

# The importance of mountain ecosystems in climate change adaptation



When moist air is forced upward by topography in mountain ranges, the temperature and pressure change, cooling the moisture and condensing it. This condensed moisture is stored in wet seasons as snow on mountain tops or glaciers and as water in lakes.

During hot and dry seasons, this stored water is released downstream, providing a steady supply for the demands of freshwater downstream. The buffering capacity of these mountain waters, therefore, is critical for **water security and the water cycle**.



These mountain waters – which store and supply water to sustain human and ecological demands – are called '**water towers**'. Water towers and their associated river basins are reported to generate 4% and 18% of the global GDP, respectively.

Downstream, the provision of freshwater in more highly populated areas, is important as drinking water and also for agriculture and industry. The water from mountains sustains **food production for more than half the world's population**.



Mountain ecosystems also provide **fibre, medicines and other non-timber forest products**.

Mountains are also important for filtering the air. Increased soil moisture in montane forests increases forest productivity, by **sequestering carbon**. Therefore, mountains serve as **carbon sinks**.



Around **670 million people including Indigenous peoples, live in high mountain regions** in all continents except Antarctica. This number is projected to reach between 740 and 840 million by 2050.

About **50% of global biodiversity hotspots are found in mountain regions**, containing one third of all terrestrial diversity and with very high plant diversity. This high species diversity and associated high genetic diversity have been the source of many of the world's major crops.



Other mountain ecosystem services include **pollination and dispersal of seeds**, as well as pest and disease control.

Mountain ecosystems protect people downstream from **extreme weather events**. For example, the soils in upland watershed forests soak up excess rainwater, protecting people downstream from floods.



Mountain ranges are historic and cultural sites and they **attract millions of tourists from all over the world**.

## The impact of climate change on mountain ecosystems

- Mountains are also highly affected by climate change and, in the last century, compared to the global mean, they **warmed faster than lower elevations**.
- Warmer temperatures are resulting in **profound ecological changes, destabilising mountain ecosystems**.
- Increased temperatures in mountain regions decrease the amount of precipitation, causing **snow and ice to melt earlier and accelerating the process of glacier retreat**.
- At the same time, the patterns of precipitation (snow, hail, rain), as well as the pattern of loss of water from soil and plants are also changing. This means that the **timing, quantity and quality of water supplied by mountains are changing**.
- These changes have significantly affected mountain ecosystems, with **changes in the distribution and abundance of species**. As a consequence, some high mountain species are at risk from extinction.
- This, in turn, affects ecosystem functioning and the **delivery of ecosystem services that are essential for human well-being described above**.

**Ecosystem-based adaptation** is an approach to climate change adaptation which helps people adjust to climate change; makes use of biodiversity and ecosystem services; and is part of an overall adaptation strategy. Building upon the achievements of the Mountain EbA Flagship Programme, the project '**Scaling Up Mountain Ecosystem-based Adaptation: building evidence, replicating success, and informing policy**' was implemented from 2017-2022 in six countries in three continents to address issues of climate change in mountain ecosystems.