Water Issues in Tibet

by Catherine Moore[1] and Lhakpa Shomar

Introduction

Water is essential to all life on Earth. This vital resource has a potential for limitless regeneration, yet it is endangered by degradation and excessive exploitation. As water cycles in, on, and above the planet through space and time, any deleterious impact has far-reaching effects. Water is now widely perceived as a grave environmental issue. It is important to recognize that water is also a social issue, an economic issue, a political issue, and a human rights issue.

The mountains and glaciers of Tibet endow it with a vast river system, whose flow provides the headwaters for the major rivers of Asia, including the Yellow, the Yangtze, the Mekong, the Salween, the Brahmaputra, and the Indus.

Almost half of humanity (47% of the global population) depends upon these rivers as a source of freshwater. As such, it is vitally important to maintain the integrity of Tibet's rivers, because all downstream river systems are compromised when headwaters are impacted.

However, Tibet's rivers have not been safeguarded during the years of Chinese occupation. Rather they have been degraded, dammed, and diverted, with repercussions rippling downstream across international borders. This has resulted predominantly from deforestation, contamination, and the construction of dams.

Impacts of Deforestation

Maintenance of the integrity of the vegetation cover is essential for the protection of aquatic resources in mountainous regions. Until 1949 Tibet's forests grew largely undisturbed on steep isolated slopes in the east, south-east, and south. Since then, however, extensive deforestation has occurred. Between 1950 and 1985 the areal extent of Tibet's forest cover decreased 46%, from 25.2 million hectares to 13.6 million hectares.

The soil erosion that commonly occurs on deforested slopes is aggravated in this area by the high intensity of the monsoon rains and the steep gradient of the terrain.

Deforestation degrades the quality of river water and accentuates the extremes of river flow within the watershed. The heightened sediment load of these rivers that results from soil erosion reduces their capacity to contain river flow and increases the risk of flooding. In recent years flooding of the Yangtze River has killed thousands of people. Chinese authorities have admitted that the flooding is linked to the deforestation on the Tibetan plateau.

[1] Department of Geography, Concordia University, Montréal, QC, Canada

Contamination

Mining is one of Beijing's "four Pillar" industries in the Tibet Autonomous Region. Among the minerals excavated are copper, gold, tin, iron, and coal. Tailings are produced by the high temperature smelting process that releases a mineral from the ore body. These tailings accumulate in toxic mounds and pollute waterways with sulphuric acid, cyanide, and heavy metals.

China has also established uranium mining sites in the Tibetan provinces of U-Tsang and Amdo. The production of 1 tonne of uranium fuel typically generates 100 tonnes of tailings and 3,500 litres of liquid waste; both tailings and liquid waste are sources of radon gases, toxic metals, and radioactivity, all of which are detrimental to the environment.

There is evidence that the Tibetan plateau is the repository of nuclear and toxic wastes generated domestically and imported. China's official *Xinhua News Agency* admitted in 1995 that radioactive pollutants had been discharged from the Ninth Academy near the shore of Lake Kokonor in a 20 km^2 dump. This improper disposal contaminates air, soil, and water for centuries.

Rivers around Lhasa, the capital of Tibet, are becoming increasingly contaminated by untreated sewage and industrial waste. It is estimated that over 40 million tonnes of liquid waste was discharged into the rivers around Lhasa in 1996 alone.

Intensive farming practices have become more prevalent in Tibet in recent years. The use of chemical fertilizers and pesticides is an integral component. Tibetan refugees have reported that farmers in Tibet are forced to sell produce to the government at less than fair market prices or are remunerated only in chemical fertilizers.

If improperly applied, fertilizers can become pollutants. For example, excess nitrate and phosphate can wash into rivers, lakes, and coastal waters, where they contribute to eutrophication, the accelerated, oxygen-depleting nutrient loading of aquatic environments.

Chemical pesticides can also contaminate waterways. Where they leach into groundwater, the quality of well water may be compromised. Chemical pesticides can cause the demise of non-target species and adversely affect human health. The development of resistance in pest populations often results in stronger doses of the pesticide, more frequent applications, or the creation of a yet more lethal alternative.

Petroleum is the base of agricultural chemicals. Is there a link between the chemical-based intensive farming practices being promoted and oil development, particularly in the Tsaidam Basin with its estimated 42 billion tonnes of oilfields?

Irrigation is another component of intensive farming. In Tibet, irrigation is supplied by surface water and groundwater. Excessive extraction of groundwater lowers the water

table, which threatens the long-term supply of well water, desiccates groundwater fed lakes, rivers, and wetlands, and increases the contaminant concentration of the water. Over much of northern China, the water table is lowering at a rate of 1 metre per year. It is likely that similar unsustainable extraction rates will occur in Chinese occupied Tibet.

Impacts of Dams

Many rivers, particularly in eastern Tibet, have been strangled with massive dams for the provision of hydro-electrical power and irrigation. The data upon which these dams have been based are flawed. The release of fossil water from the accelerated melt of snow and ice produces an erroneous over-estimate of the long-term water availability. Also, this melt water commonly accumulates behind ridges of glacial moraine. When it breaks through, as it inevitably does, it often becomes a violent torrent. Can the dams withstand this unanticipated force?

Reservoir water that is stored upstream of dams is rapidly depleted by the high rates of evaporation on the Tibetan plateau. This reduces the generating capacity of the dams and the water supply for irrigation.

There are significant impacts on the aquatic ecosystems both upstream and downstream from dams. During the operation of a hydroelectric plant, the amount and timing of river flow is dictated by the demands for electricity and not by the needs of ecosystems. The fragmentation of a river by dams isolates populations of aquatic organisms, which reduces their genetic diversity and heightens their vulnerability to extinction. Riverine and coastal wetlands are destroyed, as are the vital ecological services they supply. These services include the removal of suspended sediments, the immobilization of contaminants, the reduction of flood risk, and the provision of vital breeding and feeding grounds for a diverse array of organisms.

Within the reservoir of a dam, the river is transformed from a flowing stream into a semi-stagnant body of water with significantly altered characteristics. Mercury and methane are typically released in newly formed artificial reservoirs over a period of at least decades. Bacteria in the reservoir water transform insoluble mercury into methyl mercury, a soluble and highly toxic form of mercury that accumulates and magnifies through the food chain. Methane, a potent greenhouse gas, is released as the vegetation that was inundated in the formation of the reservoir slowly decomposes anaerobically.

Flood control is a rationale that has been offered for the construction of dams. Yet, by controlling flooding, dams deprive alluvial plains downstream of the nutrient-rich sediment needed to maintain soil fertility for agriculture. Rather, the sediment accumulates in the reservoirs, reducing their capacity. And, clearly, from the evidence of massive flooding in recent years, flood control has yet to be realized.

Large-scale hydroelectric power is an inappropriate energy source for the Tibetan plateau due to high evaporation rates and the uncertainty of long-term river flow. In addition, such projects are associated with massive environmental degradation during construction

and operation. Less recognized but equally valid are the deleterious social costs that are incurred, including forced relocation.

Given Tibet's high elevation and abundance of sunshine, solar energy is a more viable, and certainly more sustainable, source of energy. Wind power is another feasible alternative. Both can be developed on a small-scale, which minimizes environmental degradation and maximizes local control.

Conclusion

China's deforestation and mining within Tibet are obvious examples of colonist exploitation via resource extraction. However, using (and abusing) Tibet's waterways - particularly where the benefits are largely transmitted to industrial cities in China or serving Chinese migrants in Tibet - is equally exploitative. In addition, the degradation of water bodies considered sacred by Tibetans resounds with cultural insensitivity.

As has occurred in other places where inequality segregates the powerful from the powerless, those who are burdened with the impact of environmental degradation within Tibet and downstream are seldom compensated by any advantage that may accrue.

The environmental issues that have manifested during the half-century of China's occupation of Tibet are a reflection of the command and control orientation of the current government of the Peoples Republic of China. This orientation is obsolete for human interaction with the natural environment; it is obsolete, too, for government interaction with the people.

Dialogue is needed to address these and other environmental issues in Tibet – a dialogue that is open and meaningful for all stakeholders.

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