

Foreword

Himalayan mountains and the adjacent Gangetic Plains together form one of the most important areas of the planet from geological, ecological and anthropological stand points. While these young and lofty mountains represent one of the largest wilderness regions of the planet, the Gangetic plains support nearly 500 million people with almost the entire area under agriculture and urban settlements. No other region in the world has a comparable size of human population or such a long history of human activities. The plains are connected to the Himalayan ranges through glaciers from which perennial rivers originate, that not only carry water, but also deposit silt year after year. These regions and their relationships provide a challenging research area for ecologists who consider that ecology's main strength lies in understanding various aspects of interdependences and providing a larger picture. Research of this kind is required not only to conserve large ecosystems and the services from them, but also to advise the science of ecology.

The formation of the Himalayas had direct influences on the nature of the Gangetic Plains. The Himalayas are the product of the collision of the northward moving Indian subcontinent with Asia, which was once the part of Laurasia (see Molnar, 1986 for a detailed description). Somewhere about 80 million years ago, India began to move away from Madagascar, and then by 4000–5000 km northward between 80 and 40 million years ago. The movement declined abruptly to about 5 cm per year as the Indian plate collided with southern Tibet between 50–10 million years ago. This big collision resulted in the shaving off of some of the crusts of Indian lithosphere which constitute the Himalayas. The Himalayas are important biogeographically and due to their rich biodiversity, characterized by high endemism.

These mountains of extraordinary dimensions have created a maritime climate at a continental location by controlling the movements of winds and maintaining humid conditions. They are the maker of monsoon rainfall patterns and mild winters by intercepting cold winds from the north; except for the Polar region and Alaska, the Himalayan glaciers have more ice than any other region on earth. These glaciers release water gradually throughout the year, particularly during summer months when water is needed most in the Gangetic plain. Unfortunately, many of the Himalayan glaciers are retreating because of global warming. (Hasnain, 2002) and ecosystem changes. Recent floods in the Himalayas and an increase in frequency of extreme weather events are predicted to be some of the major impacts of climate change. This year's mid-September monsoon in Uttarakhand Himalaya and the disasters it inflicted is possibly one such effect. The rain storms destroyed more than 200 km of road and thousands of houses collapsed due to landslides. The misery felt by the poor due to these disasters and the fear generated will be felt for a long time. Damages are substantially due to poor management and disregard for norms. Roads and houses collapsed because they were not properly constructed or were constructed at geographically vulnerable places or even on drains. However, while evaluating the costs of monsoon-induced disasters, we need to also consider the benefits. The rains in the adjacent plains drastically reduced carbon concentration of the air. They replenished groundwater and enhanced soil fertility in downstream areas, removed soil and water pollutants and immensely contributed to the productivity of successive crops and other plants. The groundwater table is said to have risen by 3–20 m in adjacent plains after the monsoon, most of it from the mountains. This water discharge from

the Himalayas powers the flow of water in the plains, removing pollutants from India's large urban areas as well as carrying away insects which reduce leaf area of various naturally occurring crops. The fish are driven from the rivers to ponds and crop fields of villages, thus increasing precious food for millions who must survive on less than \$1 a day.

As for the Gangetic Plains, the main question is how human activities have affected the capacity of rivers to deposit silts in the plains and fertilize their crop fields. We need to know about the changes in the frequency of floods, their intensities, their coverage, amount of silt deposition and scale of spread, and nutrient quality of deposits. For example the amount of silt in the rivers generated by the recent floods was unlike any seen before. How are fertilizing processes being modified by rampaging urbanization and other landscape-level changes? With the construction of big dams on Ganges in the mountains and the diversion of river water for agriculture and other purposes, the river flow is expected to decrease. In some sections of the plain, rivers hardly flow. The lack of river flow can have several direct effects on the functioning and biotic composition of aquatic ecosystems. If the river flow, and the processes that contributed to replenishment of soil in the plains have slowed down, the high capacity of Gangetic Plains to support agriculture productivity will not last long.

Understanding ecological processes occurring over large areas, involving contrasting landforms associated with different human activities, cultural traits, and political boundaries can be an exciting research area. By developing an effective mitigation strategy, the water discharge from Himalayas could be made largely a service. The planners should know that with the increase in wealth and infrastructure, the cost of damages caused by floods and rain storms would increase. However, much of them can be saved by taking preventative measures. To achieve them we need to have a better understanding of water linkages between the Himalayas and the adjacent plains. Such large regions can have great global significance because of their dimensions and the ecological services they generate. The Amazonia has a global significance because of its great biodiversity and ecosystem services, while the Himalayas and Gangetic Plains have global significance because of different reasons. They combine great wilderness with one of the planet's greatest anthropocentric systems.

References

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"Ganga has been a symbol of India's age-old culture and civilization, ever-changing, everflowing, yet the same Ganga."

Pandit Jawaharlal Nehru
(Prime Minister of India: from his will and testament)