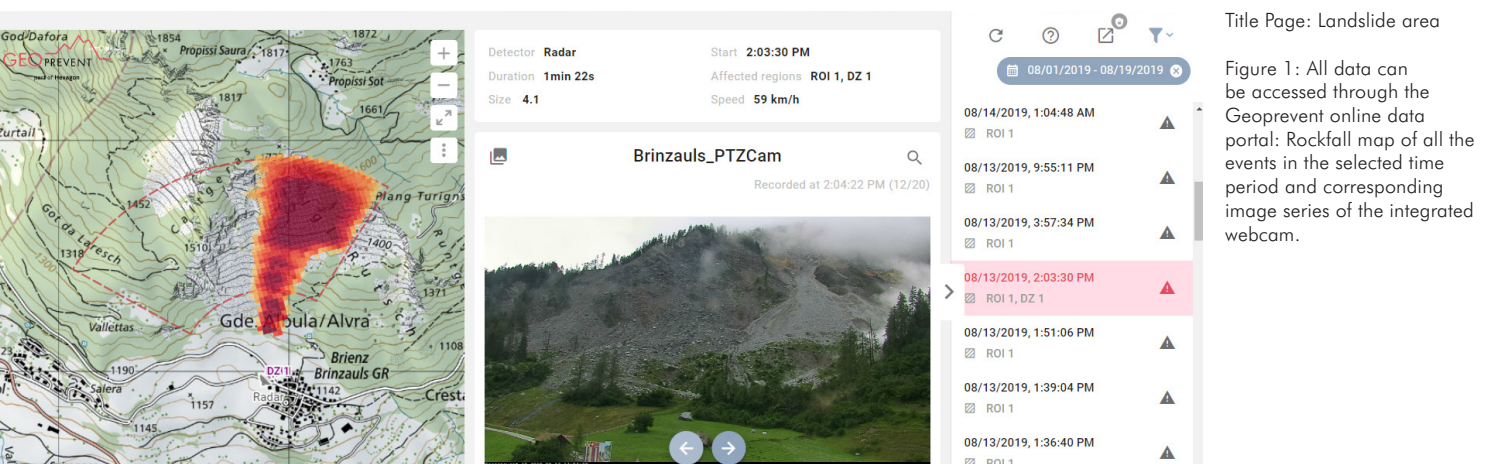


ROCKFALL RADAR BRIENZ/BRINZAULS



Rockfall radar alarm system with automatic road closure in the landslide area near the Swiss village of Brienz/Brinzauls.





CHALLENGE

The Swiss village of Brienz is located in the Albula valley amidst a large landslide area. The entire slope including the village has been sliding very slowly downhill for many years, but in recent years the slide velocity has increased significantly. Ground movements of up to 70 cm per year are currently observed in certain areas. As a result, some building walls show cracks and roads require frequent repair. On the north side of the village is a rockfall zone that is linked to the landslide. Rock boulders frequently detach there and occasionally reach the main road outside the village. Several rockfall protection dams have been built over the years. They are unable to provide complete protection though as some boulders still pass the dams and endanger the road. The village itself is not directly affected by these rockfall events.

SOLUTION

The rockfall radar detects falling boulders in real time and automatically closes transport routes at risk. At Brienz, the main road passes through the runout zone of the rockfall zone and it takes between 30 and 60 seconds for a boulder to reach the road depending. This warning time is sufficient to close the road in time. The rockfall radar functions

independently of prevailing visibility conditions, day/night as well as during fog or snowfall. The radar immediately triggers an alert upon rockfall detection and automatically switches the traffic lights to red and notifies the responsible safety managers. Once the radar detected rockfall, it tracks the course of the boulders until they stop or move out of the radar's field of view. In order to prevent long and unnecessary closures, the road automatically reopens after 2 min if the boulder does not reach the road area.

In addition, the rockfall radar activates the system-integrated webcam for automatic recording of the event. Authorized users can access all event data and images at any time using the online data portal via PC, tablet or smartphone. The rockfall event is displayed on a map including corresponding event images and key parameters (e.g. duration and speed). Following a test phase, automatic closure of the exposed road section went into operation in mid-December 2018. Since initial installation of the Rockfall Radar, more than 5000 events with boulders of various sizes have been detected. However, only a few of these boulders reached as far as the road or even crossed it and led to longer closures.



Figure 2: The rockfall radar detects falling rocks and automatically activates a webcam which takes pictures of the event.



Figure 3: Automatic closure of the road when a rockfall is detected increases safety on the road.