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Swiss Alps less than rock-solid

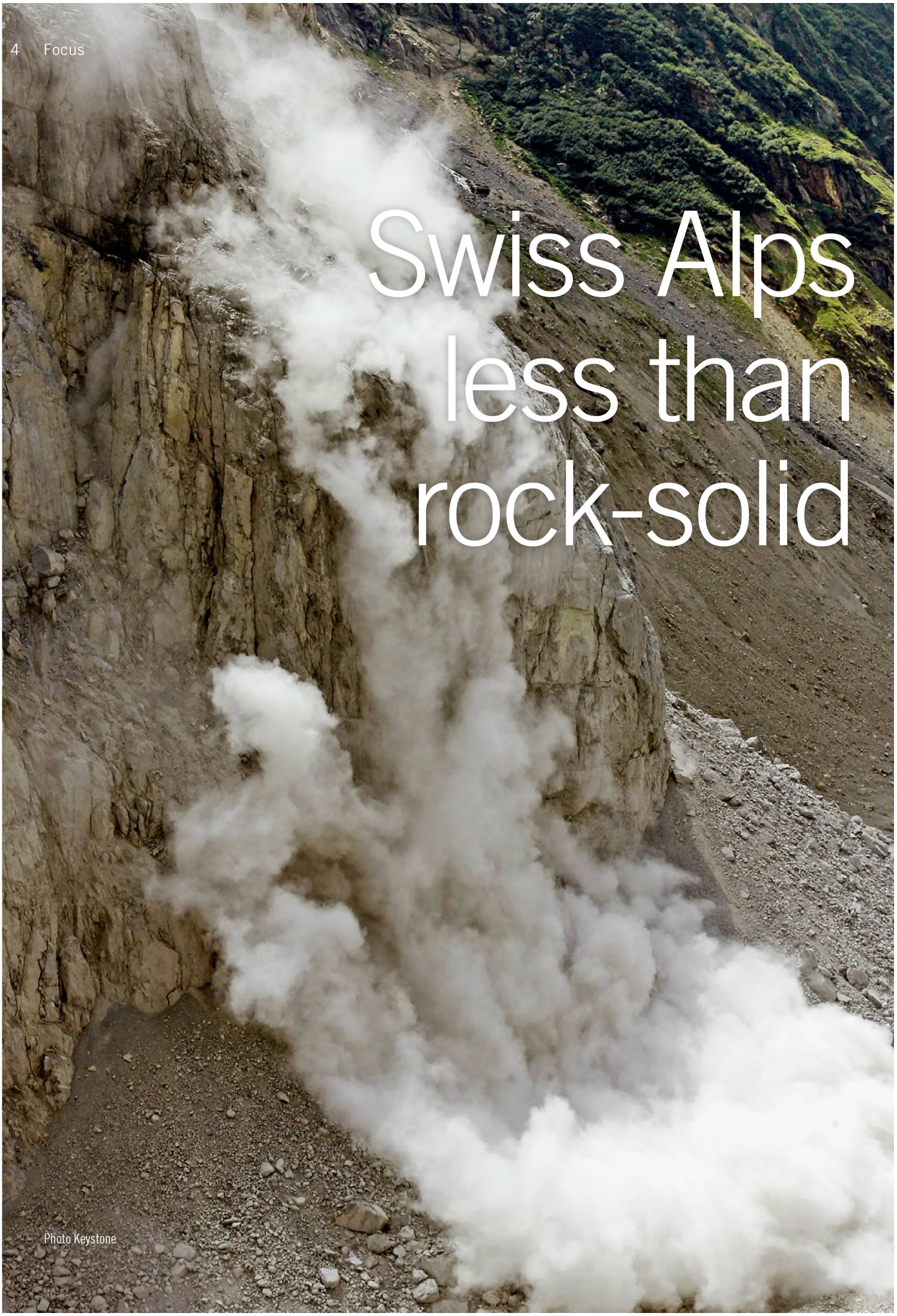

Photo Keystone

We like to view our beautiful Swiss Alps as an immovable, unyielding natural barrier, but they are less rock-solid than we thought. The earth seems to be crumbling – literally – under our feet. Our mountains are moving.

JÜRG STEINER

Brienz-Brinzauls, situated above the Albula Pass in the canton of Grisons, made headlines in early summer 2023 when its 80 or so inhabitants were ordered to evacuate over fears that a huge mass of rocks would tumble down the unstable slopes of Piz Linard and obliterate their small hamlet. Switzerland's media kept close tabs on the situation, with tabloid "Blick" even setting up a live webcam of the unstable mountain.

It made news across the pond. "A Swiss village is warned to flee its shifting mountainside" read a "New York Times" headline. The journalist quoted an inhabitant of Brienz who likened the impending rockfall to a tornado: the rocks would simply choose the path of least resistance, regardless of whether anyone or anything was in the way.

Switzerland's famous Alps were not so immovable after all.

Brienz-Brinzauls essentially had a very lucky, narrow escape on the night of 15/16 June 2023, when a massive landslide – enough rocks to fill around 300,000 lorries – stopped just short of the evacuated village. No one was injured. Residents were able to return to their homes a few weeks later.

The danger remains

But this is not the end of it. Future landslides cannot be ruled out. At the same time the ground underneath Brienz-Brinzauls is wobbly too. The plateau on which the village stands has been slipping away slowly but surely for decades – at a rate of around one metre a year. Buildings and roads are cracking. Underground pipes are snapping.

This makes it all the more surprising that the authorities in Grisons have no intention of giving up on Brienz-Brinzauls. They are doing everything they can to ensure that the hamlet remains habitable in the long term. Some 40 million Swiss francs worth of drainage tunnels and holes have been earmarked to improve stability underfoot. Both Grisons and the federal government are bankrolling the project, which might allow residents to stay put.

Landslides in Switzerland like the one in Brienz-Brinzauls almost always attract a lot of attention. They have become more frequent in recent years as global warming compromises the geological stability of our Alpine landscapes. Each new incidence is now a media event in itself.

The Alps as an indomitable fortress and a place of refuge

Coverage naturally focuses on the circumstances of each landslide. But the sight of a mountainside crumbling before our eyes also has an acute emotional impact. The reasons for this are historical. Switzerland's redoubt strategy during the Second World War cemented the legend of the Alps as an indomitable fortress and symbol of national resistance. If Hitler's troops had invaded, our government and military commanders would have withdrawn to a network of hidden bunkers in the mountains, from where they would have coordinated the country's defence. Since then, we have regarded the Alps as a place of refuge as well as natural beauty – provided we can live there and still protect ourselves, our homes and our transport infrastructure. Suddenly, the mountains are moving more than they used to. And not only in Brienz-Brinzauls. They have become less predictable. Must we reassess our relationship with them?

Geological processes "at a tipping point"

Flavio Anselmetti, professor of geology at the University of Bern, says two separate things are taking place here that are commonly intertwined. "Firstly, mountain ranges like the Alps are constantly being pulled, pushed and contorted. Landslides and rockslides are perfectly normal in view of these geological forces," he tells us.

Secondly, the parameters are now changing as a result of global warming. The Earth has a long history of alternating naturally between warmer and colder periods. However, the current era is unusual in terms of how quickly temperatures are rising this time.

And nature is trying to regain its balance amid the tumult, Anselmetti continues. Geological processes that would otherwise be considered normal in the Alps are, in his words, "at a tipping point" because of how quickly the Earth is heating up. Permafrost degradation represents the clearest example. Permafrost is soil and rocky material that stays frozen continuously. In the Alps, it tends to be found above 2,500 metres. Climate change is causing permafrost to thaw more often and for longer periods every summer. Permafrost is the "glue" that helps

Over one million cubic metres of rock thundered down Piz Linard towards Brienz-Brinzauls on the night of 15/16 June 2023. The Grisons hamlet had been evacuated beforehand.
Photo: Keystone

hold mountain faces together at high altitudes. When it melts, the risk of sudden rockfall increases.

Then again, we should try not to oversimplify matters and claim that every landslide or rockfall is a result of global warming, he adds. Or that climate change means the risks have automatically become greater.

For instance, scientists have known about and been keeping a close eye on the unstable slope above Brienz-Brinzauls for decades. The hamlet is situated at a relatively low altitude, and no direct link can be made to the rise in temperatures. Yet mountainside degradation in other circumstances could well accelerate if, say, climate change leads to an increase in heavy rainfall events. Or if protective forest is thinned out because certain tree species are unable to cope with a proliferation of droughts.

Millions of francs for monitoring and prevention

Geographer Käthi Liechti is a scientific staff member of the Mountain Hydrology and Mass Movements research unit at the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL). She is in charge of the Swiss flood and landslide damage database, which has been recording damage from debris flows, landslides and rockfalls in addition to naturally triggered floods for over 50 years.

However, Liechti says she cannot clearly state whether debris flows, landslides and rockfalls in the mountains have become more or less common, not least because you not only have to consider changes in the natural environment but also in how the authorities and the general public approach the new realities of life in the Alps.

> We regard the Alps as a place of refuge as well as natural beauty – **provided we can live there.**

Switzerland's populated areas are expanding, with infrastructure taking on greater importance. This increases the risk of events like landslides causing major damage. Regardless of whether or not such events are becoming more frequent due to global warming, Switzerland is, in other words, certainly more exposed than before. Having said this, Liechti believes that Switzerland's protection and monitoring capabilities have become more advanced from an organisational and technical perspective, incorporating forecasting and early warning systems as well as infrastructure like retention basins and protective walls. "The federal government and the cantons currently spend several million francs a year on mitigating natural risks," Liechti tells us. This has helped to minimise damage, she adds, with the costs incurred from natural disasters not having changed significantly in recent decades.

No longer at the mercy of fate

Put simply, the more the Alps crumble, the more work Switzerland puts in to manage the consequences. We are no longer at the mercy of fate. Whereas the famous landslides of the past often ended in tragedy, we are much more likely now to get a handle on events before they occur.

In 1806, the residents of Goldau (canton of Schwyz) would often hear the sound of tree roots snapping at night on the mountain above. They also began to notice fissures and cracks forming on the slopes. But they did nothing. No one even suggested evacuating. Following heavy rainfall at the beginning of September that year, a huge mass of rock and debris came sliding down the mountain, killing almost 500 people and destroying much of the village.

Some 75 years later, churchgoers attending their September morning Sunday service in the village of Elm heard the sound of rockfall from the nearby mountain, which was being quarried for slate at the time. Unperturbed, the congregation carried on as normal. In fact, some locals even ventured up the slope later to get a better view. An avalanche of rock slid into the valley that afternoon. Over 100 inhabitants perished.

A 40-million-cubic-metre avalanche of rock came hurtling down the mountain towards Goldau on 2 September 1806, killing almost 500 people and leaving a trail of devastation. Illustration: Franz Xaver Triner (1767–1824) and Gabriel Lory (1763–1840); Schwyz cantonal archives

Goldau and Elm were unavoidable disasters, people said at the time. A God-fearing public mistrusted the fact-based approach to preventing further tragedies.

Spirit of solidarity

But what the major landslides of the 19th century did bring about was a feeling of national solidarity. After the Goldau disaster, there was a countrywide fundraising push – the first of its kind – to help the village get back on its feet. This and other similar humanitarian campaigns uniting the different regions of the country were subsequently "touted as being very Swiss", according to Christian Pfister, professor emeritus in environmental history at the University of Bern. They helped Switzerland develop its own particular identity and point of difference from other nations, he writes. In neighbouring countries, the catalyst for uniting people was war.

This spirit of solidarity has persisted up to the present day. Following each of the three major Swiss landslides of the 20th and 21st centuries – Randa in 1991, Gondo in 2000, and Bondo (where residents were evacuated in time) in 2017 – the relevant member of the Federal Council visited the disaster area in person.

The message? That the entire country stood shoulder to shoulder with those affected. But there was also a subtext: we will do everything in our power to defy the mountains. When landslides occur or threaten to occur, Switzerland will not simply give up the fight – not even if global warming makes things more complicated.

Dodging the rockfalls

Since Goldau in 1806, giving up on landslide-endangered or landslide-affected settlements has never been an option. It has always been about protecting these hotspots more effectively. "Take Brienz-Brinzauls, where they pulled off a quite stunning feat," says Flavio Anselmetti. In a complex geological environment, they managed to predict the danger correctly and evacuate the village "at just the right time before the event actually occurred". You cannot really do a better job than that. But it is not always such plain sailing. Professional mountaineer Roger Schäli knows what it feels like to have rocks falling around him. He has scaled the north face of the Eiger well over 50 times, often via the original route that traverses the infamous "White Spider" – a snowfield that now melts completely in summer. "Rising temperatures have taken an unbelievable toll on the Eiger," he says. "A lot more melted ice runs down the north face. Rockfalls are more serious and more frequent. You are protected to a certain extent during the steepest parts of the ascent, because the rocks simply fly over your head." Nowadays, the classic route up the north face is only really possible in winter when the weather is freezing.

Goldau and Elm were unavoidable disasters, people said at the time. **A God-fearing public mistrusted the fact-based approach to preventing further tragedies.**

Residents of Bondo (canton of Grisons) watch as a mudslide rips through their village on 25 August 2017. The event was triggered by a massive rockfall that had taken place two days previously on Piz Cengalo. Photo: Keystone

The problems that a professional like Schäli has encountered can also be an issue for amateurs and tourists. The Swiss Alpine Club (SAC) manages 153 mountain huts in Switzerland, many of which are potentially at risk from global warming. In 2021, for the first time ever, the SAC closed a hut, the Mutthornhütte on the Kanderfirn glacier, due to an acute risk of rockfall. It intends to rebuild the hut in a safe location. The new structure will cost 3.5 million francs.

Defying the mountains can be a costly business.