MOUNTAINS AND WATER

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Water is life. It is essential for all aspects of our livelihood, from basic drinking water to food production and health, from energy production to industrial development, from sustainable management of natural resources to conservation of the environment. 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 Andes.

As a consequence, more than half of humanity relies on the fresh water that accumulates in mountains. Growing populations, intensifying agriculture, increasing urbanization and industrialization are leading to greater demands for water. Clean mountain water plays a major role in satisfying these growing demands. In some regions, however, the current demand for high-quality fresh water is already greater than existing supplies. If water resource development is restricted, a thorough management of demand is required in order to avoid potential conflicts over the allocation of water between different users. Water stored in mountain lakes and reservoirs has further economic value, given its potential as a source of hydroelectric power that can provide opportunities for the production of energy in a rapidly growing urbanized and industrialized world. Mountain fresh water also sustains many natural habitats, both in the mountains and the lowlands, thus contributing to the conservation of biodiversity.

Mountains are the Water Towers of the World

Mountains, covering 27 percent of the Earth's land area, provide 60–80 percent of the world's freshwater resources while in semi-arid and arid areas, such as the Middle East, Central Asia, South Asia, and parts of Western North America, this rate is much higher (up to 95 percent). This is possible due to the phenomenon known as the "orographic effect". Mountains form a barrier to incoming air masses. Forced to rise, the air cools and precipitation is triggered. Rainfall thus generally increases with altitude, reaching maximum values between 1,500 and 4,000 m altitude. Mountain waters captured at high altitudes are carried under gravity via the stream network or groundwater aquifers to the lowlands, where the water demand from population centers, agriculture and industry is high. The distance covered can be hundreds to thousands kilometers. Thus mountains naturally help to distribute water resources in space. With high elevation and cold temperatures, mountains have the capacity to store precipitation in solid form as snow and ice. In semi-arid and arid areas for example such as Morocco, when temperatures rise, melt water is released precisely at the time when precipitation is at a minimum and water demand, particularly for irrigation, is at a maximum. Mountains also store water in lakes and recharge groundwater bodies, similarly supporting lowland rivers in dry seasons through delayed flows. Mountains thus help to distribute water not only in space, but also at the right time.

Fragile ecosystems

Even though mountains have always embodied "stability", "strength" and "endurance", they are highly fragile ecosystems. The vertical nature of a mountain 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. In addition to that, earthquakes as well as the pull of gravity make mountains more prone to soil erosion. Anthropogenic activities also contribute to the fragility of mountain terrain. Deforestation of mountain woodland, land exploitation, mining, construction of infrastructure, agriculture, ill-managed tourism, landslides and floods in mountain areas are all factors that may significantly impact on the quantity and quality of the water. Climate change is also an important element heavily affecting mountain water reserves. Some of the freshwater obtained from mountains is stored in glaciers.

As the world heats up, mountain glaciers are melting at unprecedented rates, having an enormous impact on fresh water resources in many parts of the world. According to a study carried out by two researchers of the Alaska University, glaciers could lose from 21 to 26 percent of their volume by 2100 and Alpine glaciers are particularly at risks, followed by those in New Zealand. The majority of glaciers on the Tibetan plateau - 100,000 square kilometers of glaciers that supply water to about 1.4 billion people in Asia - and in the surrounding region - are retreating rapidly. The glaciers in Kenya, East Africa, the only source of freshwater for more than 7 million people, have lost at least 45 percent of their mass since the mid-twentieth century. Moreover, if the Quelcaya ice cap, the traditional water source for residents of Lima, continues to melt at its current rate, it will be gone by 2100, putting freshwater at risk for 10 million people.

Thirsty World: Fighting for Freshwater Resources

Each day, one of every two people on the planet quenches his or her thirst with water that originates in mountains. Yet, worldwide demand for freshwater continues to soar unabated. While the number of people on the planet has doubled over the last century, the demand for fresh-water 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 liters of water per person, according to a recent report by the United Nations Population Fund. 2.3 billion people worldwide already endure chronic water shortages. A disproportionate number live in developing countries where water scarcity is so dramatic that the ability to produce food and to build a stable economy have been severely jeopardized. Water is a shared resource. Worldwide, 261 river basins - host to 40 percent of the world's population – are shared by two or more countries. Transboundary water flows can also create political tensions. Conflicts over water can also arise at a smaller scale, between regions or highlands and lowlands within national boundaries. Cooperation is a key to the protection and equitable distribution of the world's fresh water 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 ecosystem –mountain people themselves, too often marginalized. Involving mountain people in decision-making processes is essential to ensure a fair allocation of water resources.

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