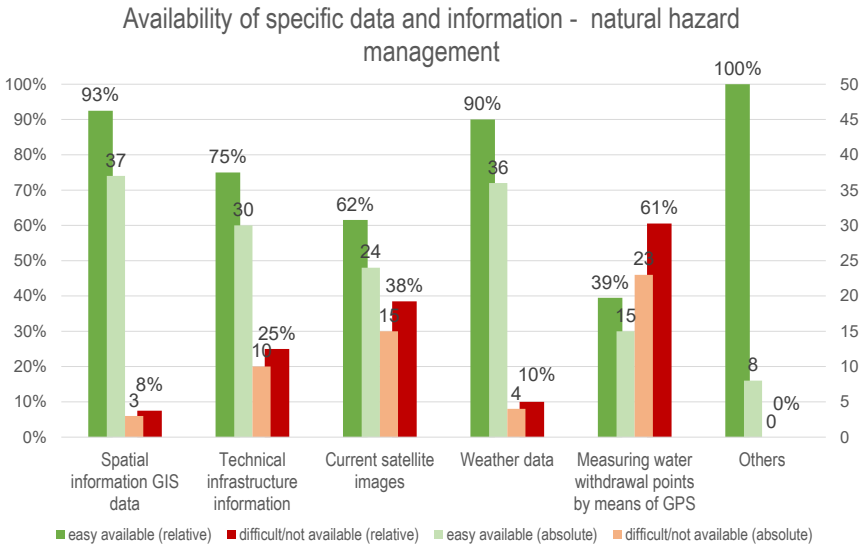

Figure 81: Availability of specific data and information from a soil slope failure management perspective.

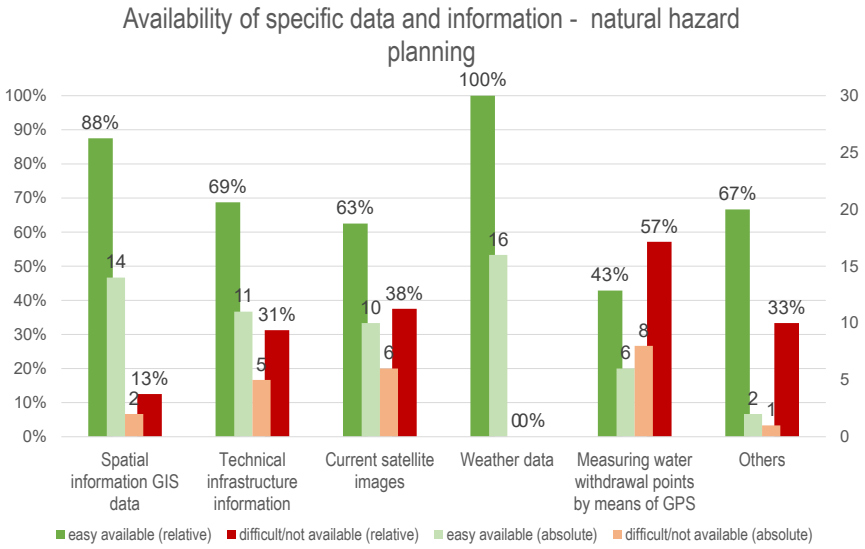

Figure 82: Availability of specific data and information from a soil slope failure planning perspective.

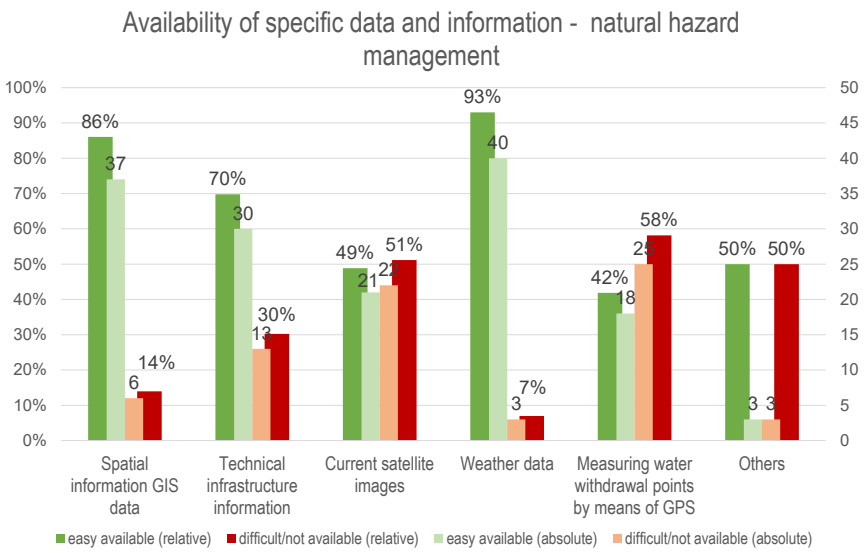

Figure 83: Availability of specific data and information from a forest fire management perspective.

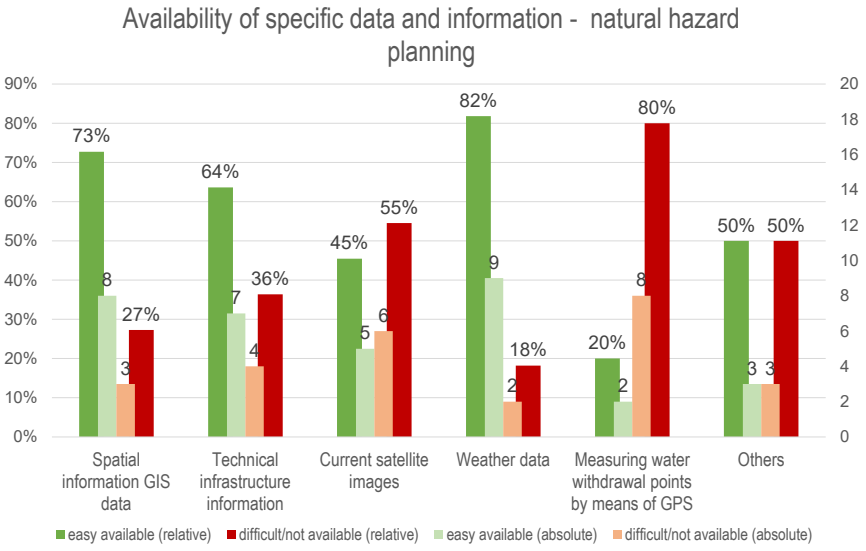

Figure 84: Availability of specific data and information from a forest fire planning perspective.

DATA AND INFORMATION TRANSFER

Question 31 analysed the data and information transfer between contingency planning and operational management.

The question of the data and information exchange between natural hazard planners and natural hazard managers shows us the major shortcoming at this interface. As the fact of the unsatisfactory exchange was known in advance, this survey was started. This answer within the four natural hazards only confirms this feeling of the experts in the consortium. The data exchange was rated almost equally as good and in need of improvement. However, the feedback from the natural hazard managers is somewhat better than from the natural hazard planners for floods and avalanches / ice avalanches. Whereas for soil slope failures and forest fires the feedback from the natural hazard planners is a little bit better.

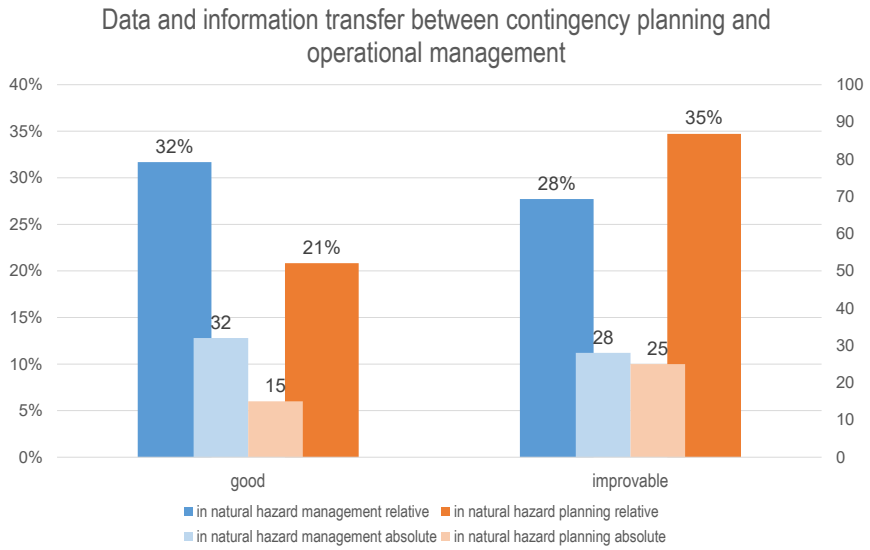

Figure 85: Data and information transfer between contingency planning and operational planning in floods.

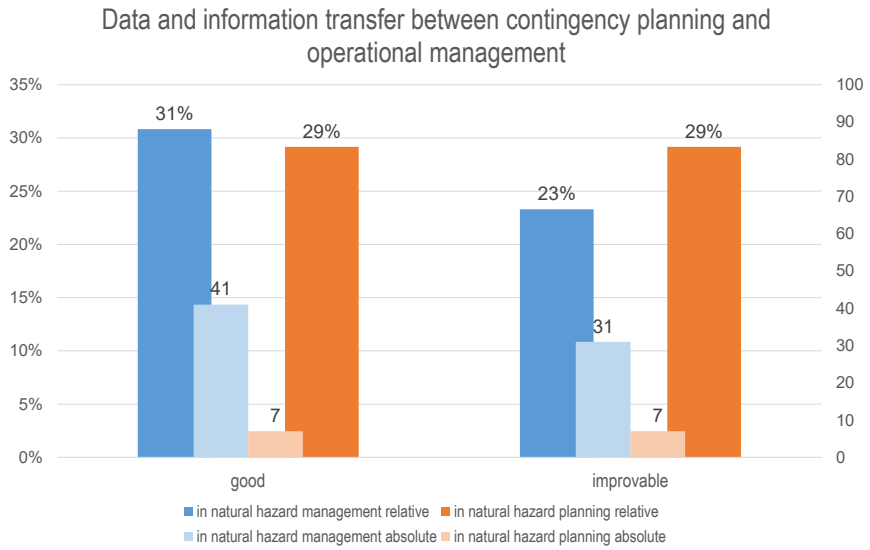

Figure 86: Data and information transfer between contingency planning and operational planning in avalanches / ice avalanches.

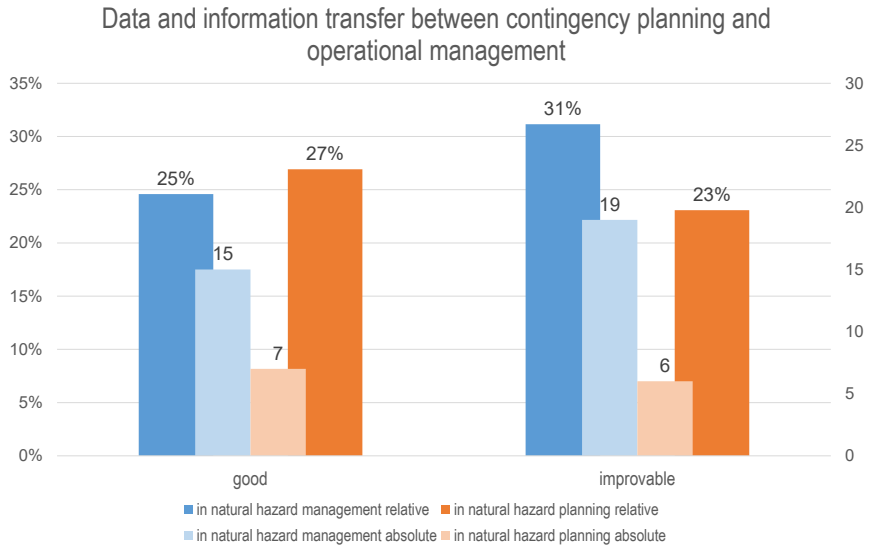

Figure 87: Data and information transfer between contingency planning and operational planning in soil slope failures.

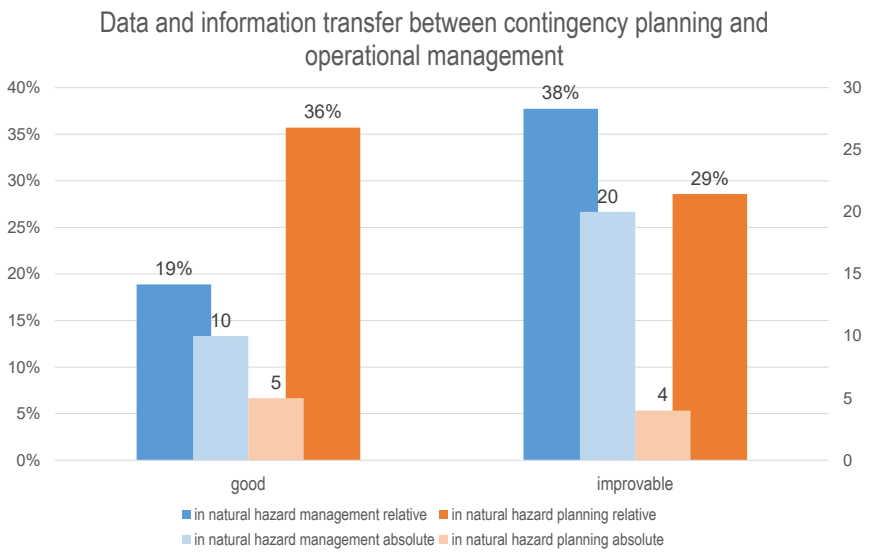

Figure 88: Data and information transfer between contingency planning and operational planning in forest fires.

RISK COMMUNICATION

Directly in the chapter on risk communication the participants answered two questions with sub-questions (25A-25G and 26A-26E). These 12 sub-questions and others from the other chapters, which refer to risk communication, have been summarized for three focus points.

First, the quality of the relationship between the emergency planners and emergency managers was considered. For this purpose, the sub-questions 25B, 25C, 25E-25G and 31A were summarized and divided into positive (4-6 positive answers), moderate (2 or 3 positive answers) and negative feedback (0 or 1 positive answer).

Another focus was the structural qualities, for which questions from the chapters Risk Communication and Structural Quality were combined: 26A-26E, 28A and 31C, 31D.

Thirdly, the focus was placed on the exchange of information between planner and manager and for this purpose the sub-questions 16B, 16D, 16E, 25A, 25D, 31B and 37A, 37B were summarized. For the last two focus points, the answers were rated as positive feedback if 6-8 answers were positive. With 3-5 positive answers it was rated as moderate and with 0-2 positive answers as negative feedback.

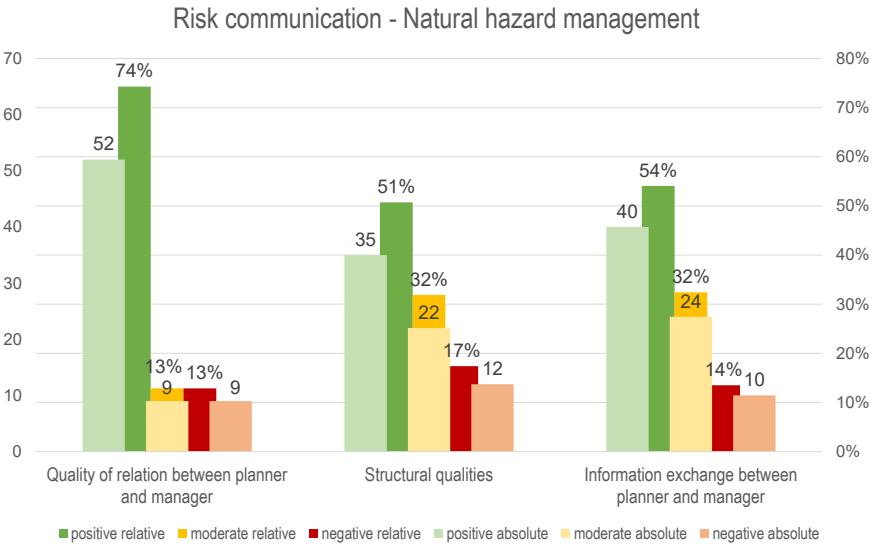

Figure 89: Three focus points of risk communication from a flood management perspective.

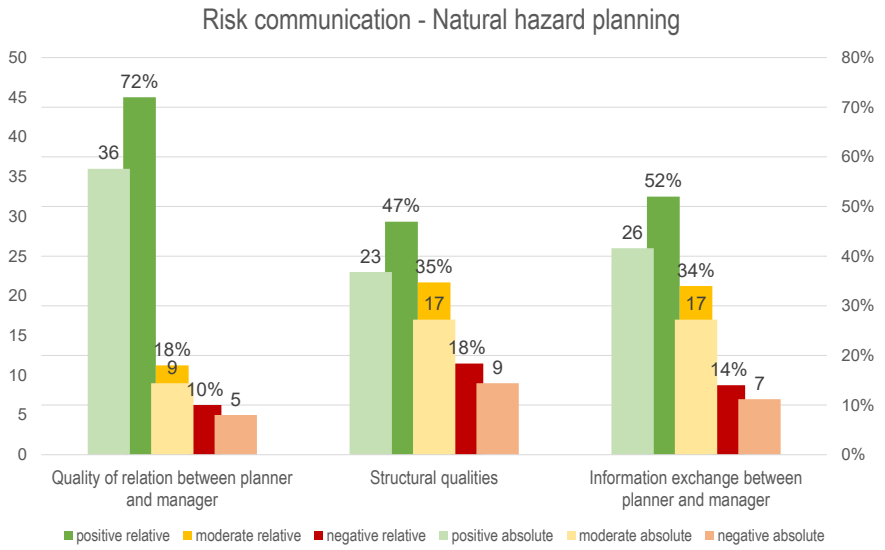

Figure 90: Three focus points of risk communication from a flood planning perspective.

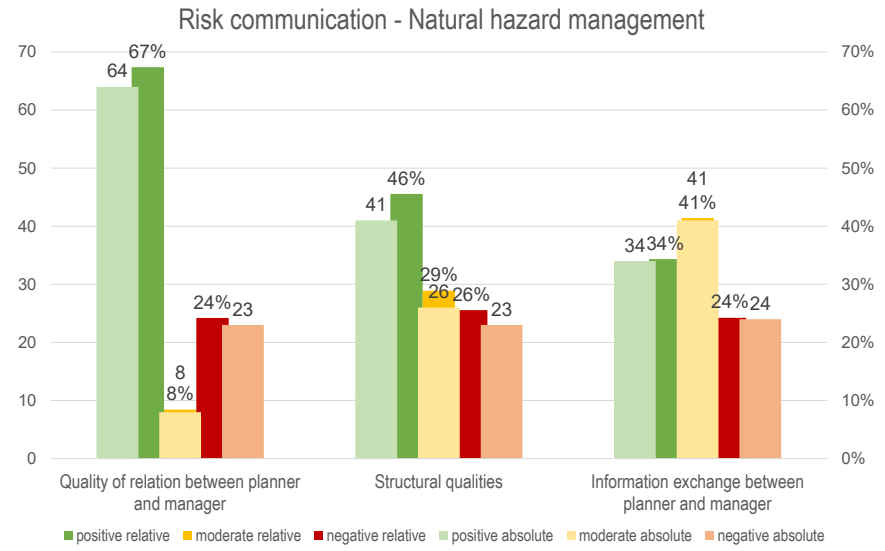

Figure 91: Three focus points of risk communication from an avalanche / ice avalanche management perspective.

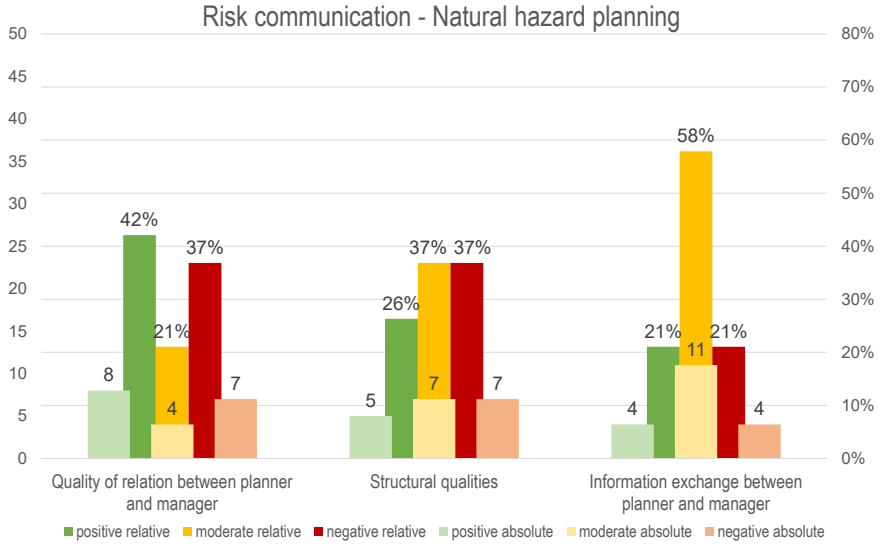

Figure 92: Three focus points of risk communication from an avalanche / ice avalanche planning perspective.

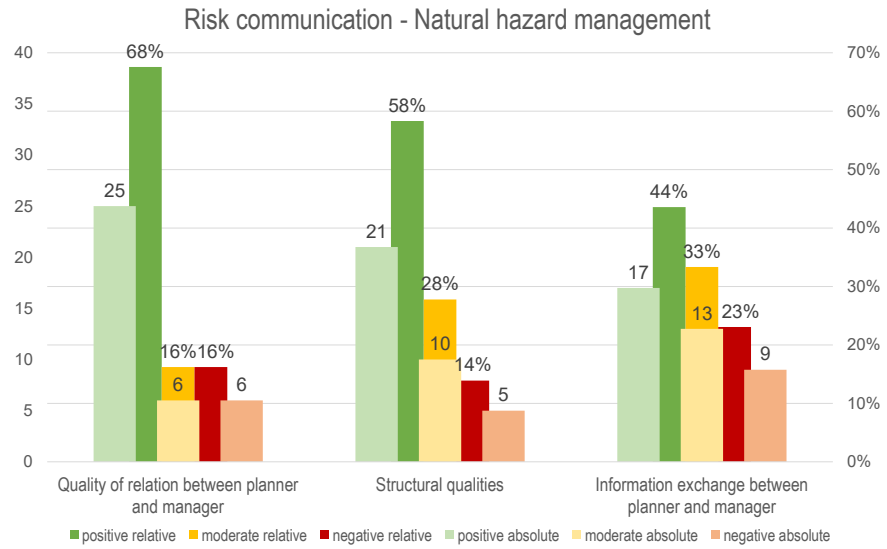

Figure 93: Three focus points of risk communication from a soil slope failure management perspective.

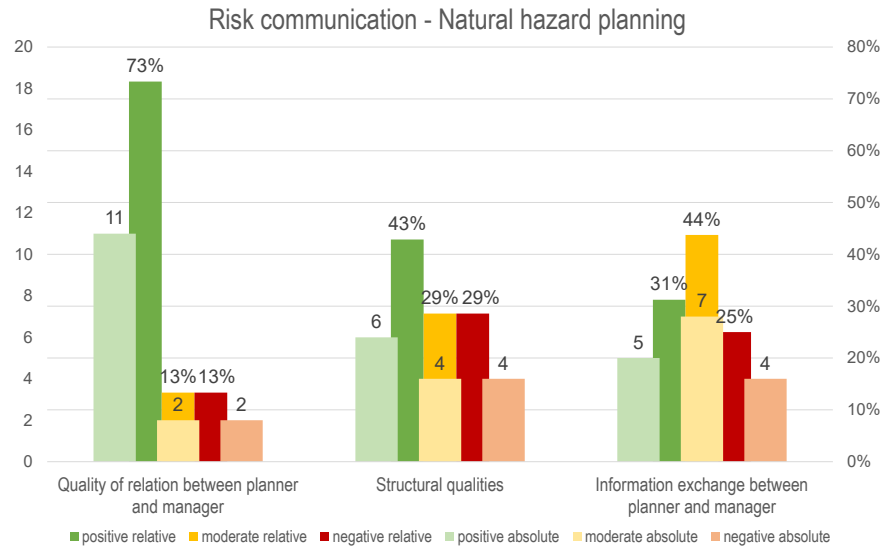

Figure 94: Three focus points of risk communication from a soil slope failure planning perspective.

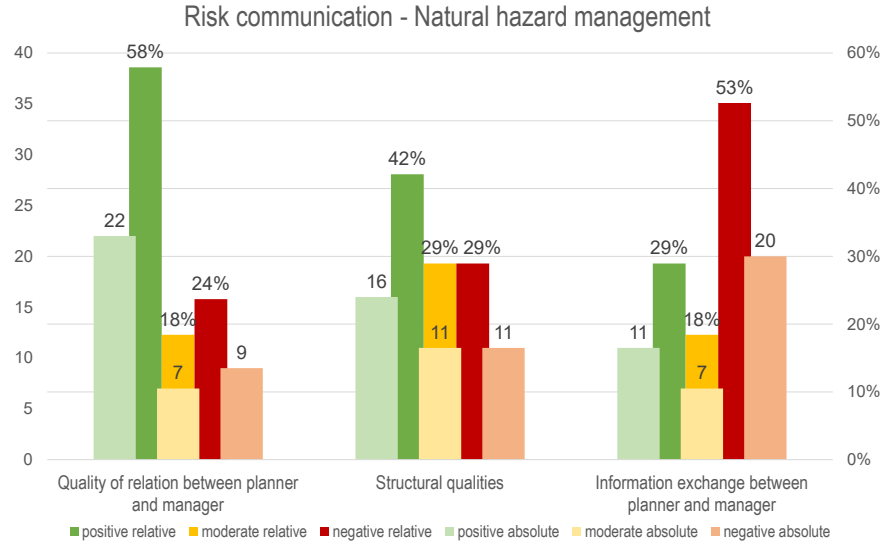

Figure 95: Three focus points of risk communication from a forest fire management perspective.

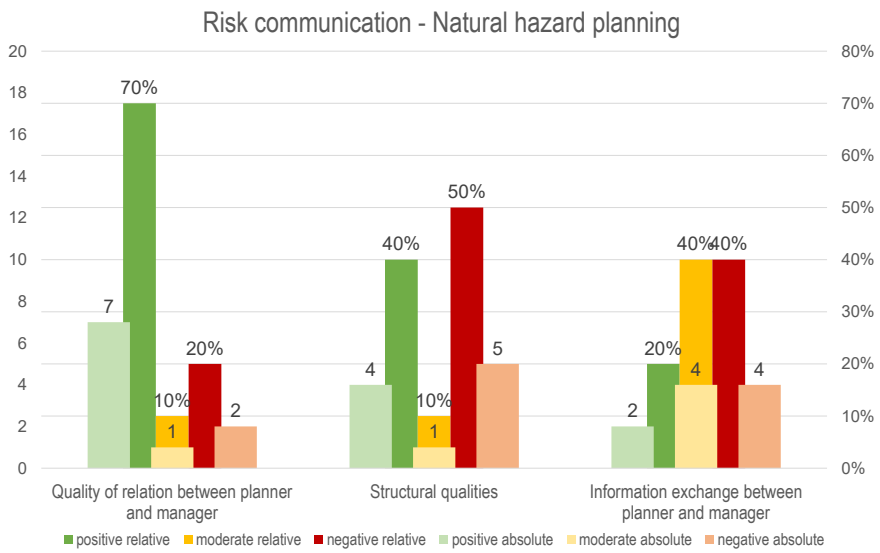

Figure 96: Three focus points of risk communication from a forest fire planning perspective.

STRUCTURAL QUALITY

Information on the structural quality can already be found in the focus on structural qualities of the chapter risk communication, as specifically the qualities or structural obstacles for well-functioning risk communication between planners and managers were queried. Here, the structural quality within the disaster management as well as the contingency planning will be discussed and the quality of emergency plans and protective measures will be evaluated.

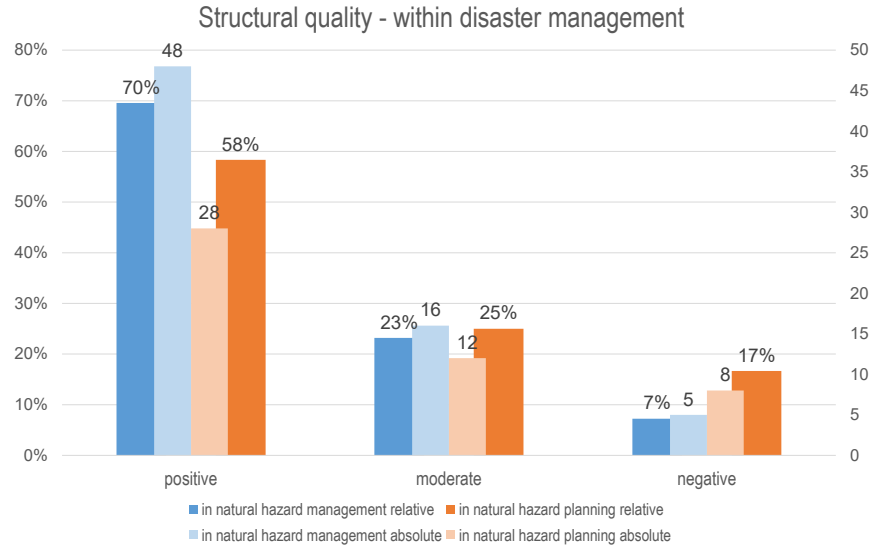

Figure 97: Evaluation of structural quality within flood management.

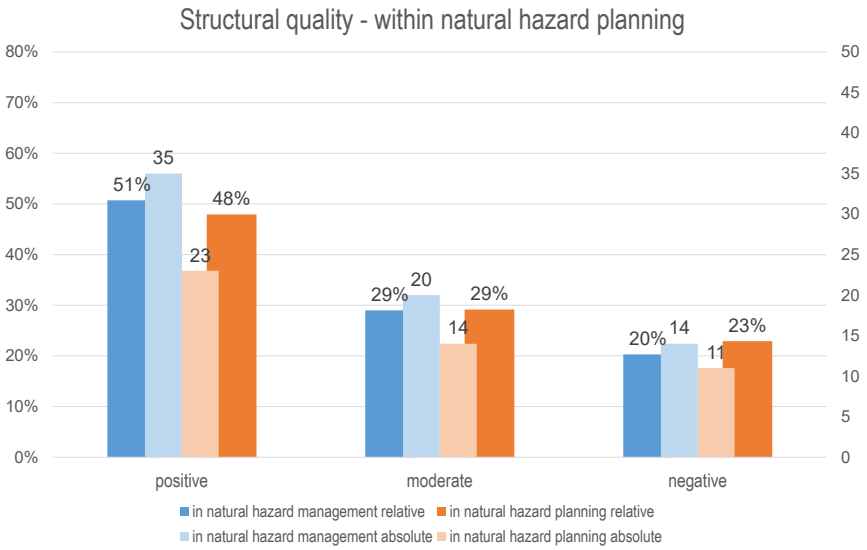

Figure 98: Evaluation of structural quality within flood planning.

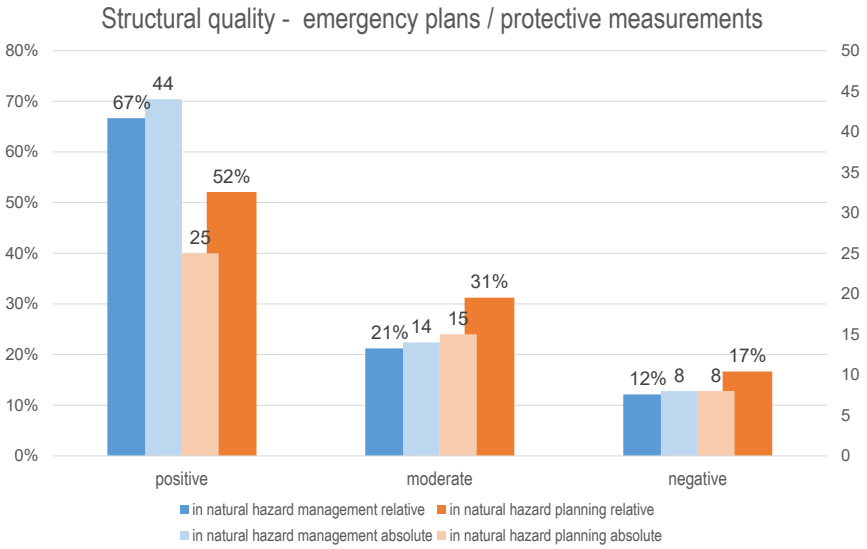

Figure 99: Evaluation of structural quality of emergency plans and protective measures for floods.

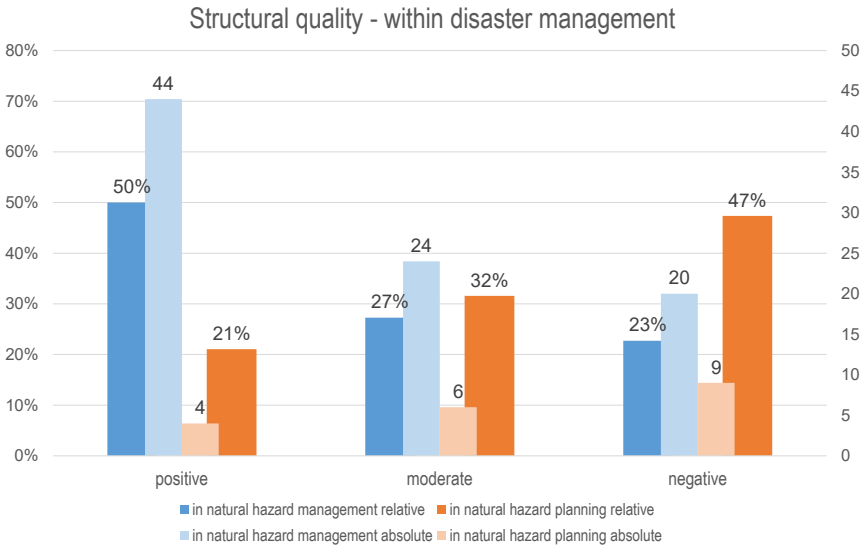

Figure 100: Evaluation of structural quality within avalanche / ice avalanche management.

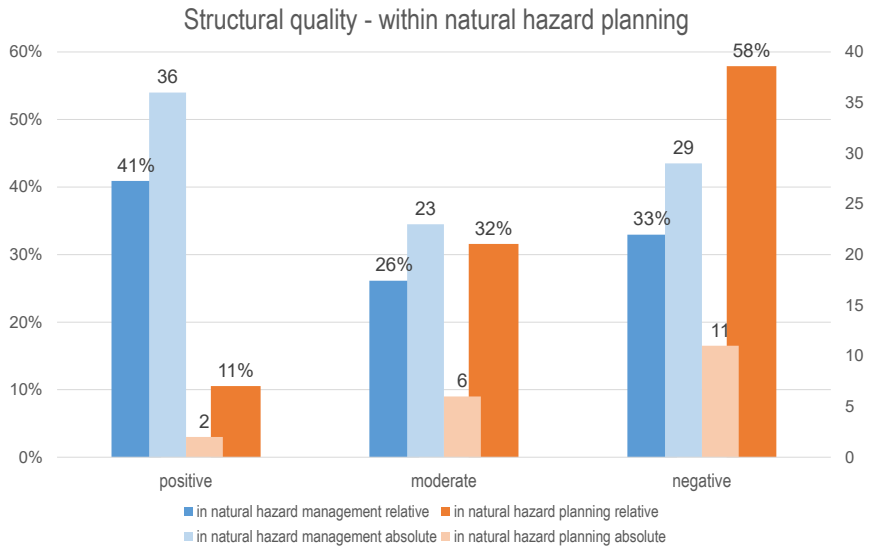

Figure 101: Evaluation of structural quality within avalanche / ice avalanche planning.

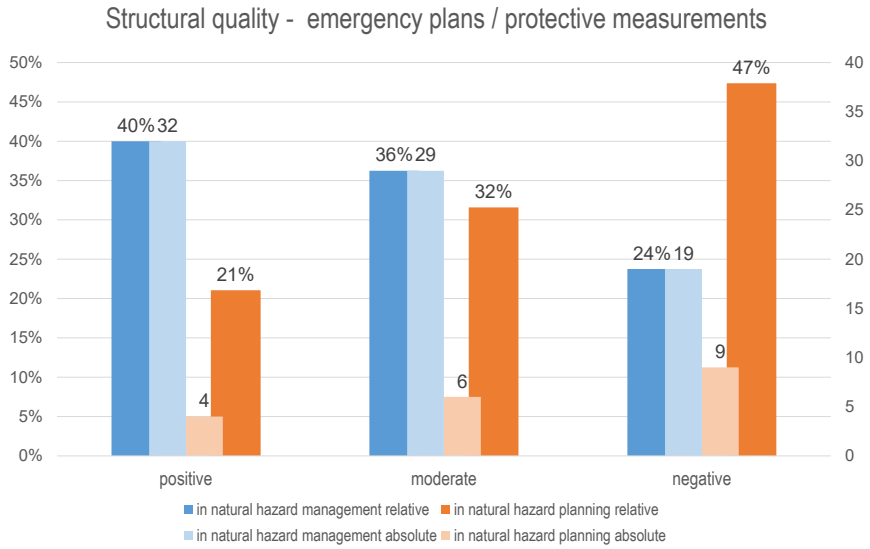

Figure 102: Evaluation of structural quality of emergency plans and protective measures for avalanches / ice avalanches.

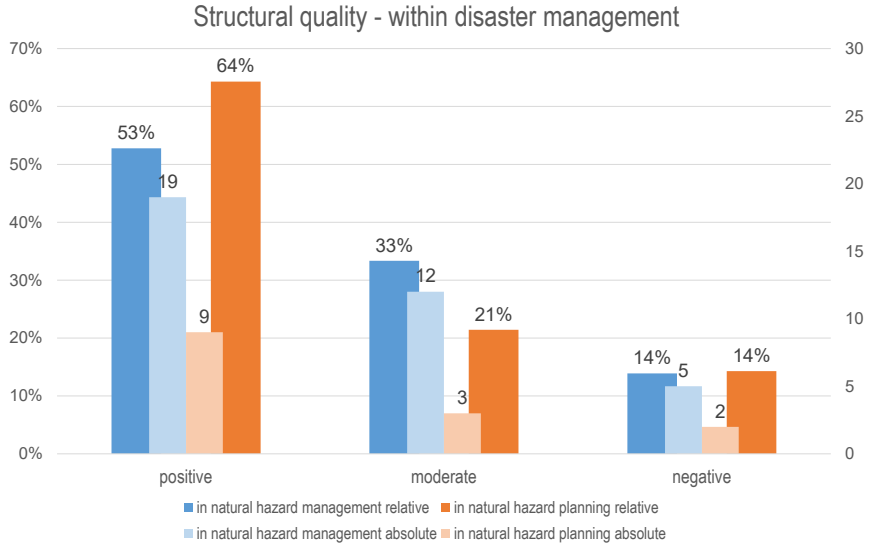

Figure 103: Evaluation of structural quality within soil slope failure management.

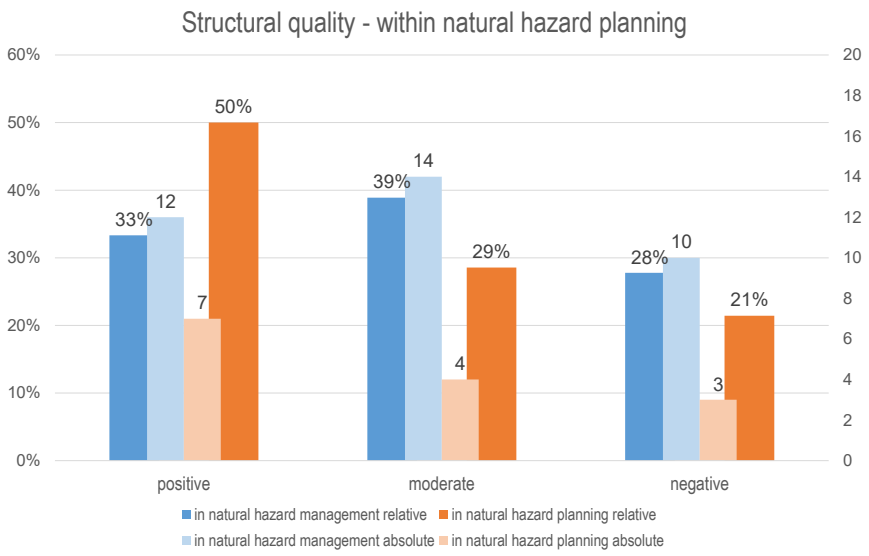

Figure 104: Evaluation of structural quality within soil slope failure planning.

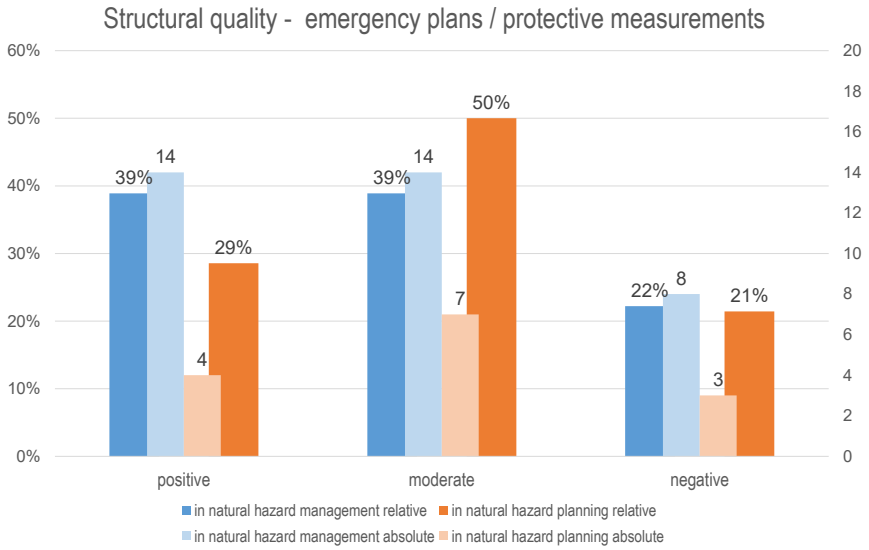

Figure 105: Evaluation of structural quality of emergency plans and protective measures for soil slope failures.

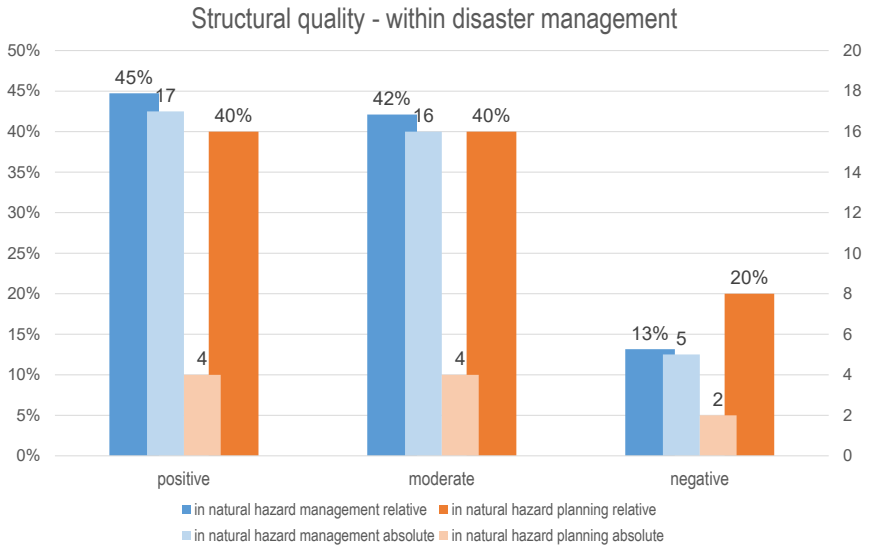

Figure 106: Evaluation of structural quality within forest fires management.

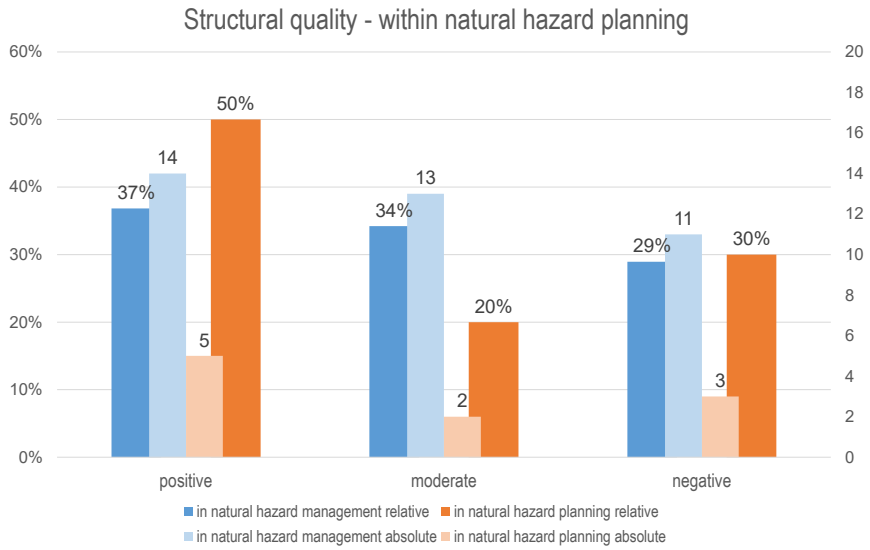

Figure 107: Evaluation of structural quality within forest fires planning.

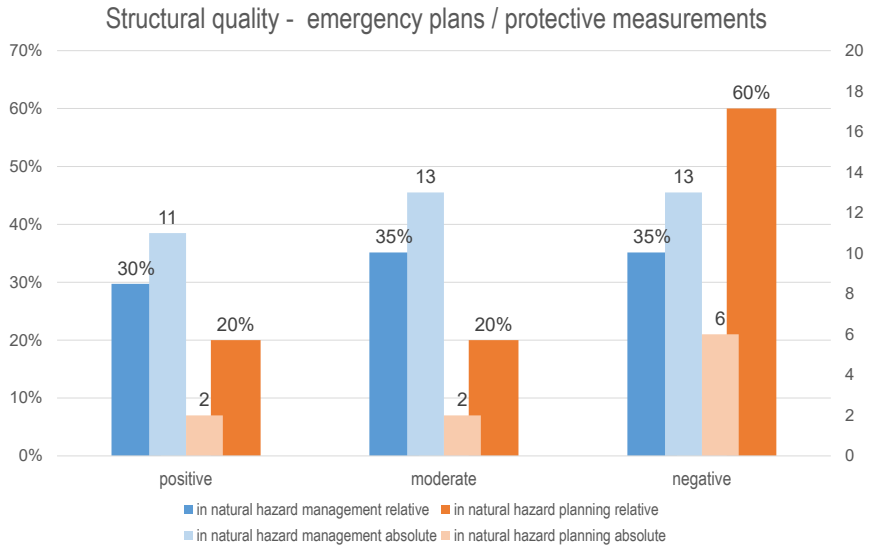

Figure 108: Evaluation of structural quality of emergency plans and protective measures for forest fires.

MATERIAL RESOUCES

The material resources were specifically queried for each natural hazard, for which individual questions were also designed. In addition to the selection questions, the participants were also asked in their own words about the lack of input material. These evaluations are listed and explained here as a result of the graphical evaluation of the selection questions.

FLOODS

In the case of flooding, permanent structural or technical measures such as retention basins, river bank walls or dams were asked for in the respective area of responsibility. If there are any, the assessment was asked whether there were enough. The second focus was placed on the need for temporary measures in addition to the permanent ones and if these were necessary, whether they would be available in the area of responsibility in the event of an incident.

Question 29A in this subcategory was also evaluated for the questions in the chapter on material resources. It was evaluated whether there was a clear inventory management for the material in order to be able to better assess the existing possibilities in the event of an emergency.

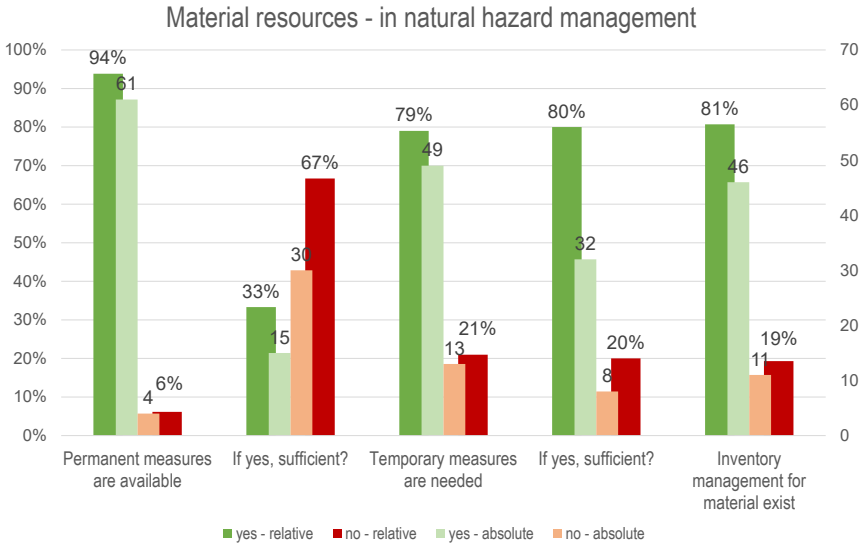

Figure 109: Evaluation of material resources from a flood management perspective.

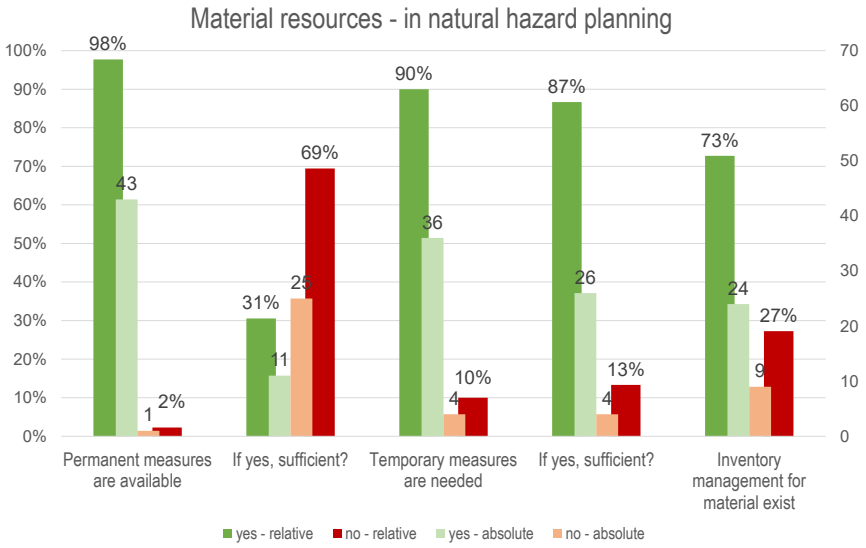

Figure 110: Evaluation of material resources from a flood planning perspective.

When asked about material resources, the natural hazard planners and natural hazard managers agreed quite well. Overall, there exist sufficient permanent measures, but these were often classified as inadequate. Temporary measures, on the other hand, are a less necessary, but when necessary, they are sufficiently available. In general, the natural hazard managers organized the inventory of materials a little more satisfactorily than the planers.

When asked about the missing input materials, the following comments were given:

- The acquisition and maintenance of operational resources is a matter for the municipal fire brigades. The cantonal fire brigade inspectorate has centrally stored large resources (heavy pumps, etc.) which can be used according to priorities in the event of an incident.
- The input material for the individual process sources / operational plans is usually stored on site. Supplementary general material is stored centrally.
- basic flood protection
- We can organize what we need in case of an event.
- We do not miss anything, but flood protection is a task that will never end.
- mobile flood barriers, flood bags, sludge pumps, etc.
- arranged areas for the installation of barriers, flood barriers, embankments and dams, retentions, non-return shells

- half-mounted prefabricated partitions
- high water mobile / segmental flood barriers, flood bags, etc.

AVALANCHES / ICE AVALANCHES

The experts for avalanches / ice avalanches were asked if structural / technical permanent and temporary measures for protection are sufficiently available in the area of their responsibility.

Question 29A in subcategory structural quality was also evaluated for the questions in the chapter on material resources. The question was if a clear inventory management for the material is in order.

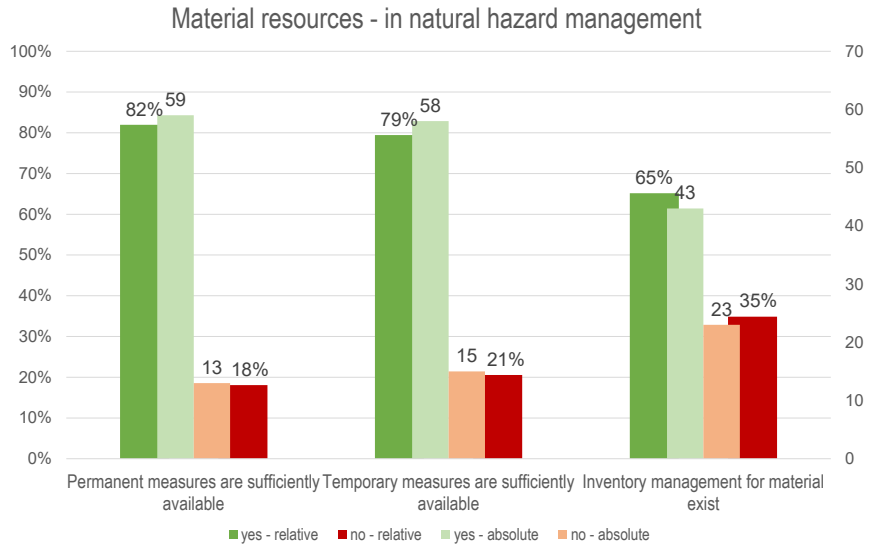

Figure 111: Evaluation of material resources from an avalanche / ice avalanche management perspective.

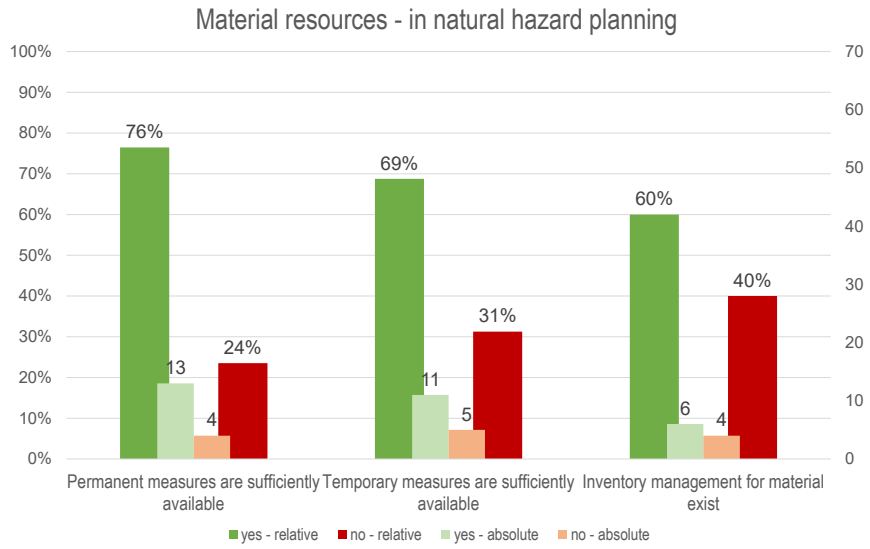

Figure 112: Evaluation of material resources from an avalanche / ice avalanche planning perspective.

The results show that a high percentage of natural hazard management and planning agrees to have sufficiently available permanent and temporary measures. However, the temporary measures are not as positive rated as the permanent measures. About the inventory management for material 35% or 40% of the participants said that it does not exist.

When asked about the missing input materials, the experts made the following comments:

- Equipment (avalanche transceiver, probe, shovel, radio, snow cover investigation)
- temporary avalanche protection (road barriers, artificial release systems)
- permanent avalanche protection (avalanche barriers)
- Data (weather station, avalanche maps)
- Personnel (explosives officer)

Most of these comments were mentioned more than once, temporary avalanche protection was mentioned five times, equipment and data was mentioned three times.

SOIL SLOPE FAILURES

In the case of soil slope failures, the questions asked about the sufficiently availability of permanent or temporary measures for protection. Besides some specific questions about retention areas were asked. In addition, it was asked if the experts have the necessary input material in case of damage.

Question 29A from chapter structural quality asked about the existence of a clear inventory management for the material and was additionally evaluated for the questions in the chapter material resources.

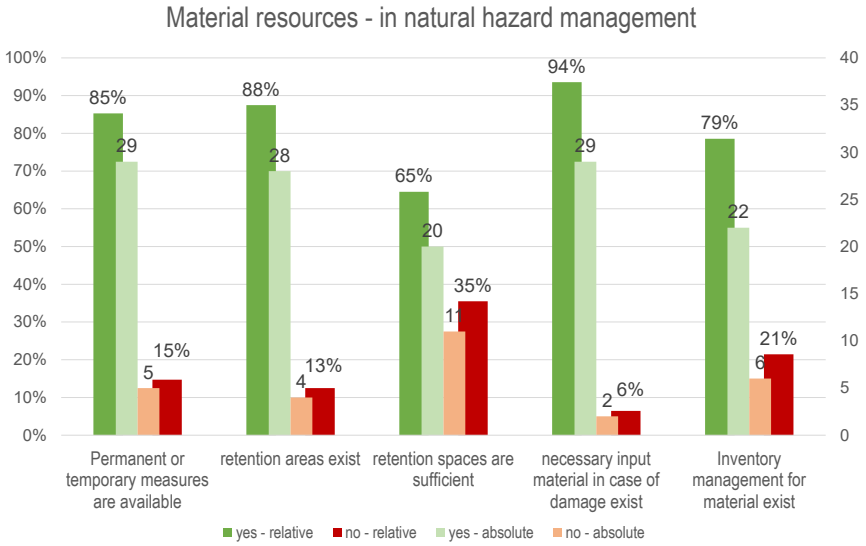

Figure 113: Evaluation of material resources from a soil slope failure management perspective.

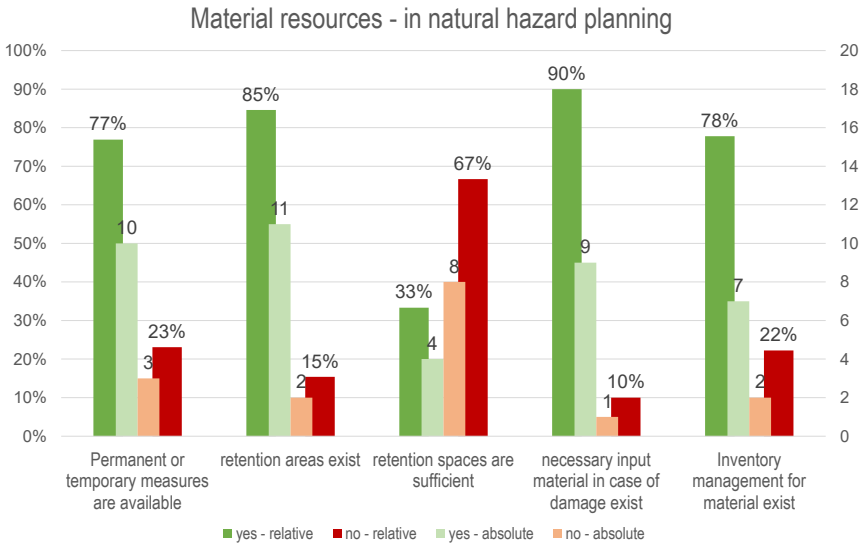

Figure 114: Evaluation of material resources from a soil slope failure planning perspective.

A high percentage of experts answered that permanent or temporary measures are available and that retention areas exist. On the question, if retention spaces are sufficient natural hazard management and planning did not agree. While 65% of the experts in natural hazard management thought that the retention spaces are sufficient, 67% of the experts in natural hazard planning answered that the retention spaces are not sufficient. This wide disagreement is surprising and raises the question why these two expert groups have such different opinions. Are their needs that different?

On the questions about the existence of necessary input material in case of damage and inventory management for material both expert groups gave to a very high percentage positive feedback.

When asked about missing material only once drones were reported.

FOREST FIRES

The experts for forest fires were asked in this chapter if they have the necessary technical firefighting resources like helicopters, fire engines, etc. Additionally, it was asked if there exist special forest fire brigades and special protective equipment for forest fire events.

Question 29A from chapter structural quality asked about the existence of a clear inventory management for the material and was additionally evaluated for the questions in the chapter on material resources.

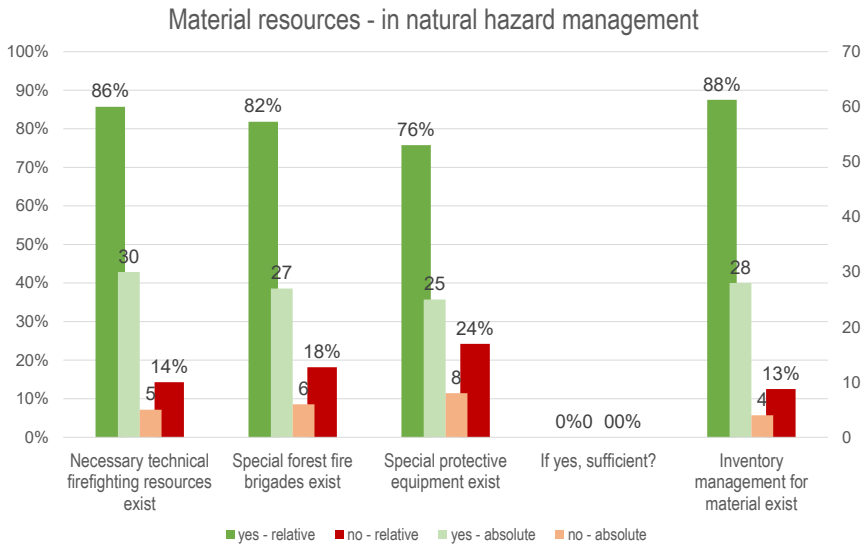

Figure 115: Evaluation of material resources from a forest fire management perspective.

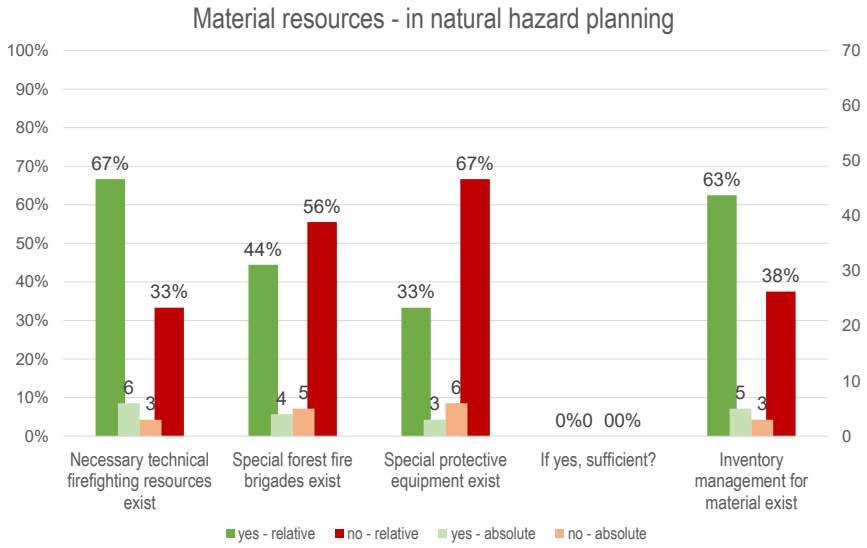

Figure 116: Evaluation of material resources from a forest fire planning perspective.

At the question about the existence of necessary technical firefighting resources and an inventory management for material, both expert groups answered mostly with yes. At the questions about the existence of special forest fire brigades and special protective equipment, the opinions differed very much. Natural hazard management said that those things exist, while a significant part of the participants in natural hazard planning disagreed (56% and 67%). This wide disagreement on those two questions is surprising and raises the question why these two expert groups have such different opinions. Do the natural hazard planer not have the full knowledge about the available material or do these two expert groups have such different needs and expectations in their equipment?

When asked about missing input materials, the forest fires experts made the following comments:

- Special fire trucks (suitable for forests, mountains)
- Material for small fires and extinguishing work
- Protective clothing for forest fires
- Heat-resistant safety ropes
- Platforms for stabling cargo in the field
- Sprinkler systems
- Helicopters
- Communication

Most of these comments were mentioned more than once; special fire trucks were mentioned four times for example.

HUMAN RESOURCES

Six questions with a total of 19 sub-questions were asked about human resources, whereby the questions focused on experience-based knowledge (here specifically on know-how and training), willingness to learn and staff availability.

For the evaluation of practical knowledge - know-how, five sub-questions (35A-C, 37D and 37G) were summarized and divided into three categories: positive (4 or 5 positive answers), moderate (2 or 3 positive answers) and negative (0 or 1 positive answer).

The questions 36A-C, 37E-F and 37J were summarized to get results about practical knowledge concerning the training within the chapter human resources. The categories for that evaluation were: positive (4-6 positive answers), moderate (2 or 3 positive answers) and negative (0 or 1 positive answer).

The questioning about willingness to learn summarized four sub-questions (37A-C and 37H) and divided the results into three categories: positive (3 or 4 positive answers), moderate (2 positive answers) and negative for 0 or 1 positive answer.

In addition, the questions about cross-border cooperation were considered and evaluated separately. Both, the current situation of cross-border cooperation and the need or desire for cross-border cooperation were asked: In my area of responsibility cross-border trainings take place (37J). In my area of responsibility there is a need for cross-border operations (37I).

Summarized together with the evaluation of the willingness to learn, the results show that more training and exchange between the countries would be welcome and would be accepted as a further training opportunity.

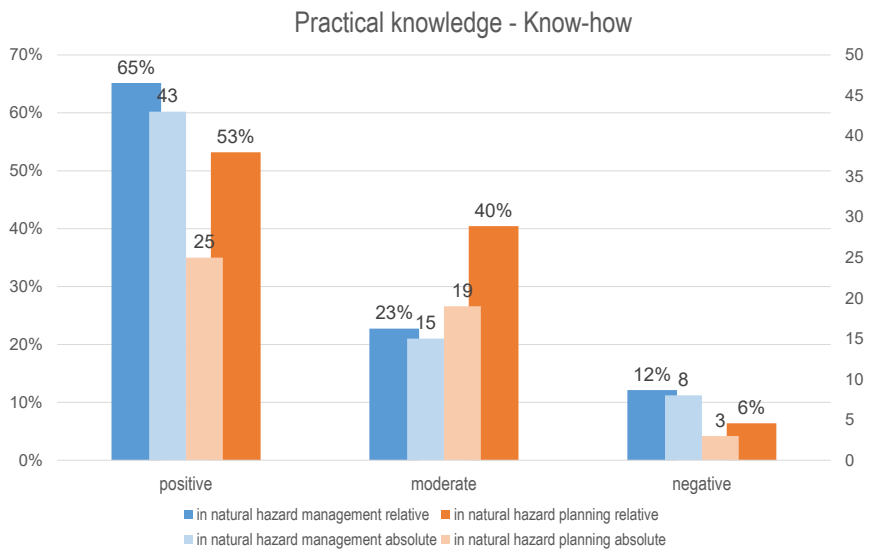

Figure 117: Practical knowledge due to know-how within the natural hazard floods.

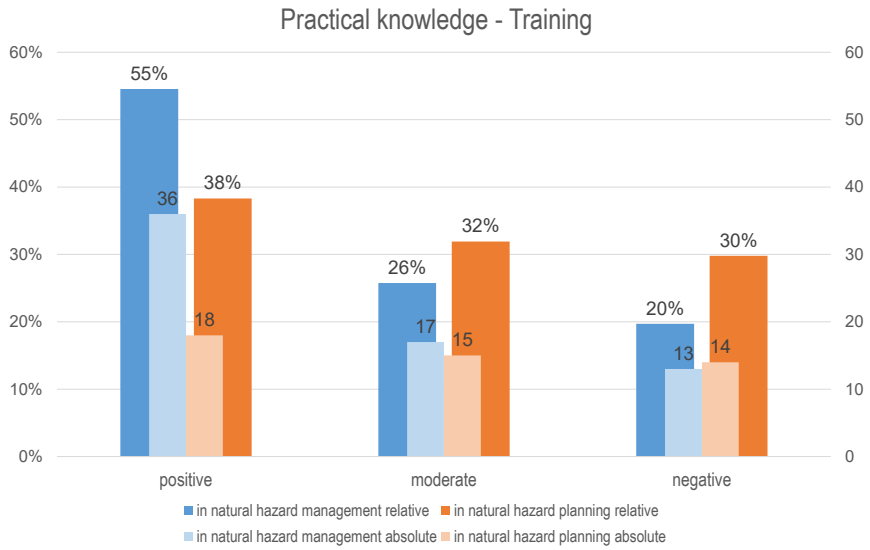

Figure 118: Practical knowledge due to training within the natural hazard floods.

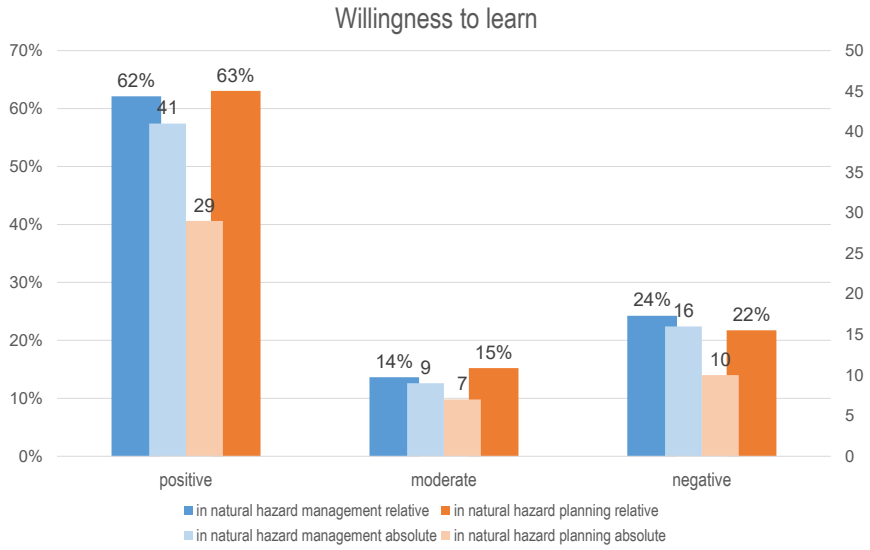

Figure 119: Evaluation of the willingness to learn of the flood experts.

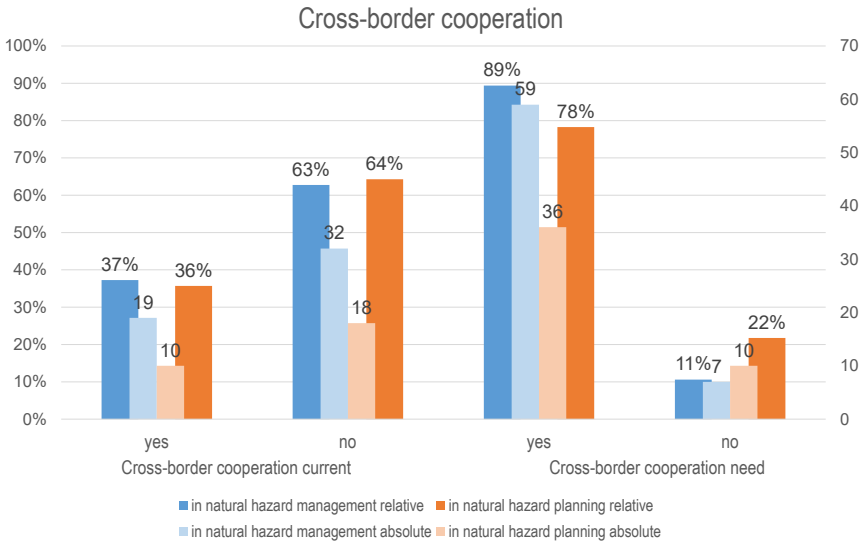

Figure 120: Availability of cross-border cooperation current and needed for flood experts.

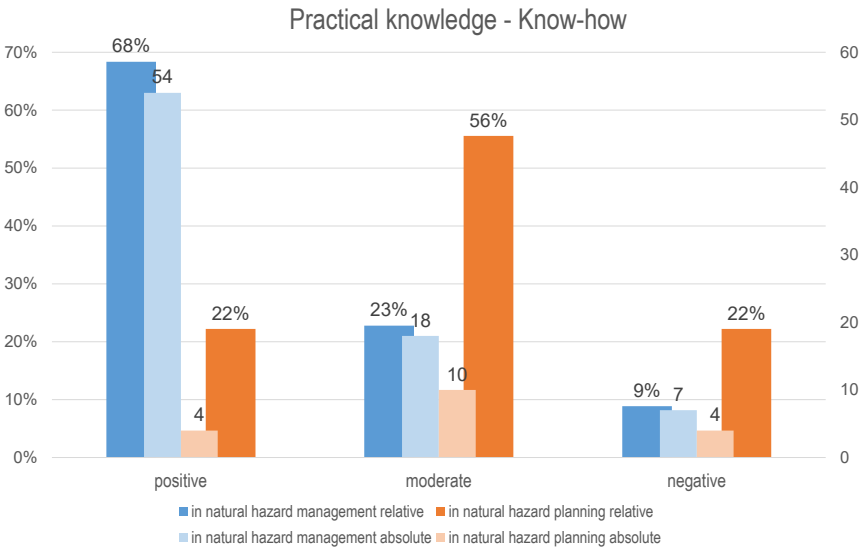

Figure 121: Practical knowledge due to know-how within the natural hazard avalanches / ice avalanches.

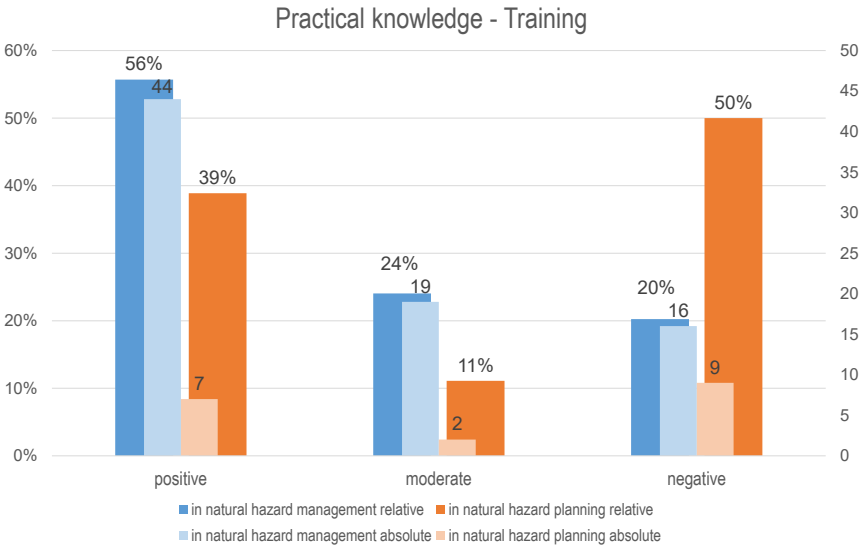

Figure 122: Practical knowledge due to training within the natural hazard avalanches / ice avalanches.

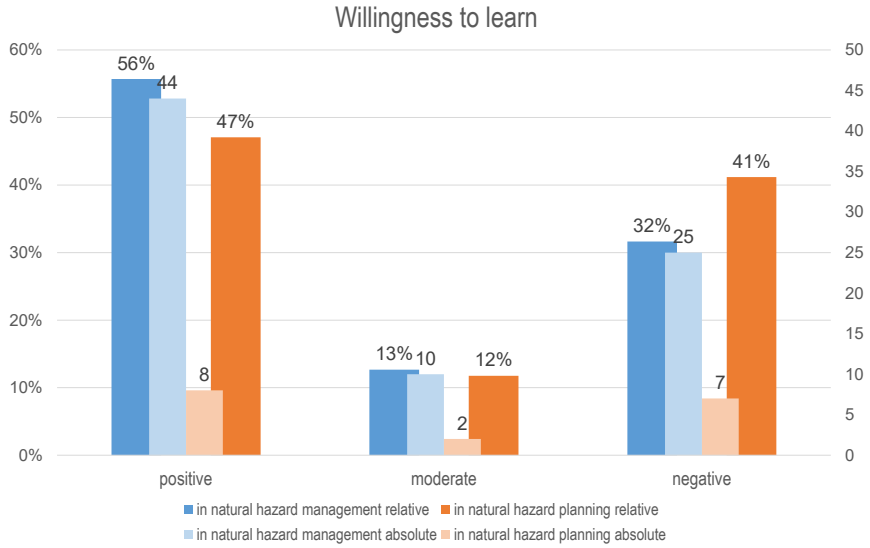

Figure 123: Evaluation of the willingness to learn of the avalanche / ice avalanche experts.

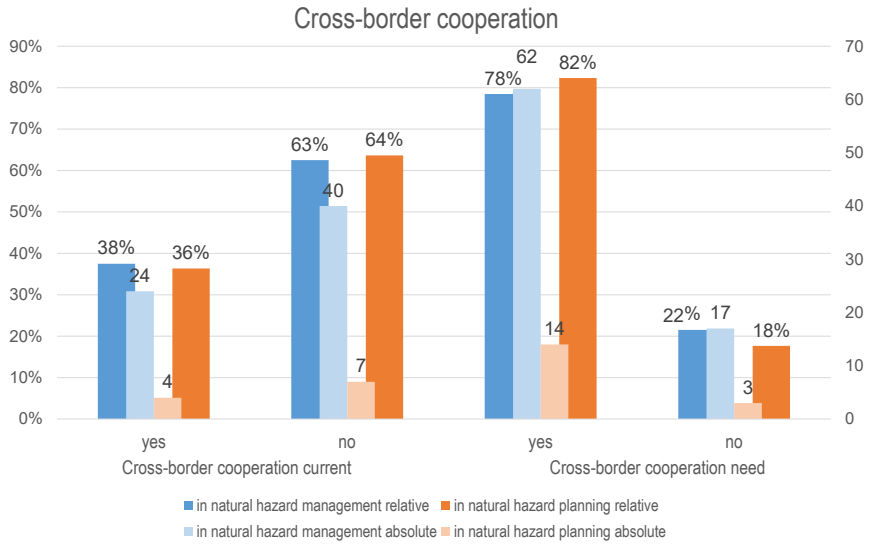

Figure 124: Availability of cross-border cooperation current and needed for avalanche / ice avalanche experts.

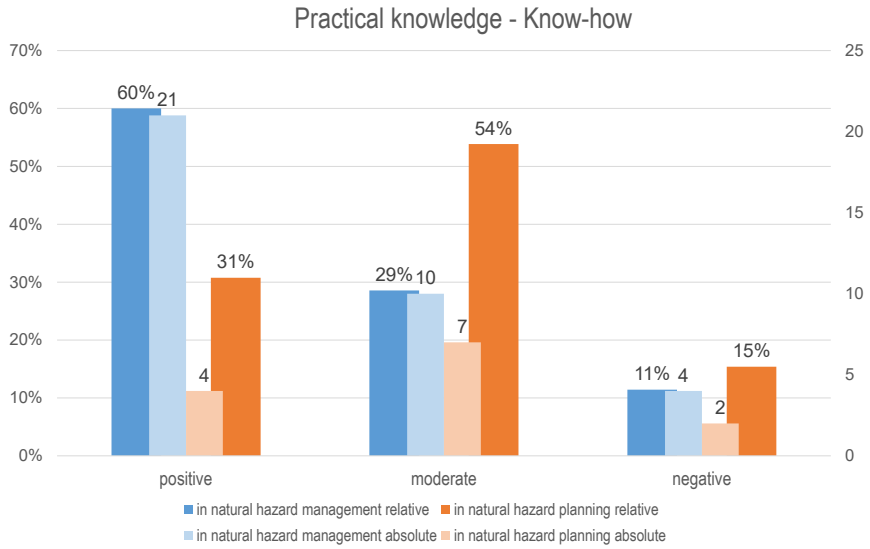

Figure 125: Practical knowledge due to know-how within the natural hazard soil slope failures.

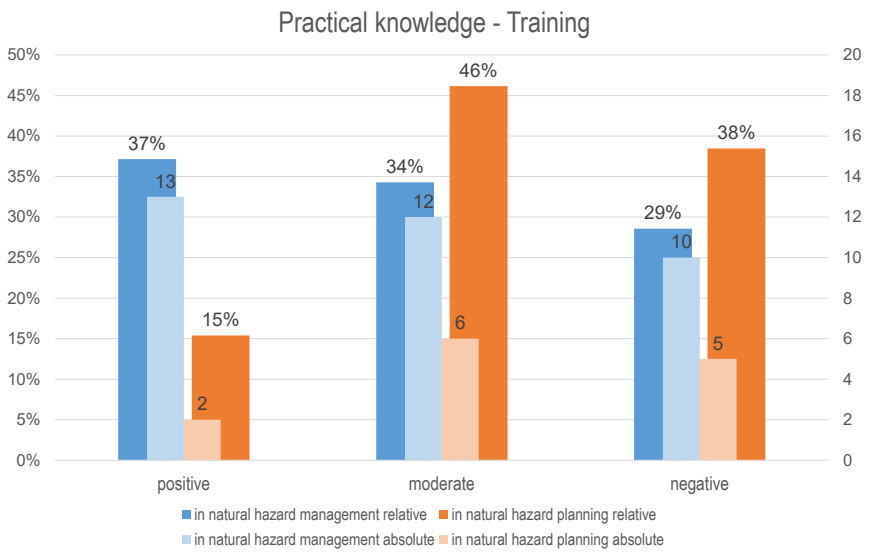

Figure 126: Practical knowledge due to training within the natural hazard soil slope failures.

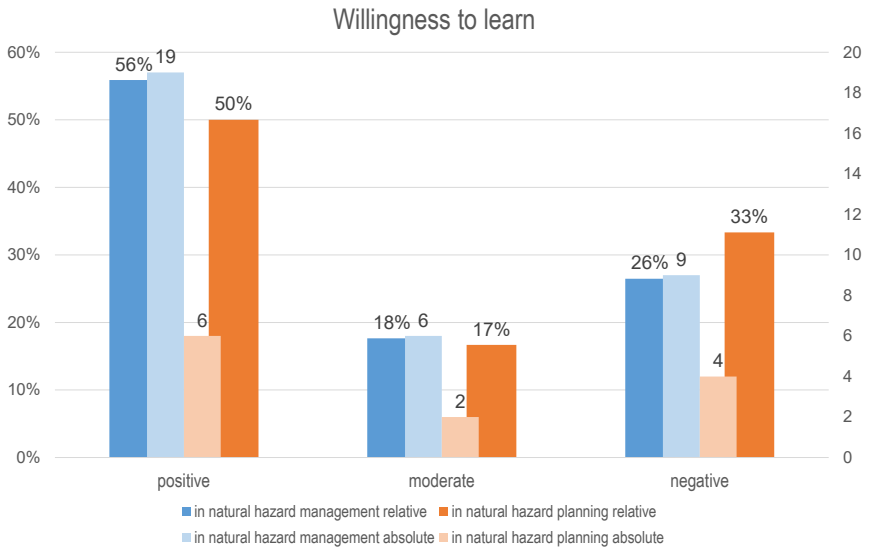

Figure 127: Evaluation of the willingness to learn of the soil slope failure experts.

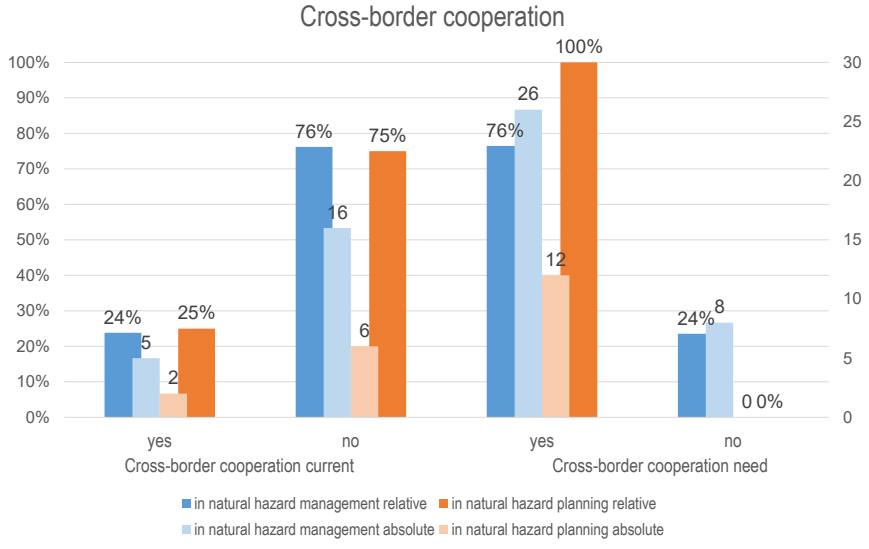

Figure 128: Availability of cross-border cooperation current and needed for soil slope failure experts.

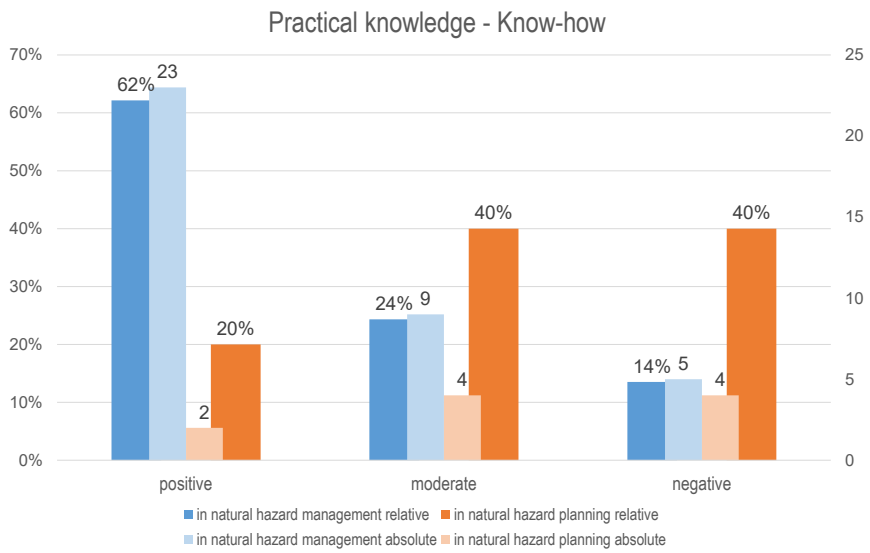

Figure 129: Practical knowledge due to know-how within the natural hazard forest fires.

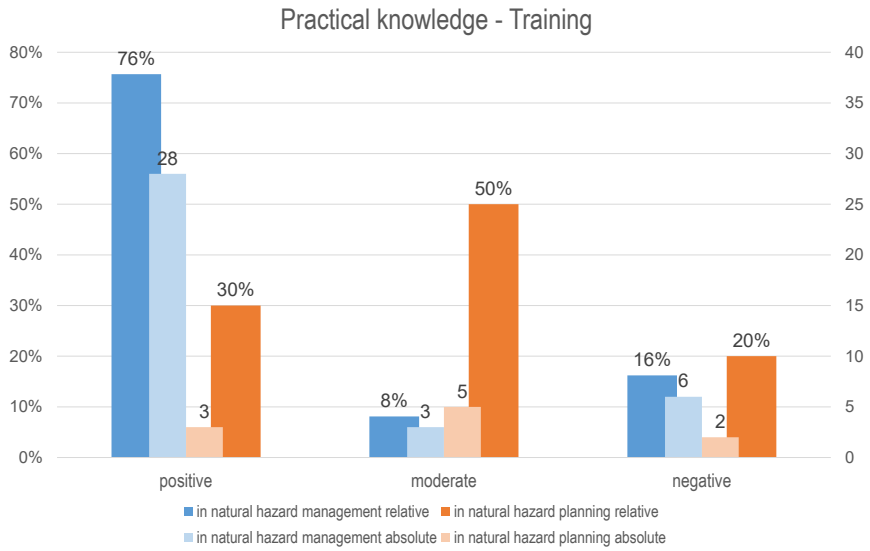

Figure 130: Practical knowledge due to training within the natural hazard forest fires.

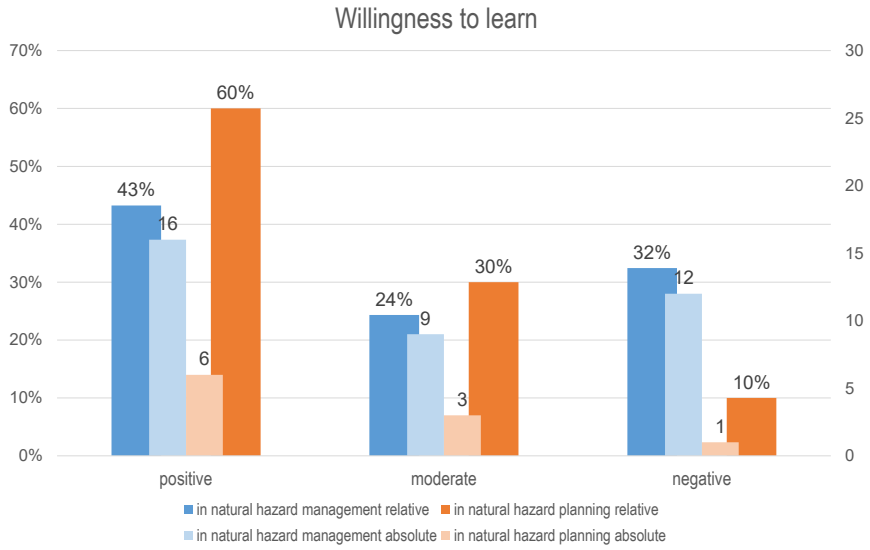

Figure 131: Evaluation of the willingness to learn of the forest fire experts.

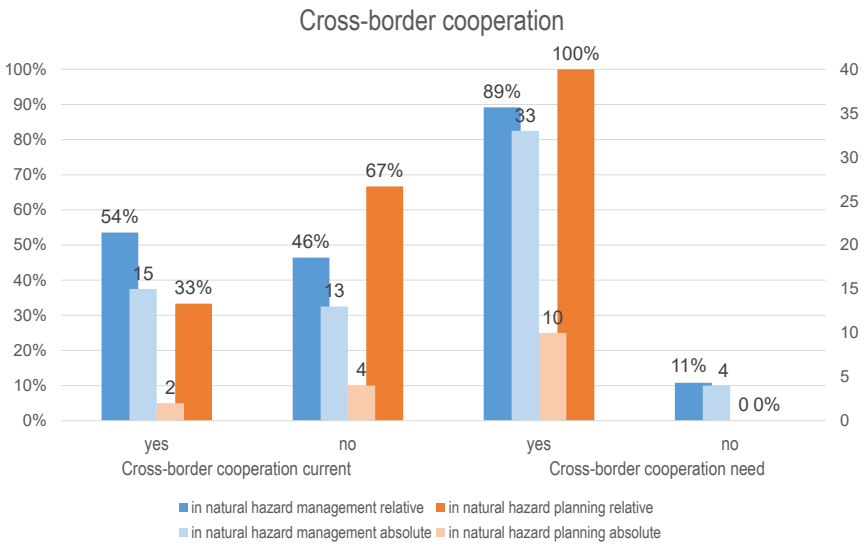

Figure 132: Availability of cross-border cooperation current and needed for forest fire experts.