

## **Abstract**

Rock slopes and associated talus covers are integral to any high-mountain denudation system. Present-day climate warming, the associated deglaciation and permafrost degradation in high mountain regions are increasing rockfall frequency. Rockfalls pose a severe hazard to people and infrastructure. However, they are difficult to predict. The dissertation's main objective was to comprehensively recognise the contemporary intensity of rock slope degradation in the Polish High Tatras by determining its triggers and the resulting hazards of rockfalls for touristic and climbing traffic and infrastructure. For its purposes, monitoring of large and steep rock surfaces using a terrestrial laser scanner was started in this region for the first time. It was also the first time that the course of one of the largest rockfalls in the Tatras in the last decade was quantitatively documented, together with its geological and hydrometeorological conditions. In addition, the first regional map of potential rockfalls was prepared, showing their extent and kinetic energy. The results show that the rate of changes of granitoid slopes under the influence of weathering and rockfall processes is highly variable both in time and space. During the period of the Mięguszowiecki Szczyt-Cubryna slopes monitoring, the retreat index ranged from  $0.00013 \text{ ma}^{-1}$  to  $0.004 \text{ ma}^{-1}$ . The spatial diversity of the number and size of rockfalls within the studied slopes was mainly related to the crack density. The greatest hazard is rock walls in fault/mylonite areas in the zone of potential sporadic permafrost. In the last decade, however, rockfalls have not been linked to permafrost degradation but to frost preceded by rainfall or snowmelt. The areas contemporarily hazarded by rockfalls, released in the periglacial zone of the Polish High Tatras, coincide with the extent of rock and talus slopes. The potential relief energy of the area and the initial size and shape of the released rock boulders have not fundamentally changed since the complete disappearance of the glaciers. At the same time, the degree of burial of glacial and periglacial landforms depends on their location, the degradation intensity, location, number and size of release areas, and the kinetic energy of the rockfalls. The most dangerous area is the region of the Morskie Oko and the Czarny Staw pod Rysami lakes, where the number of visitors sometimes exceeds the so-called tourism carrying capacity (TCC), and rockfalls, which can be released in exceptionally many places, are characterised by the highest kinetic energy.