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Summer mountain tourism in climate change: Scenarios and need for action using the example of the high Alpine trail network

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Abstract

This contribution summarizes the findings of a doctoral thesis that dealt with the need for action to adapt the high Alpine trail network to consequences of climate change. In three pilot studies different aspects of former and current changes of the trail network were analyzed. To investigate possible future effects of climate change on the high Alpine trail network, landscape and tourism scenarios were developed for three sections of the Austrian Alps (Glocknergruppe, Venedigergruppe, ÖtztalerAlpen). In five workshops these scenarios were discussed with regional stakeholders, who are concerned with summer mountain tourism in the study areas. The need for action differs a lot in the particular mountain ranges and main problems cannot be solved just by local measures. Facing the ongoing glacier retreat and permafrost degradation, a change of the trail concepts as a whole might be necessary in some high Alpine regions.

Keywords

mountain tourism, mountaineering, climate change, glacier retreat, mountain hazards, trail network

Figure 1: Examples of changes along trails in already ice free areas: Extreme runoff peak of a glacial stream flooding a bridge in ÖtztalerAlpen (left). Partial destruction of a trail along the ridge of the 1850-moraine along a glacier in Venedigergruppe (right). © Erich Heuke

Introduction

The Alpine trail network and the Alpine huts are the infrastructural basis for summer mountain tourism (hiking, mountaineering) in a mountainous country such as Austria. Due to landscape modifications resulting from climate change (e.g. glacier retreat, permafrost degradation and associated processes) risk potentials for mountaineers are changing in high mountain areas, as well as the accessibility of the terrain and the maintenance of the trails (for examples see Fig. 1, 2, 3).

Figure 2: Examples of changes due to terrain becoming ice free in glacier forefields: Unconsolidated debris slope along a route in a glacier forefield in Silvretta (left). Glacio-fluvial outwash fan developing in front of a glacier in ÖtztalerAlpen (middle).Melted hollow in an intensely debris-coverd dead-ice-body in ÖtztalerAlpen (right). © Florian Ritter

Figure 3: Examples of changes due to terrain becoming ice free in summit areas: A former easily accessible firn ridge in ÖtztalerAlpen has turned into an unstable, hazardous rock ridge as a consequence of becoming ice free (left). Old ascent to a mountain pass across a former firn couloir that has become ice free (orange), and new ascent equipped with fixed ropes leading across compact rock (red) in StubaierAlpen (right). © Florian Ritter

The first objective of the thesis was to identify the problems in the field summer mountain tourism and climate change. The second one was to develop ideas how to deal with these phenomena in future, i.e. how to adapt the high Alpine trail network or its organization. The practical implementation was conducted in three sections of the Austrian Alps: Glocknergruppe and Venedigergruppe in the National Park Hohe Tauern and a part of Ötztaler Alpen.

Methods

The project followed the principles of transdisciplinary research with the goal of integrating different scientific disciplines and the experiential knowledge of the case actors. Several groups of scientists and stakeholders could be integrated in different stages of the project (Fig. 4).

In three pilot studies different aspects of former and current changes of the trail network were analyzed: A collection of examples of current changes in the trail network related to climate change, an investigation of glacier changes at steep mountain passes using maps and measurements of the ice thickness and an analysis of the development of the high Alpine trail network in the study areas using historical maps.

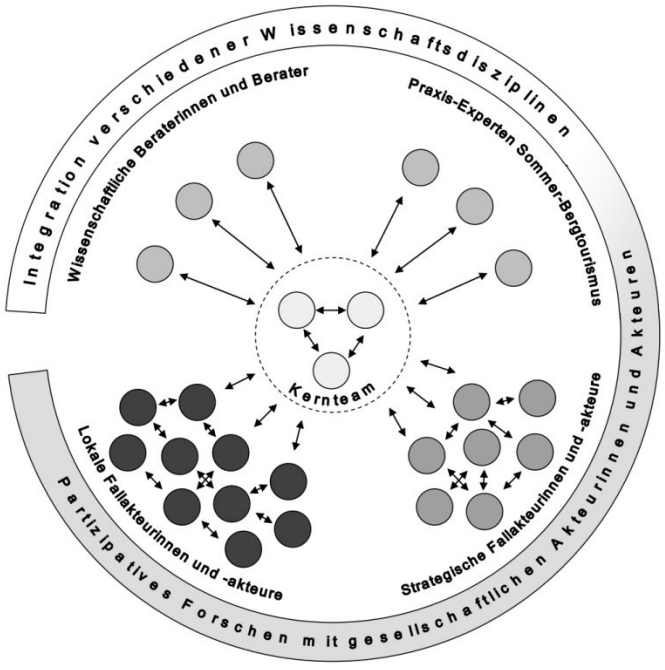

Figure 4: Integration of several groups of scientists and stakeholders in different stages of the project (in German). © Florian Ritter

To investigate possible future effects of climate change on the high Alpine trail network, two different kinds of scenarios were developed (landscape scenarios, tourism scenarios). The landscape scenarios show the dimension of possible impacts of climate change on the trail network in the study areas. Based on hiking maps (1 : 25 000) three scenario maps were developed for each study area, which described the state of the trail network in 2008, as well as a moderate and an extreme scenario for 2040 (Fig. 5). Complementary the tourism scenarios were three short narratives about the situation of summer mountain tourism in 2040: 'Classical Mountaineering', 'Wellness-Hiking' and 'High Alpine Adventure'.

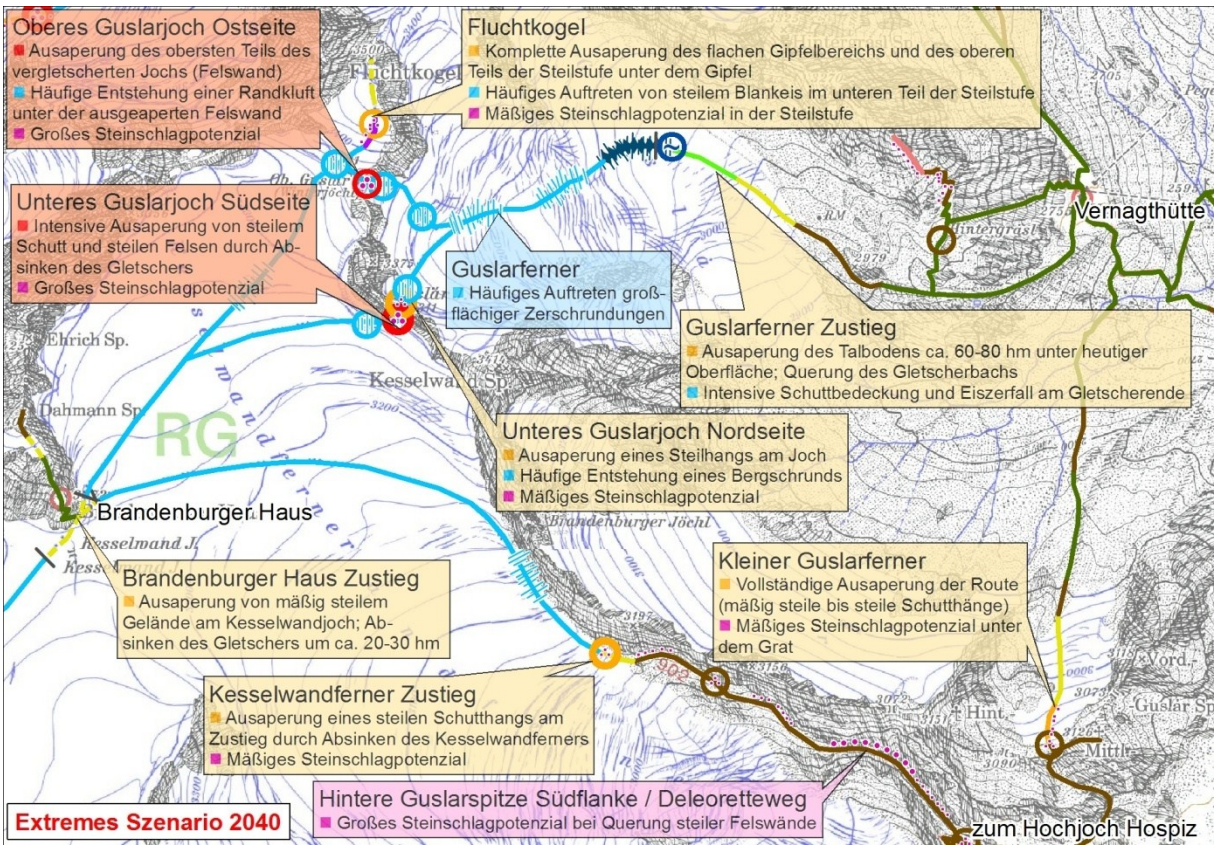

Figure 5: Detail of the scenario map in the surrounding of Brandenburger Haus (in German; Background: Alpine Club Hiking Map Ötztaler Alpen - Weißkugel) © Florian Ritter

In five workshops the scenarios were presented to regional stakeholders (e.g. Alpine Clubs, mountain guides, national park management, local tourist boards) and were further developed and evaluated. Afterwards the stakeholders discussed the need for action and their ideas to adapt the high Alpine trail network.

Results

The results of the scenario workshops show that the need for action is mainly related to organizational and tourism strategic questions. The suggestions of the participants were grouped as follows: The field 'Concentration and Reduction' describes ideas for prioritizations concerning the maintenance of trail infrastructure. 'Integration and Cooperation' deals with the involvement of all relevant stakeholders. 'Coordination and Professionalization' concerns the adaptation of maintenance activities and quality standards. The field 'Proactive behaviour and Positivity' includes suggestions regarding the motivation and the commitment of the stakeholders.

Furthermore two different operating scales could be identified: The regional scale, dealing with problems in a particular mountain range, and the scale of the total system, concerning the general surrounding conditions as well as the organization of the trail network maintenance in the national context. Both scales are important since the need for action differs a lot in the particular mountain ranges and main problems cannot be solved just by local measures. Main recommendations were the implementation of new organizational forms concerning the maintenance of the trail network and the installation of a computerized trail-information system.

Discussion

In Fig. 6 we present a possible framework for investigation of effects and development of management measures at local level. This can only successfully be implemented by integration of a wide variety of stakeholders. Cumulative effects of numerous individual critical developments at the local level can also induce a need for strategic decisions at a different scale level, such as a complete redesign of the trail network or even the abandonment of trail maintenance in critical sections of a mountain range.

Planning and management of the trail network has to be adaptive and future-oriented. Trail holders have to look for alternatives in time. Our findings show that many problems are foreseeable. Actions should be taken before severe accidents happen or trails become completely impassable.

Concerning transdisciplinarity our work showed that scientists and stakeholders can play different parts in specific stages of projects like our case study. Mostly they have different objectives and hopes concerning the cooperation. Therefore a key skill is to manage and overcome the boundaries between the groups so that different perspectives of the research problem can meet each other. As a consequence a more comprehensive perception and a more holistic handling of real-world problems can emerge from transdisciplinary processes.

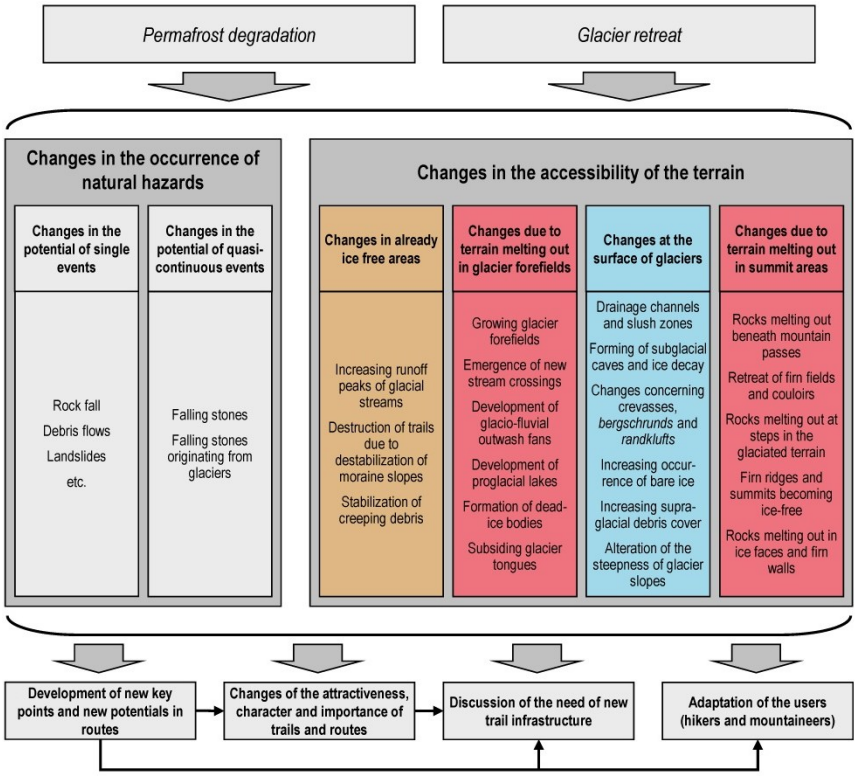

Figure 6: Overview of the phenomena and the resulting changes concerning the high Alpine route and trail network (brown = non-glaciated areas only; red = transition zone between rock and glacier and areas that are getting ice-free; blue = glaciated areas only; grey = all mentioned areas). © Florian Ritter

Conclusion

The high Alpine trail network is a dynamic system and has to be managed according to this. There is not only need for action to adapt the high Alpine trail network to certain changes. In fact the further development of the total system of summer mountain tourism is necessary against the background of a changing landscape as well as changing surrounding conditions in society.

Acknowledgments

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