

Water Towers of the World

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As population grows and water becomes evermore scarce, the ecological protection of mountains becomes evermore vital. There are calls for a new awareness by the people of the plains of their debt to the mountains and their inhabitants.

Planet Earth is able to distinguish itself as the living planet because of the existence of water on its surface. But easily accessible freshwater is limited to the lakes, streams and rivers. It accounts for about 90,000 km³ or only 0.26% of the total global freshwater reserves on earth, much of which are locked up in the polar ice fields. Even this amount cannot all be used up exclusively for satisfying human demands, because of the requirements for ecosystems conservation. Thus, the blue planet does not have an abundant stock of fresh water for humanity to keep consuming in the traditional wasteful pattern.

It is estimated that 80 per cent of the volume of freshwater on which humanity precariously depends is generated in the mountains and the uplands. It is distributed very unevenly in both space and time. And a large part of it is used up as it flows down onto the plains which are denser in population and wider in economic activities.

Not surprisingly, supply has not kept up with growing demand. Today, about one billion people in the world do not have assured supply of good quality water. Chronic water scarcity is predicted to touch the lives of some three billion people in 52 countries by 2025. If this situation is to be faced without panic or major conflicts, a very new human perspective on the management and use of water resources will be needed.

In developing this perspective, we have to be more sensitive to the processes constituting the global hydrological cycle, which renews the freshwater stocks of the world. The mountains and uplands play an extremely important and distinctive role in the hydrological processes of the planet and in the regional hydrology of all continents.

Despite the relatively small area they cover, mountains have a direct influence on the climate conditions of a much larger area. By acting as a physical barrier to atmospheric flows, they extract large amounts of moisture creating sharp climatic divides. Water extracted on the windward side flows out as innumerable streams, rivers and lakes to meet human needs. The availability of large volumes of snowmelt has given a perennial character to many rivers, allowing significant human civilizations to flourish along their courses.

Mighty rivers like the Indus, the Tigris, the Nile and the Yangtze are only a few examples of Mountain Rivers which have cradled human civilizations. The Alps, the Andes, the Caucasus, the Himalaya and all the mountain chains of the world are the sources of these life giving rivers. There is hardly an area on land that is not hydrologically linked in some way with mountains and uplands.

Without the presence of mountains, water endowment on the surface of the earth would have been very different. The Indus valley civilization would not have the privilege of surviving on the water supply from the snowmelt originating in the high Himalaya. Nor would the Amazon, the largest river of the world, find its water supplies without the presence of the Andean mountains

Storing water

The annual water demand of the world is reliably projected to increase from 4,130 km³ in 1990 to 5,190 km³ in 2000. This will certainly be accompanied by a sharp decline in the per capita availability of water in large parts of the world. The problem is expected to be most acute in parts of Asia and Africa, where water for domestic needs will compete with needs for irrigation and industry.

Regional disparity of water supply and the explosive growths of megacities will intensify the demand for large scale storage and long distance transfer of freshwater. Between 1950 and 1990 the number of cities with a population of over a million increased from 78 to 290. This trend will continue in the future decades. Indeed, the scarcity of water may soon prove to be the most important obstacle to sustainable development, and even survival, over large parts of the world.

The Three Gorges dam on the Yangtze in China originated primarily from the need for flood control: generation of hydroelectricity got added on. The Tucurui dam in Brazilian Amazonia on the other hand, was designed directly for the generation of electricity. Supply of water to the megacities is also quickly becoming part of the menu, as in the case of the proposed Tehri high dam on Bhagirathi in the Indian Himalaya. This is supposed to supply water to the Indian capital city of Delhi some 250 km away, as well as generating electricity and providing for irrigation.

These are only a few examples of the large scale initiatives humanity has already started in the mountains to ensure the supply of freshwater and electricity. This potential, if manifested with wisdom and a new ethical view, could provide supplies of additional freshwater to the needy plains. If, on the other hand, the mountains continue to be seen as a free resource waiting to be exploited then this potential is sure to disappear.

Mountains are also threatened by other extractive activities that can destabilize their role as the water towers of humanity. Mountain watersheds need to be protected from large scale deforestation, extensive mining and unsustainable agricultural practices, while mountain streams need to be saved from large scale diversion or toxic dumping. We have to remember what happened through the encouragement of unsustainable agriculture in the Aral Sea watershed and deforestation of the Ethiopian highlands which perpetuated water scarcity and grossly affected agriculture.

As many parts of the world come face to face with the threat of permanent water scarcity, adequate ecological protection of the mountain watersheds as well as full involvement of the mountain communities in the new initiatives for water management, have now become essential.

In order to take the wisest decisions for the sustainable use of the water of the mountains and uplands, systematic scientific data gathering activity will be required. Due to their undulating landscape, there is a need to monitor the meteorology of the mountain areas much more intensively than in the plains. This is handicapped by their inaccessibility.

Another important element of study will be the possible impact of global climate change on the hydrology of the mountain and upland areas. Mountains are very sensitive to climate changes and should be monitored intensively. There may be significant impact on climate change on the precipitation pattern, extent of glaciers and permafrost, which may alter the water supply pattern in the plains.

Above all, there is a need to change the policy for the use of water produced by these regions. As we approach the next century, with all the increased demand and expected scarcity of fresh water that may inflame human societies, we may seek a substantial rescue from the mountains and uplands of the world. Human societies, especially those in the plains, need to sensitize themselves about their indebtedness to the planet's water towers, which can provide an end less flow of freshwater to form the basis for human survival and development.

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Notes to readers

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