

Water

MOUNTAINS ARE OFTEN CALLED NATURE'S WATER TOWERS. BECAUSE OF THEIR SIZE AND SHAPE, THEY INTERCEPT AIR CIRCULATING AROUND THE GLOBE AND FORCE IT UPWARDS WHERE IT CONDENSES INTO CLOUDS, WHICH PROVIDE RAIN AND SNOW. ALL THE MAJOR RIVERS IN THE WORLD – FROM THE RIO GRANDE TO THE NILE – HAVE THEIR HEADWATERS IN MOUNTAINS. AS A CONSEQUENCE, MORE THAN HALF THE WORLD'S PEOPLE RELY ON MOUNTAIN WATER TO GROW FOOD, TO PRODUCE ELECTRICITY, TO SUSTAIN INDUSTRIES AND, MOST IMPORTANTLY, TO DRINK. AS POPULATIONS INCREASE AND DEMAND FOR CLEAN WATER GROWS, THE POTENTIAL FOR CONFLICT ALSO RISES. CAREFUL MANAGEMENT OF MOUNTAIN ECOSYSTEMS AND THE WATER RESOURCES THEY SUPPORT HAS NEVER BEEN MORE IMPORTANT TO OUR LONG-TERM SECURITY AND SURVIVAL.

MOUNTAIN WATER AND A THIRSTY WORLD

Each day, one of every two people on the planet quenches his or her thirst with water that originates in mountains. One billion Chinese, Indians and Bangladeshis, 250 million people in Africa, and the entire population of California, United States, are among the 3 billion people who rely on the continuous flow of fresh, clean mountain water. Yet the future of this vital, life-giving resource has never been more uncertain.

Deforestation of mountain woodlands, mining, agriculture, urban sprawl and global warming are all taking their toll on mountain watersheds. At the same time, the worldwide demand for freshwater continues to soar unabated. For

example, while the number of people on the planet has doubled over the last century, the demand for freshwater has jumped sixfold. If current trends continue, by 2050 as many as 4.2 billion people will be living in countries that cannot meet the daily minimum requirement of 50 litres of water per person, according to a recent report by the United Nations Population Fund.

Already, 2.3 billion people worldwide endure chronic water shortages. A disproportionate number live in developing countries where water scarcities are so great that the ability to grow food and to build a stable economy have been severely hindered.

MOUNTAIN GLACIERS ARE MELTING

Some of the freshwater obtained from mountains is stored in glaciers. Runoff from the Quelcaya Ice Cap, for example, has been the traditional water source for residents of Lima, Peru. Now, however, because of the effects of global warming, many mountain glaciers are melting at unprecedented rates. Over the last decade, melting of the Quelcaya Ice Cap has increased

from 3 to 30 m a year, putting freshwater at risk for 10 million people. Similarly, in northern India an estimated 500 million people already plagued by water shortages, depend on tributaries of the glacier-fed Indus and Ganges Rivers. Scientists believe that, as Himalaya ice caps melt, these rivers will swell – before falling to dangerously low levels.



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International Year of
MOUNTAINS

*We are all
mountain people*

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Key facts

▲ More than half of humanity depends on mountains for water to drink, to grow food, to produce electricity and to generate industry, as well as for transportation.

▲ In humid parts of the world, mountains provide 30 to 60 percent of the freshwater downstream. In semi-arid and arid environments, they provide 70 to 95 percent.

▲ All the major rivers of the world depend on mountains for water. For example, 90 percent of the lowland flow of the Indus River originates in the mountains of the Karakorum and Western Himalaya. Nearly 80 percent of the water of the Rio Grande comes from the Rockies and the Sierra Madre mountains. Sixty percent of the Rio Negro comes from the Andes.

▲ Mountain water helps to sustain ecosystems in both highland and lowland areas, contributing greatly to the conservation of the world's biodiversity.

▲ To help ensure that freshwater resources are shared equitably by all who rely on them, the United Nations has developed a framework convention to guide freshwater negotiations. To date, 10 of the 35 countries required have ratified the agreement.

CASE IN POINT

The Aral Sea Basin: overuse of mountain water resources

The degradation of the Aral Sea, which flows into both Kazakhstan and Uzbekistan, represents one of the greatest environmental catastrophes in human history. In 1985, water from the Tien Shan and the Pamir mountains was rerouted to fields in a failed irrigation experiment. As a result, the Aral Sea shrunk to half its size, leaving 266 invertebrates, 24 fish species and 94 plant species extinct.

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International Centre for Integrated Mountain Development (ICIMOD)

- Water Focus
www.icimod.org.sg/focus/water/
water_toc.htm

International Water Management Institute

www.cgjar.org/iwmi/

Mountain Forum on-line library

www.mtnforum.org/resources/
resources.htm

World Water Council

www.worldwatercouncil.org/

UNESCO Water Portal

www.unesco.org/water/

UNEP Dams and Development Project

www.unep-dams.org/

FIGHTING FOR FRESHWATER RESOURCES

Water is a shared resource. What begins in mountain watersheds trickles down into streams and rivers, meanders across borders, flows into lakes, fills aquifers and, eventually, empties into oceans. Worldwide, 214 river basins – host to 40 percent of the world's population – are shared by two or more countries. Too often, however, where there is need for cooperation there is potential for conflict. In 1995, the distribution of water from mountains was the cause of 14 international disputes.

Many water-use disagreements arise locally between highlands and lowlands or regions within a country. Mount Kenya, for example, is the source of water for more than 2 million people in Africa. But in recent years, farmers living in the mountain's highlands have been using increasing amounts of water to irrigate crops. As a consequence, downstream water flow has been severely

reduced, fuelling hostility from those whose survival depends on lowland pastures, cattle ranching and tourism in wildlife parks.

Cooperation is a key to the protection and equitable distribution of the world's freshwater resources. Watershed management must take into account the needs of all those who depend on mountain water, including those who have the greatest stake in preserving healthy mountain ecosystems – the mountain people themselves. Yet in many areas, mountain people are among the poorest residents and those with the least amount of influence. In their struggle for survival, they are forced to scratch out a living on marginal lands and to cut trees at unsustainable rates. Breaking the cycle of poverty and involving mountain people in decision-making processes is an essential first step to ensuring the flow of fresh mountain water.

THE FRAGILITY OF MOUNTAIN TERRAIN

Words such as "stability," "strength" and "endurance" are often used as metaphors for mountains but, in reality, mountains can be fragile.

The vertical nature of a mountain – its contours, projections, peaks and plateaus – makes its surface highly unstable. In fact, mountain soils, which form more slowly because of the higher altitudes and colder temperatures, are often young, shallow and poorly anchored. Add the threat of earthquakes as well as the pull of gravity, and it is not surprising that mountains are susceptible to soil erosion.

Yet human activities also contribute to the fragility of mountain terrain. Unsustainable forestry and inappropriate farming practices, for example, can lead to deforestation and a severe loss of vegetative groundcover. Without trees and plant life to absorb water, runoff increases and soil erosion escalates. A doubling of water speed, for example, produces an eight- to sixteenfold increase in the size of particles that can be transported.

Eventually, as more and more soil and sediment travels downwards, the likelihood of avalanches, landslides and floods increases.

THE WETTEST PLACE ON EARTH

Mountains are home to some of the wettest environments on earth. Cherrapunji, India, for example, sits on the southern slopes of the Himalaya's Meghalaya Hills and receives an annual rainfall of as much as 12 m.

Like all mountains, the Himalaya force air to rise and cool, triggering large amounts of precipitation. This phenomenon is known as the orographic effect. As altitude increases, generally speaking, the greater the orographic effect and the wetter the environment. Since the Himalaya are home to some of the world's highest peaks, it is not surprising that Cherrapunji receives the greatest amount of rainfall.

MOVING MOUNTAINS TO SUPPLY MEGACITIES

Between 1950 and 1990, the number of cities with populations greater than 1 million increased from 78 to 290. Some of these places, particularly in the developing world, have exploded into "megacities" with millions of people and unprecedented demands for freshwater and electricity.

To help meet the needs of growing cities, many countries are developing schemes to divert mountain rivers or dam them entirely. The Tucurui Dam in Brazil, for example, generates electricity for cities and industries in the

country's north by diverting the Tocantins River, an Amazon tributary. At the same time, one of the Tehri Dam's functions in the Indian Himalaya will be to supply freshwater to the Indian city of Delhi, 250 km away.

As with all large-scale initiatives like these, the potential is great but the threat to mountain watersheds, people and biodiversity is even greater. Protecting mountain ecosystems and the freshwater they generate should be the first priority as nations consider such development plans.

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