and conducted by the Institute of Soil Bioengineering and Landscape Construction at the BOKU, Vienna in 2017. The institute and the State Government commit their long-time efforts to preserve the cultural heritage of natural stone walls and craftsmanship using the "Wall Inventory".

The aim of the project was to get knowledge regarding the building types present, their condition and interplay with the environment as well as an analysis of their constructional and sociocultural significance.The development of a new valuation method should also provide a basis on which well-founded and efficient rehabilitation measures can be derived in the future.

Methods of historical building research were used to attain the results. The basis was a stocktaking exercise of all buildings. Supplementary analyzes of historical maps, images and text documents as well as discussions with experts allowed assessments of age and significance of the buildings. Of interest was their regional context and the position of the structures within the development of avalanche protection systems.

In the project area eight building types can be distinguished according to their function, shape and construction. Of these "dry stone walls" and "earthworks" are the oldest forms (1907 to 1920) and despite their age and the challenging terrain, are in better condition compared to the younger structures. This indicates a long durability of professionally constructed dry stone walls.

The valuation of the buildings was carried out in terms of their value as cultural heritage but also their current condition and their effectiveness. Nine parameters formed the criteria of the process and build the basis of suggested measures.
This method allows decision-making despite the wide range of parameters. Their protective effects, conditions and necessary measures as well as the correlations with the environment are weighted with the constructional and sociocultural significance of the buildings. This holistic approach enables the WLVV to decide which of the buildings should be rehabilitated. In this way, the authority has an instrument for a sustainable and locally adapted further development of the historical stock.

The multifaceted significance of the buildings is still apparent today. They are witnesses to the pioneering work in avalanche protection and reflect their development. Despite their age, they still fulfil important functions, such as sliding snow protection, retention area for rocks, slope stabilization and support of forest rising. Currently, they are formative landscape elements, which keep the volatile avalanche history and the heavy losses of the valley in people's mind.

The results of the "Wall Inventory" thus form the basis for a sustainable, respectful, professional and proactive handling of the technical and cultural heritage of exceptional avalanche protection barriers.

O3.7

AVALANCHE RISK MANAGEMENT IN THE SKI RESORT OF THE SILVRETTASEILBAHN AG CORPORATION (ISCHGL)

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The Silvrettaseilbahn AG (Ischgl) ski resort was established in 1962. It is located in the Paznaun Valley in the Tyrolean Oberland. 238 km of ski runs and 45 cable cars & lifts make it one of the biggest ski resorts in the Alps - and even worldwide. Thorough ski resort management as well as far-reaching, avalanche-associated risk management is required to ensure that up to 17 million passengers (annually) will return safely to the valley.
This paper discusses the integral avalanche risk management of Silvrettaseilbahn AG. Modular elements are shown in detail.
Next to a comprehensive range of forecasting and analyses tools, Idalpe - the Avalanche Commission - also disposes over several advanced weather stations to determine current weather events in the wider assessment area. Issuing of well-founded statements on the current and future avalanche risk in the assessment area is enabled through regular and continuous observations of the snow cover and avalanche activities. Consequently, appropriate actions can be taken.
For securing areas with an increased avalanche risk, the avalanche commission operates 89 automated installations for artificially triggering avalanches as well as a helicopter deployed in the ski resort. Throughout the entire ski resort, preventive action encompasses artificial triggering of avalanches by means of 450 blast points. This approach includes blast points where avalanches are still released with manually charged blasts. These undertakings guarantee the safety of guests and staff. Nevertheless, despite these extensive tools and the measures taken, at times, classic actions must be initiated, like closing certain parts of the assessment area. In such cases, the avalanche commissions are faced with the special challenge to keep the duration of potential closures as short as possible while simultaneously trying to eliminate the risk of an avalanche hitting an open ski slope or cable car/lift.

O3.8

A NEW APPROACH TO AVALANCHE RISK ASSESSMENT IN RUSSIA

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Snow avalanches pose a significant problem in most mountain regions of Russia. The constant growth of economic activity and therefore the increased avalanche hazard demands risk assessment methods elaboration. Such methods are needed for the determination of appropriate avalanche protection measures as well as for economic assessments. The researchers from MSU Laboratory of snow avalanches and debris flows have been developing methods of natural hazard risk assessment in order to estimate the potential social and economic losses in different scales. More precise and accurate calculations are required for risk evaluation in rapidly developing mountain territories. Thus, we have developed a new method, that can be used to estimate snow avalanche risks in a large scale. It includes calculations of full social and individual risk values for ski resorts and other types of mountain infrastructure. It also can be used for risk estimations within separate ski pistes and their particular parts.
In this research, we present the results of potential avalanche risk assessment for avalanches with different return periods within Russian ski resorts Rosa Khutor (Caucasus) and Big Wood (Khibiny). We take into account such parameters as the area of avalanche-prone territory, the duration of resort functioning during the year and the day, the number and distribution of visitors within the study area, the configuration of trails etc. Zoning of the territory and allocation of areas with high risk values were performed using data obtained during two separate field observation campaigns in 2016-2017. The area of avalanche-prone territory was calculated using RAMMS model, which fits this task perfectly.
The total social and individual risk values were calculated for the 4 avalanche return period scenarios (1, 10, 30 and 100 year). It was established that the total values of the total social risk in the study territories are of the same order and amount to 7 and 4 persons per year, respectively. However, the most vulnerable areas of the Rosa Khutor resort are located on pistes overlapped by avalanches with 1 to 10 years return period (about 70% of the total risk values), while in the Big Wood resort, such areas are concentrated at the “rest zones”, exposed to avalanches with 30 to 100 years return period.
The results of risk analysis are shown in quantitative data that can be used to suggest methods to decrease social risk. It makes possible to compare risk values obtained from different regions, analyze it and estimate the economic feasibility of protection measures.

O3.9

HOW LITTLE COTTONWOOD CANYON GOT THIS WAY AND WHAT CAN BE DONE TO FIX IT

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To understand the distinct avalanche issues faced in Little Cottonwood Canyon today, it helps to look back at its history starting as a booming mining town. Beginning in the 1870s, the town of Alta was continually being destroyed by avalanches and rebuilt until the price of silver dropped in 1927 and the town was abandoned. The next era brought skiers and Monty Atwater, a 10th Mountain Division Veteran, Snow Ranger for the United States Forest Service, now considered the grandfather of the avalanche profession in North America. He was the first to use artillery to control avalanche danger. Fast-forward to now; much still is done the way that Monty did it in the 40s with artillery being the primary tool. What has changed is that Little Cottonwood is now home to Alta and Snowbird ski resorts and is situated next to over two million people along the Wasatch Front. On average over 1200 cm of annual snowfall mixes with nine hotels, 132 residential buildings, and a robust backcountry scene. This is all fed by a two lane 13 km long dead-end highway crossing 64 avalanche paths.
The Utah Department of Transportation (UDOT) is now tasked with managing the avalanche threat to the highway and by default, the Town of Alta and the Village of Snowbird. This case study examines UDOT’s efforts to keep Utah State Hwy 210 and the canyon structures safe with two WWII era Howitzers, 550 rounds of artillery flying over many inhabited buildings, 21 Gazex exploders, two O’Bellx Exploders, a DaisyBell, one Wyssen Tower, six forecasters and a dog. Further, it explores plans for the Highway Avalanche Safety Program to evolve and better manage the avalanche problem into the future balancing the needs of the municipalities, multiple agencies, businesses, recreationists and residences.

O3.10

THE AVALANCHE WARNING SERVICE OF AUSTRIAN RAILWAYS - DEVELOPMENT OF AN INNOVATIVE SAFETY CONCEPT

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Natural events such as avalanches, floods or rockfalls have an impact on the safety and the availability of railroad lines. ÖBB-Infrastruktur GmbH is responsible for protecting a rail network with more than 5,000 km in Austria against natural hazards. There are more than 1,000 avalanche paths which intersect with the railroad network. Here, avalanche safety is a particular challenge. Railroad infrastructure is primarily protected against avalanches by means of technical defense structures and by managing protection forests.

Where technical defense structures cannot be erected or where the intention is to increase the protection goal, organizational measures are taken, such as reduced line