

Local Conditions and the Quality of Expert Networks: A Case Study of Avalanche Risk Prevention Practices

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ABSTRACT

As natural hazards and risk always represent an interaction of natural and social systems, avalanche risk prevention is especially important in heavily-touristed alpine regions. This research compares the local risk prevention practices of Nordkette, Tirol and Planneralm, Styria by considering the influence of local conditions and the quality of expert networks. This in-depth analysis demonstrates that local conditions influence the intensity and frequency of necessary prevention measurements and the level of pressure on the decision makers. Local conditions influence the level of professionalization, the incorporation of systematic data analysis and personnel competence. This study aligns with general findings about the role of social capital, emphasizing that trust within the avalanche commission team and between the avalanche commission and external experts increases the quality of local risk prevention. Although the study provides important insight into the scope of risk prevention practices, further research is necessary to understand how coping capacity could be improved through optimizing the use of social networks.

KEYWORDS

Local conditions; quality of networks; avalanche risk prevention; risk communication

INTRODUCTION

It is commonly assumed that due to climate change, the number of extreme weather events resulting in gravitational processes is increasing (e.g. IPCC, 2014), although some critics emphasise the missing observational records for that assumption (Stoffel and Huggel, 2012). What is certain, however, is that the Austrian economy relies heavily on tourism and is vulnerable to climate change, especially in alpine regions (e.g. OECD, 2007). Nowadays winter sport regions are facing the challenge of ensuring the safety of local and visiting populations, safeguarding infrastructure, and at the same time, gaining economic profit. Therefore, efficient and professional avalanche risk prevention in Austria is a topic of great importance and leads us to focus on internal risk communication (Renn, 2008) and risk prevention practices in this paper. Höppner et al. (2012) assume that through risk communication, the social capacity –competence to cope with hazard events - can be increased at individual, communal and organisational (the risk managing) level. Social networks are considered to be a key social capacity because of their role in transmitting other capacity types like motivation, knowledge or financial resources (Kuhlicke and Steinführer, 2010).

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Based on Höppner's insights into social capacity, we first seek to shed light on the local expert network in order to consider its role on the network's quality. This is important because permanent protection measures cannot replace human services and temporary protection measures. Therefore, local avalanche risk prevention significantly depends on the engagement and know-how of local avalanche commissions. Second, we assume an interaction between local conditions and the way risk prevention is practiced.

In brief summary, the case study aims to deepen the limited understanding of the nature of local avalanche risk prevention practices. Through explorative case studies in Tirol and Styria, we consider local and network internal conditions and aim to address a set of interrelated questions: 1.) How do communication and decision processes between the study sites differ? 2.) How are the practices of avalanche risk prevention influenced by local conditions? 3.) How do local conditions and the quality of networks support or hinder local risk prevention?

RESEARCH DESIGN

The theory of structuration (Giddens, 1995) serves as a meta-theory to consider the context dependence of social action, as local risk prevention can never be understood isolated from where it takes place. Giddens explains the relation between "action" and "structure" as interdependent. "Structure" includes rules and resources and is a spatiotemporal phenomenon. While in our research "action" is represented by communication and decision processes within the experts network, "structure" includes local conditions. The latter refers to, for instance, legal requirements for avalanche commissions, personnel and financial resources and the economic relevance of risk management in the respective areas.

In order to consider the interaction between local conditions and the way risk prevention is practiced, we applied maximum variation sampling (Quinn Patton, 2002). The two selected study sites in Austria differ in terms of geographical characteristics (see Table 1) such as snow climate, population and economic activity and therefore offer different local conditions for avalanche risk prevention.

Study sites

The case of the Nordkette in Tirol represents a densely populated central region that is threatened by avalanches. The mountain range in question is the main ski-area for the approximately 120,000 inhabitants of the city of Innsbruck, located at the foot of the Nordkette. Economically, the region is strongly diversified and characterised by agriculture and moderate tourism. In contrast, the second study site, Planneralm, is a sparsely populated peripheral area; permanent settlements are not at risk of avalanches. Nevertheless, the only access road to the Planneralm is jeopardised by 12 avalanche paths, which significantly influences the competitiveness of the Planneralm as a tourist destination. The mountain pasture forms part of the municipality of Irdning Donnersbachtal with a population of about 4000.

Table 1: Comparison of selected geographical characteristics of our study sites.

Characteristic	Nordkette (Tirol)	Planneralm (Styria)
Landscape category	Northern-Limestone Alps	Central Alps (Niedere Tauern)
Morphological characteristic	Accentuated high mountains, avalanche corridor dominated by rock and debris, avalanche paths up to 1500 m vertical distance	Moderate high mountains, avalanche corridors dominated by steep partly rocky slopes covered by alpine meadows, avalanche paths up to 1000 m vertical distance
Snow-climate	Rich in snow on the lee side of the Northern congestion area, lee side of the main zone of orographic precipitation in the Northern Alps	Rich in snow in the secondary Northern congestion area, windward side of the secondary zone of precipitation in the Central Alps, broad exposure variety
Population	Densely populated central region, permanent settlement endangered by avalanches	Sparsely populated peripheral region, permanent settlement not endangered by avalanches
Economic activity	Strong diversification, declining agriculture, moderate tourism	Mountain farming structures, relatively high relevance of tourism
Relevance of avalanche risk-management	Protection of area of permanent settlement and of infrastructure	Protection of the access road of a regional important skiing area

Data material

In accordance with the interpretative paradigm (Wilson, 1973) we developed problem-centered interviews (Witzel, 1982) to identify the core communication and decision-making process, and to better understand supporting and hindering factors of risk prevention.

As a conceptual framework we applied the qualitative social network approach that allows understanding both who is connected to whom, and what quality of the relation exists (Hollstein, 2006). We focus on the intensity of risk communication (Renn, 2006), also asking interviewees from whom they use documents, whose information is of importance and who is involved in the discussion and decision-making process.

As we are considering the local level, our analysis is derived from the viewpoint of local avalanche commissions. Besides considering their reflections on their own work we also use those sequences from interviews with other avalanche experts that consider their quality of relations to the local avalanche service. We interviewed members of the avalanche warning service, the avalanche commission, external consultants and members of the Wildbach- und Lawinenverbauung (WLV) which is the service for torrent and avalanche control in Austria. All together, 12 face-to-face interviews ranging from 50 to 90 minutes were conducted and analysed applying Mayrings (2010) content analysis. We inductively analysed indications of local conditions that influence avalanche risk prevention practice. In addition, the data are analysed deductively with the above mentioned focus on networks.

RESULTS

While in Tirol, rights and obligations of local avalanche commissions are regulated by law (LGBl. Nr. 104/1991), there are only official recommendations in Styria. Despite a different regulatory intensity, the composition and appointment of the members, the areas of responsibility and the avalanche commissions' duties are to a great extent identical in content. The mayor of a region exposed to avalanches is primarily responsible for founding an avalanche commission in his/her municipality. Commission members need to have professional experience and must be available on-site during the winter season. The area of responsibility is the organized ski area (cross country skiing trails, ski slopes), traffic routes and the settlement area of the respective municipality. Local avalanche commissions exercise an advisory role; hence they are responsible for continuous evaluation of avalanche risk.

Communication and decision processes of local avalanche commissions in the two study sites

The assessment process at Nordkette in Tirol takes place daily in the winter season in the form of a meeting between at least 3 commission members. On ordinary days, this team is composed of 3 rotating employees from the lift operating company of the Nordkette.

In dangerous situations, more members of the avalanche commission are involved, primarily forestry employees and members of the city government. Members of the avalanche commission exchange their private phone number so that everyone is reachable day and night, even on days off. Every commission member (altogether about 9) has e-mail access and receives the avalanche report daily. Those who are at work are in radio contact for a rapid assessment: "within minutes, we review the situation" (avalanche commission member). Through a logging software (LWD-KIP), not only the sequence of data research is documented, but also assessments, decisions and recommended measurements are documented digitally. Through LWD-KIP, avalanche commissions have access to all relevant snow and weather data of the respective region. Decision-making is based on a variety of different data (see figure 1). The data sources include: a meteorological station located at the summit lift station of the Nordkette, the analysis of snow and weather conditions through LWD-KIP, personal observations made by on-site assessment, and snow-profiles in early winter before many sections receive human traffic. Existing data is analysed daily, based on both practical knowledge and a discursive process of avalanche danger.

In general, an unanimous decision is preferred regarding how to act in response to avalanche risk. The dominant attitude favors closing the skiing area as opposed to disagreement within the commission and an awkward feeling between commission members: "we think if one of us names a good argument to not open the ski-slope than it makes sense to keep it closed" (avalanche commission member). Numerous statements of the commission members refer to professional competence and a huge pool of experience (e.g. the ability to assess similar slope exposures and to transfer this knowledge to the area of responsibility, or to know where snow transporting can be expected if south or north wind picks up). The know-how of other informants (avalanche warning service etc.) is considered even though the commissions own

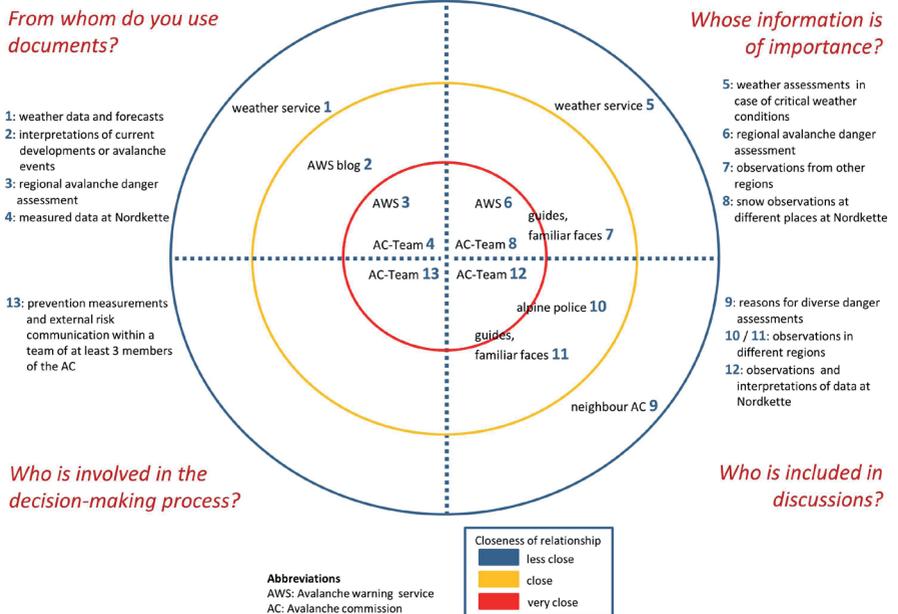


Figure 1: Communication and decision-making process of the local avalanche commission Nordkette, Tirol. Networks used and content of relation from the avalanche commissions' perspective.

daily and seasonal observations receive the greatest attention. Despite levels of professionalism and objective data, the commission members emphasise that the final decision remains a question of “gut feeling.” Members of WLV and the avalanche warning service in Tirol perceive the avalanche commission of the Nordkette to be very professional and independently working. The commission itself explains their relationship to the avalanche warning service to be good. They meet regularly and their relationship is open to constructive criticism. Once a year, all members of the commission and the local authority meet and discuss optimisation possibilities.

At the Planneralm in Styria, the assessment process takes place on demand: “if it becomes dangerous, we meet each other” (chairman and his deputy). Consultations are rare and happen only between the chairman and his deputy, though occasionally third person is involved in the discussion. “We have a small frame that allows us to work effectively. It is never good if there are too many” (chairman). Primarily the avalanche danger is assessed by the chairman: “I say that’s how it looks like. Or my deputy informs me about his observations and asks me how I assess the situation and I say how it is.” (chairman) The decision is made through one authoritative voice, and often without a discussion process between members. The fundamental attitude prioritizes rapid decision-making, whereas reflection and critical discussion are subordinated. Different statements from the chairman and his deputy

refer to their professional experience and local knowledge (long term observations over many seasons, responsible for ski slopes preparation in the past, etc.). However, subjective perceptions are rarely verified or supplemented by standardized weather and snow data analysis. The latter are partly considered, but not systematically. Since the sports hostel of the University of Graz has been closed at the Planneralm, the avalanche commission has to proceed without observations and snow profiles from mountain guides who visited the alpine terrain daily. Currently, the chairman works instead with imagined snow profiles (“and I make a picture in my head about the existing snow profile, I am able to do that, I feel that”) and observes mountain slopes with field glasses only. Above all, subjective perception, personal experience and instinct determine risk assessment at the Planneralm.

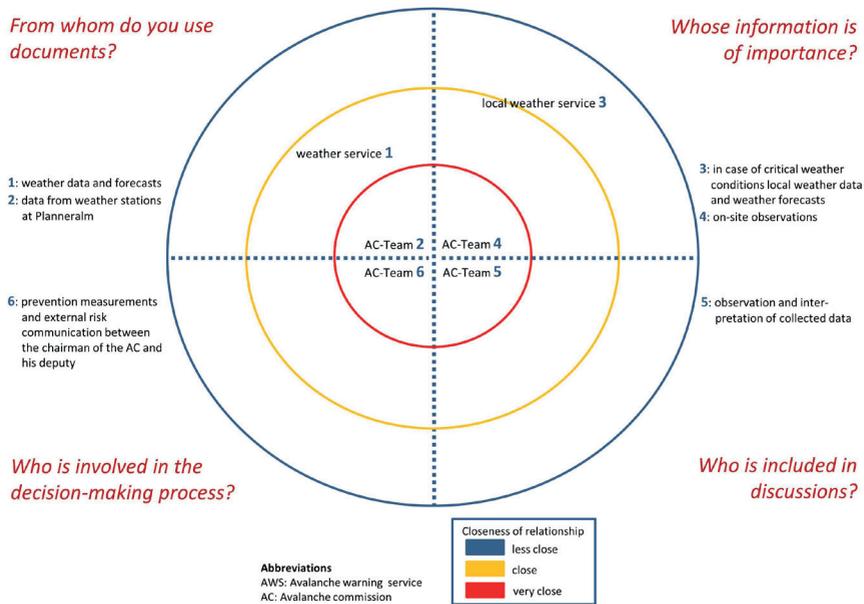


Figure 2: Communication and decision-making process of the local avalanche commission Planneralm, Styria. Networks used and content of relation from the avalanche commissions' perspective.

A closer look at the quality of relations within the avalanche commission shows a variety of contradictory statements and disputes between the chairman and other official members of the commission. On the one hand, the chairman and his deputy emphasise having a good working relationship within the avalanche commission; on the other hand, conflicts within the team are mentioned in interviews from different sites. As a consequence, the organized ski area at the Planneralm is more or less excluded from the evaluation of the avalanche commissions chairman and his deputy. They see the manager of the cable cars as solely responsible for evaluating avalanche danger. Although the manager is an official member of the

avalanche commission, he is not involved in regularly consultations between the chairman and his deputy. Statements from the chairman as well as from externals refer to the strained relationship between the chairman and the manager of the cable cars. Besides, the official recording clerk of the commission even refused the interview and mentioned that he was not actively involved in the avalanche commissions' work. All together, of the 8 official avalanche commission members, only two regularly meet each other and represent the active avalanche commission of the Planneralm. Occasionally, one additional person is asked to assist in the case of avalanche dispersion. The others are not actively involved, except through their participation in a general meeting with the mayor once a year. External people critically stress that trust is lacking between the chairman and nearly all entrepreneurs at the Planneralm. While the chairman sees his relationship to the avalanche warning service as quite good, the contrary is true if considering the statements of the experts concerned.

Influence of local conditions on avalanche risk prevention practices

Table 2: Summary of inductively analysed indications of local conditions that influence risk prevention practice.

Local conditions	Nordkette (Tirol)	Planneralm (Styria)	Prevention practice: consequence on
Danger zone	Avalanche danger often affects the upper third of the Nordkette. The commission easily regulates stream of visitors by closing the upper lift station, while visitors can still ski until the mid-station of the mountain lift	Avalanche danger predominantly affects the access road of the Planneralm. Road closure means that neither tourists nor logistic services are able to leave or reach the Planneralm	Intensity of necessary prevention measurements
Economic dependence	Complete economic independence because rather inhabitants of Innsbruck than tourists are skiing at Nordkette	Road closure endangers the economic profit of all tourism enterprises at the Planneralm. Target group: tourists, especially families	Decision-making pressure
Surrounding	The Nordkette is out of competition, it is the local mountain for inhabitants of Innsbruck	Surrounding ski areas are easier to reach and more modernised (e.g. Riesneralm)	Decision-making pressure
Financial resources	High financial resources because avalanche protection is in the interests of the city of Innsbruck. Maximum permanent protection (technical measurements etc.) was realised in the past	Low financial resources with the consequence of only a small number of permanent protection measurements. The threatened road is a communal road	Frequency of necessary decisions

Local conditions	Nordkette (Tirol)	Planneralm (Styria)	Prevention practice: consequence on
Innovation culture	Development of LWD-KIP (professional logging software) and implementation of this tool in their daily work	Rejection of technological innovation and preference for conventional ways	The degree of professionalization: including systematic of data-analysis and logging and speed of data distribution between experts
Personnel resources	Key players of the avalanche commission are employees of the mountain lift company Nordkette. Evaluating avalanche danger is part of their job. Training of new staff lasts one year before participating in decision making is allowed. There are plenty of candidates	During wintertime only twenty people tend to live at the Planneralm, hence there are difficulties in finding qualified stuff. Avalanche commission members work voluntary	The degree of professionalization: including level of professional know-how, social competence and capacity for teamwork; maintenance of high competence in the long term

Supporting and hindering local risk prevention

The comparison of the study sites in this research has shown that well-functioning and trusting internal and external relationships improve both data quality and quantity of data (see figure 1 and 2) used for decision-making. Constructive team work allows critical reflection of personal opinions and perceptions, thus improving both final decisions and the quality of risk prevention. This aspect aligns with previous work on social capital in which it is understood to be embedded in social networks (Lin, 2001) and increases access to social support and information (Buckland and Rahman, 1999). It also corresponds to the so called “social and organisational capacities” (Höppner et al. 2012: 1757) or “network capacities” (Kuhlicke et al. 2011: 806) which emphasizes the importance of skills for communication, cooperation and building up trustful relationships. A transparent decision-making process can protect the commission in the case of misjudging avalanche risk, which in the past, has led to impeachment charges against members. Furthermore, exogenous factors such as a lack of financial resources and competitive neighboring regions, can significantly increase pressure on the decision-makers who often have a dual role as risk manager and owner of a tourist enterprise in the respective area. In avalanche commissions with full-time employees, personnel recruitment can be selective and attention can be given to professional knowledge and social competence. To the contrary, however, volunteer associations often have general difficulties in finding members. The case of the Planneralm has shown that this could exacerbate risk assessment measures in a context where distrust and conflicting interests among the avalanche commission team are already present. As a consequence, existing talents within team members are not tapped as resources, succession planning goes unnoticed, and risk prevention proceeds in far from optimal conditions. The results of this study

bring us back to the coping capacity discussion (Kuhlicke et al., 2012) and other research in the context of climate change in which it was shown that local resilience can be fostered by strong social networks (Ford et al. 2006).

This finding proves even more interesting when we discovered that social competence and the role of risk communication is neither part of the desired profile of commission members, nor it is considered in any of the training courses. Furthermore, this research has shown that professional working practices are not only a question of personnel resources but also of the culture of innovation. The existence and implementation of LWD-KIP allows systematic data analysis, logging and rapid risk communication. While at Planneralm not even information transfer between commission members is guaranteed, the digital logging software automatically informs all relevant persons, thus reducing human errors.

CONCLUSION

The importance of professional risk prevention in alpine regions highlights the need for more qualitative research assessing different practices and their influence factors. The main finding of the case studies in Tirol and Styria is that both local conditions and the quality of social relations within the expert team influence risk prevention. Although tasks and regulations of the commission teams are similar, the case studies show a considerable range of local risk prevention practices and the gap between an officially-presented picture and its practical reality. This finding points out the need to consider how to assure quality in the future. Closely linked with the quality assurance is the importance of communication skills and trusting relationships, which have been proven to be significant but understudied components in risk assessment. As this study presented only two contrasting examples, a larger study could provide evidence as to the type and quality of social networks through which reliable and optimized risk assessment decision-making occurs.

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