



DISASTER RISK MANAGEMENT IN MOUNTAINS

Reducing risk saves lives

Mountains are hazardous places. Many mountain communities live under the threat of earthquakes and volcanic eruptions caused by shifting tectonic plates.

Gravity pushing down on sloping land compounds the destructive power of storms and heavy rains, producing avalanches, landslides and floods.

According to the Intergovernmental Panel on Climate Change scenarios, it is very likely that heavy precipitation will become more frequent and likely that future storms will become more intense. These outcomes will make mountain regions even more hazardous to live in.

In December 2009, high level policy-makers will gather in Copenhagen at the 15th Conference of the Parties of the United Nations Convention on Climate Change. As International Mountain Day falls in the middle of this important conference, the theme of disaster risk management in mountains was chosen to highlight the urgent need to adopt climate change adaptation strategies that reduce the risk of disasters in mountains.

Understanding vulnerability

There may be many natural hazards in mountains, but there are no 'natural' disasters. A disaster is a measure of a hazard's impact on society. This impact is determined by the extent to which a community is vulnerable to the hazard. Vulnerability is not natural; it is a combination of a variety of physical, social and economic factors.

An obvious step to reduce the vulnerability to disasters in mountains is to avoid building settlements in hazardous areas. But there are strong cultural forces that cause people to expose themselves to such threats. For example, individuals may choose to live in scenic mountain properties despite the risks of landslides or wildfires. Ties of kinship and community bind families to lands that are prone to hazards. A culturally different world view may well mean that some people perceive risk differently and are more fatalistic about the prospects of disaster.





However, the greatest factor that causes people to live in vulnerable situations is poverty. In many large mountain cities, slums climb the sides of the surrounding hillsides where the risk of floods and landslides is greatest. In rural areas, it is the poorest families who are forced to earn their livelihoods higher up, on steeply sloping and dangerous terrain.

Other factors make mountain communities particularly vulnerable to disasters. For example, in remote mountain areas, providing advanced warnings of possible threats and emergency relief can be extremely difficult.

In many countries, mountain areas are home to indigenous peoples and cultural minorities. Their marginalization, combined with language differences, often mean they do not participate in disaster risk reduction activities.

Women, children and the elderly are especially vulnerable to disasters. And in many mountain areas, it is these members of the community that are looking after mountain homesteads, as the men move to lowland cities or abroad to earn a better income and support their family through remittances.

Paying for protection

Mountain regions in wealthy industrialized countries are not immune to natural hazards and disasters. Switzerland has established a system of protective forests to shield cities, industrial zones and transportation routes against avalanches and landslides. These forest 'shields' also sustain biodiversity, preserve the beauty of the landscape and provide recreational areas for locals and tourists.

These forests benefit everyone, but maintaining them is not profitable for the forest owners. For this reason, federal and local governments provide financial compensation to the forest owners for their services. Although this involves a considerable outlay of public funds, this approach offers protection comparable to heavily engineered structural solutions at a lower cost.

Gender inequality in mountain areas compounds the impact of disasters on women. Even when they are heads of household, few women are given title to mountain farmland, which can often be a requirement for receiving emergency relief and rehabilitation assistance. Often women's movements and social interactions are restricted. This prevents them from learning about potential hazards, participating in disaster risk reduction initiatives and benefiting from emergency relief.

Considering the often extreme vulnerability of mountain people and the high number of natural hazards, it is not surprising that more than half of the deaths caused by natural disasters occur in mountains and adjoining lands.

Degraded mountain ecosystems spell disaster

For centuries, mountain agricultural systems produced a wide variety of nutritious foods in ways that protected the soil from erosion and conserved water resources. These systems were explicitly designed to reduce the risks of disasters triggered by natural hazards.



Many developing countries are not in a position to adopt this approach. However, considering the high cost of landslides and flooding, investing in protection forests may be a feasible and cost-effective solution to reducing mountain hazards in many areas.

Other types of payments for environmental or ecological services (PES) schemes could play an important role in disaster risk reduction in mountain areas. Currently, the four main markets for PES schemes are climate change mitigation, watershed management, biodiversity conservation and landscape aesthetics. All of these services directly contribute to disaster risk reduction. If this added value was well advertised, the market for these environmental services would expand.

Surviving Hurricane Mitch

In 1989, Central America experienced a severe drought. The Honduran government, with technical support from FAO and funding from the Netherlands, initiated a project in the hilly and impoverished Lempira Sur region to introduce new practices to better conserve water in the soil. The practices involved growing maize, sorghum and beans interspersed with trees and maintaining maximum soil cover at all times through mulching crop stubble.

In 1998, Hurricane Mitch damaged or completely destroyed over half of Honduras' agricultural infrastructure and production. Large-scale deforestation, the cultivation of marginal lands without soil conservation practices and a lack of adequate watershed management were blamed for severely compounding the effects of the hurricane.

However, the Lempira Sur region suffered less damage than the rest of Honduras. The reduced impact of the hurricane was due not only to the newly introduced agricultural practices.

However, as mountain populations have grown and the expansion of commercial agriculture has reduced the availability of arable land for small-scale farming by local communities, impoverished farmers have had to clear marginal lands on steep slopes unsuited to agriculture. More and more animals graze on mountain pastures and forested land. This overgrazing destroys ground cover and compacts the soil.

Traditional agricultural systems have been abandoned or become unsustainable. For example, small agricultural producers often clear land for agriculture by slashing and



PES schemes in mountain regions would reduce the risk of disaster in two ways. They would lead to healthier more resilient mountain ecosystems that are less prone to natural hazards and contribute to alleviating poverty, a driving force for environmental degradation, which in turn magnifies the severity of disasters.

The building of 'social capital' played perhaps a greater role in reducing the vulnerability of local communities during the emergency. The project fostered the creation of diverse interest groups, which later began working together through a community development committee. It was through such committees that the producers in Lempira Sur obtained crucial first-level warning and assistance during the emergency.



burning mountain forests. Although this can be a sustainable approach with a small, widely dispersed population, when communities grow and competition for land increases, the needed fallow period that allows soils and forests to regenerate is often reduced.

Forces from outside mountain communities, such as commercial logging interests and market-driven agricultural production also put dangerous pressure on mountain ecosystems. All of this can lead to permanent deforestation and irreversible environmental degradation. The loss of forest cover deprives mountain communities of a protective barrier against landslides and avalanches and further contributes to increased soil erosion and water run off.

The disastrous effects of the unsustainable management of natural resources were illustrated in the 2005 earthquake in Pakistan. More than half of the landslides were caused by human-induced factors, especially grazing and conversion of forest land, poor terracing, settlements located on exposed slopes and road construction.

Disasters in mountains and the forces that help trigger them affect larger areas, for example entire watersheds. Landslides, soil erosion and increased water run off contribute to flooding in nearby low land areas and can affect water quality and water availability.

Confronting the mountain tsunami

There is increasing evidence that climate change is causing many of the world's glaciers to retreat. As ice melts, lakes form at the foot of the receding glaciers. The banks of these lakes are weak and when they are breached a natural hazard known as a glacial lake outburst flood (GLOF) results. Because of their suddenness and potential to cause catastrophic damage, GLOFs have been called 'mountain tsunamis'.

In the Hindu Kush-Himalayan region the rates of warming are significantly higher than the global average. The Kathmandu-based International Centre for Integrated Mountain Development, known by its acronym ICIMOD, has identified more than 200 lakes that are considered to be susceptible to outburst floods.

Outburst floods can be prevented. Nepal has collaborated with the Dutch government on a US\$3 million project to release water from a potentially hazardous glacial lake. However, such costly solutions are not always feasible. What is essential for preventing a humanitarian disaster in the event of an outburst flood is an understanding of the flood's probable path and the speed of the deluge.



The Imja glacier in Nepal, just 6 km from Mount Everest, is retreating at a rate of 74 m a year – the fastest rate of all the Himalayan glaciers. Imja Lake, at the foot of the glacier, almost nonexistent in 1960, now covers nearly 1 km² and is considered one of the most likely sites for a catastrophic outburst flood.

To raise awareness at the local and international levels about this threat, WWF Nepal, a Sherpa students association and iDEAS, a local non-governmental organization, staged the 'Beat the GLOF Action Run'. Local runners followed the path of the potential torrent, from Imja Lake to Khumjung village, where a flood could have disastrous effects.

The way forward

Policy-makers involved with disaster risk management cannot afford to neglect mountains, considering the high number of natural hazards in mountain areas and the high vulnerability of mountain communities. Key activities that should be undertaken to reduce the risk of disasters in mountains include:

- supporting sustainable agricultural, pasture and forestry practices in mountain areas as a key element of disaster risk reduction for both upland and lowland communities;
- carrying out baseline vulnerability studies in mountain community areas using gender analysis to ensure that disaster risk reduction initiatives and emergency relief and rehabilitation efforts target those most at risk;
- increasing awareness and developing integrated strategies and policies on disaster risk management at the national level;
- integrating local environmental knowledge and community memories in disaster risk reduction strategies;
- increasing capacity building in all the elements of disaster risk management, including preparedness, mitigation, response and rehabilitation;
- facilitating mountain communities access to resources through several tools such as microcredit and banking, non-farm income opportunities, as well as disaster mitigation strategies that offer payments to mountain communities;
- conducting further research on the natural hazards threatening mountain regions and studying the likely increase in these hazards that will result from climate change.

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