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Sagarmatha: Managing a Himalayan World Heritage Site

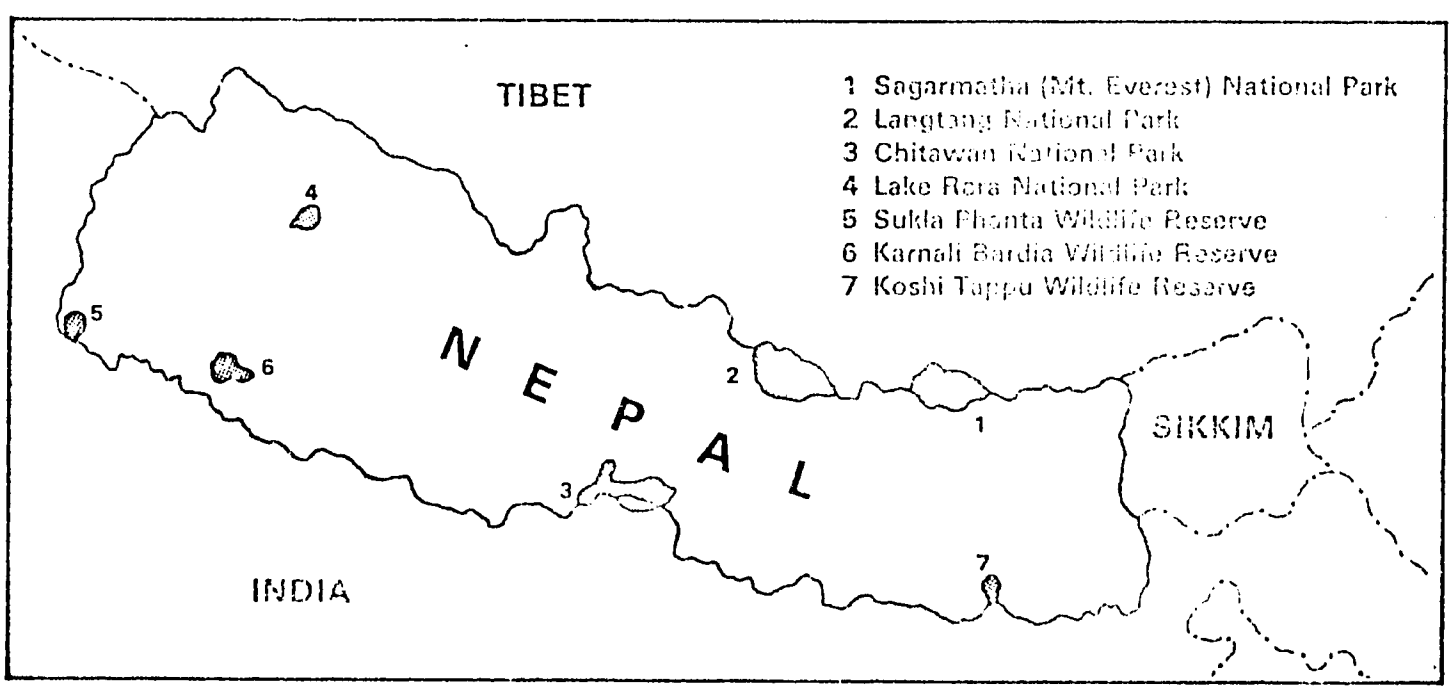
Within the boundaries of Nepal's Sagarmatha National Park rise some of the highest peaks in the world, including Mount Everest. The area which had remained protected by its remoteness has been affected recently by unforeseen human impacts including the yearly visit of some 5,000 tourists, who come for climbing and trekking. The most visible sign of these impacts on this fragile alpine environment is the lack of trees within a one-to-three-kilometre radius of each village; but many traditional pasture lands are deteriorating as well, and there are increasing problems of erosion and destabilized slopes. In 1980, Unesco, acting upon a proposal from the Nepalese Government, designated Sagarmatha National Park as a World Heritage Site under the World Heritage Convention, with the aim of helping to protect its unique natural and cultural features. In addition, a request for support from the World Heritage Fund was approved. This article stresses measures for restoring forests and providing alternatives to firewood. It gives an example of how a country can benefit from the World Heritage Convention. It suggests management techniques which could be applied in other parts of Nepal as well as in a number of countries suffering from similar problems of erosion and deforestation because of rural energy requirements.

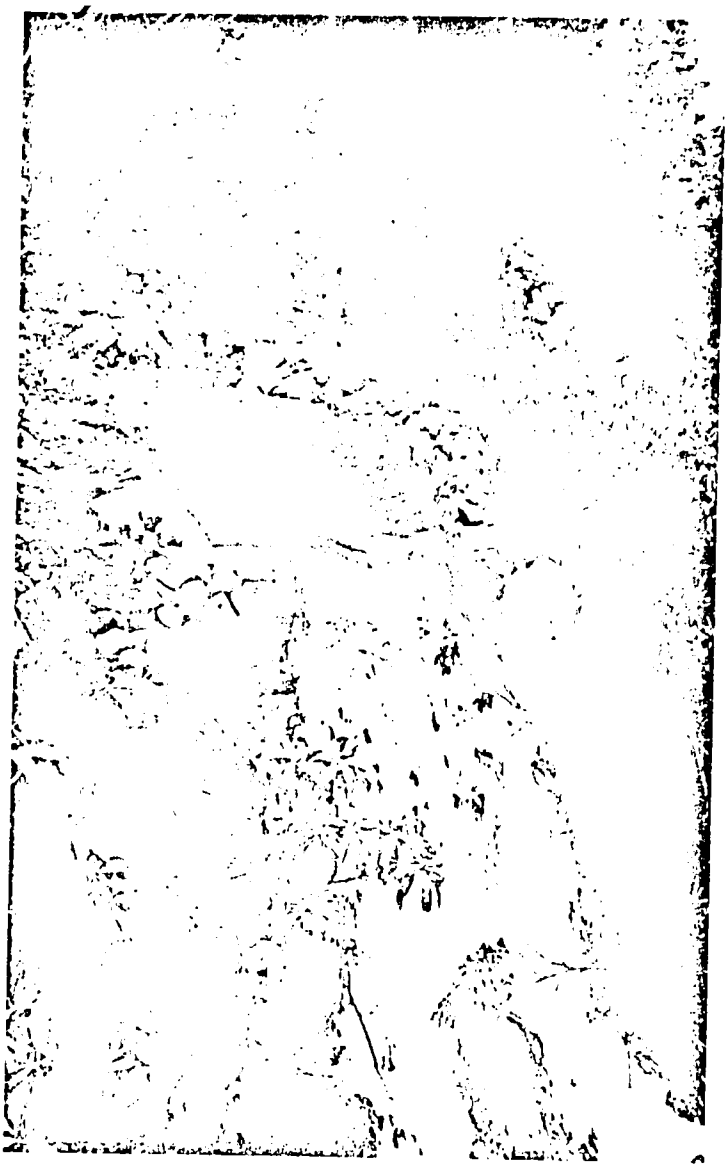
Nepal is a landlocked mountain kingdom, a landscape of incredible geographic diversity that stretches from the Gangetic plain of India through the Mahabharat and Siwalik ranges to the central range of the Himalayas. This topographic variety is matched by a wealth of cultural diversity: over a score of ethnic groups of distinct traditions and languages coexist here. Until 1951, when the country opened up its borders for the first time, the complementary barriers of topography and isolationist political policy insulated Nepal from most of the rest of the world. Since then, population growth, immigration from the north and south, tourism and changing lifestyles and modes of production have placed increasing stress on the country's limited resources.

Deforestation and agriculture expanding on to marginal lands are twin culprits in the acceleration of erosion, providing what Erik Eckholm has termed the country's leading export: soil.

An unstable environment

The Himalayas are geologically young mountains, the result of tectonic uplift caused by the collision of the Gondwanaland conti-





Nepali stonemasons constructed this streamflow measuring canal which directs the flow of water through a notched weir before cascading down the hillside. Photo: B.A. Coburn.

nent with the continent of Asia. Some of the rivers that flow from them, which join the Ganges and Brahmaputra, predate the uplift of the range and have maintained their courses as the mountains rose, creating extraordinary vertical relief. Glaciers have rounded the upper valleys of the major rivers, which cut through old glacial deposits reworked with old glacial debris.

Sagarmatha National Park's 1,243 square kilometres include the catchment basins of the Dudh Kosi, the Bote Kosi and Imja Khola rivers, which drain the slopes of Sagarmatha and other 6,000 metre peaks. Evidence of the erosive capacity of these streams and the agitation of a landscape still in motion are readily visible throughout the park. Flooding rockfall, debris flow and avalanches are events that have left their mark on the mountains of the park and in the memories of its inhabitants. These events are often triggered by the monsoon rainfall, which brings 80 per cent of the area's precipitation and swells rivers to many times their winter size. This accelerated geomorphological activity, combined with intense insolation, diurnal and and seasonal temperature variability and thin air, has shaped the vegetation and influenced cultural adaptations; it has also hampered the planning of large scale civil-development works such as roads and hydroelectric projects.

The Khumbu area in which lies Sagarmatha National Park was first settled by Sherpas moving westward from Tibet about 450 years ago. The subsistence practices they developed based on an agro-pastoralist trading economy utilized the agricultural opportunities provided by altitudinal gradient and capitalized on the region's intermediary location between Tibet and the Indian subcontinent. Hardy grains, greens and potatoes (introduced by the European settlers in Darjeeling in the mid-nineteenth century) formed the mainstay of their diet.

Survival strategies

Subsistence strategies tailored to the constraints and opportunities peculiar to the Everest region have permitted the Sherpas to thrive in an environment of inherently low productivity and high variability and risk. Social and religious institutions regulating resource use have mitigated some of the environmental disruption concommittant with human settlements.

Yak and yak/cattle crossbreeds, important symbols of wealth, act as draft and pack animals and yield dairy products, hair, hides, fertilizer, fuel, meat and calves for trade. Yak management involves seasonal migration of the animals and their tenders from low to high elevations, in response to the availability of pasture. The timing of livestock movements is co-ordinated by an elected village committee of guardians, or *naua*. The *naua* sets opening dates when livestock will be allowed to graze on particular high summer pastures, and levies fines for infractions.

The total number of large animals (about 3,000) remained approximately the same between 1957 and 1978, but both the ownership structure and the relative proportions of cattle types has changed. More residents now have smaller herds, and the earlier preference for *naks* (female yaks) over *dzum* (crossbred cows) has reversed. Stockmen now depend more heavily on purchased feed and pasturelands adjacent to each village, where overgrazing is a growing problem. Large-scale stock-owners have also changed their stock-management strategies. Young men and boys, generally herdsmen before the advent of tourism, are now attracted to the trekking business, and livestock as a result is less widely dispersed. Increased demand for dairy products and the tourism-generated affluence of many Khumbu Sherpas may have triggered these changes.

Forest composition and production in the Khumbu is linked closely to slope and aspect. Birch is dominant on north-facing slopes at about 3,000 metres, juniper on drier south-facing slopes and hemlock, fir and pine are found at lower elevations. Deforestation in Sagarmatha National Park has generated considerable concern among park planners, and a number of studies have been directed at the nature and extent of the problem, and possible solutions.

The forests of Khumbu provide the Sherpas with timber for house construction, roof shakes, litter for latrines, animal bedding, some animal feed and medicinal, ritual and culinary herbs. More than all of these combined, fire for cooking and heating is the largest consumer of wood. Each Sherpa hearth burns over 5,000 kilograms of wood each year. Additional fuelwood is required for ceremonies and cremations. The local demand for firewood has little more than kept pace with the gradually increasing population of the Khumbu. Tourist fuel wood demands, however, have grown much more quickly.

This panorama view shows Sagarmatha (Everest) at the extreme left, Lhoste and Ama Dablam. A park game scout is resting on the trail in the center of the picture. Photo: D. L. Golobitsh.

Trekkers and refugees

The impact of tourists (tourism is Nepal's primary source of foreign exchange) visiting Sagarmatha National Park has been of annually increasing severity. Tourism in the Khumbu began with the first mountaineering expeditions in the 1950s, by 1982 more than 5,000 visitors entered the park through the Djorsaale entrance station. The trekkers have contributed considerably to the incomes of enterprising Khumbu residents, and to a certain extent tourism for the Sherpas fills the place that trade with Tibet occupied in an earlier day.

A typical climbing expedition lasting two months and burning four loads of wood per day can consume upward of 8,000 kilograms of firewood. During peak periods of trekking (October-December and March-May), an average of two groups per day enter the park. Prior to the introduction of firewood-burning restrictions, each group was estimated to burn a total of 28 loads. The sale of firewood to tourists was a lucrative business along the trail from Lukla to Everest base camp, worth nearly $16,000 a year to Pangboche residents alone according to one villager. In 1980, the National Parks and Wildlife Conservation Department of the Government of Nepal banned the sale of firewood to trekking groups, and the burning of outdoor fires in all the high-altitude national parks. Trekking groups are now required, upon entering the park, to carry a quantity of kerosene sufficient for the duration of their stay. A kerosene depot was recently established at the Sagarmatha National Park entrance. But this has been recognized by many as a stop-gap measure, and difficulty has been encountered in enforcing the regulations on small scattered trekking groups.

Historically, Khumbu's forest and grazing lands were most severely stressed following China's assumption of control in Tibet in 1959. Waves of refugees fled Tibet, crossing the Nangpa La and other high passes with their livestock, passing through – some settling in – Khumbu. In Tibet, trees were scarce; the unaccustomed abundance of Khumbu's forests prompted a lavish use of local forest resources that scandalized resident Sherpas, who found their regulatory institutions largely disregarded. In the memory of one Khumjung stockman, before the migration from Tibet there was more than enough grass for all the cattle, but the extensive bands of sheep and other livestock brought from the far side of the Himalayas "ate the grass to the ground," especially in the Thame valley. Starvation and disease eventually decimated those animals, along with Sherpas' herds, though they have recovered enough to sustain some numbers at the carrying capacity of the pasturage. The pastures and forests have not fully recovered.

The threat posed by intensifying land-use practices provided part of the incentive for the establishment of Sagarmatha National Park. The park developed out of a proposal compiled through the collaboration of an FAO wildlife officer, the Nepal Government and the Government of New Zealand.

Managing change in a national park

Reforestation was a primary focus of early park-management efforts. New Zealand foresters and National Parks staff established two nurseries at Namche and Trashinga, which continue to supply pine and fir seedlings for each summer planting. Park regulations prohibit the introduction of fast-growing exotic species, but there are a number of foresters who feel that exotics might significantly improve production. In 1980 the villagers of Namche, Khunde and Khumjung were provided with seedlings to plant. The survival rate of these trees has not been very high, but there is general popular support for park reforestation activities. A major impediment to the regeneration of unfenced plantings is livestock, particularly goats and sheep, which will browse on seedlings less than eight years old. The National Parks administration and the township governments are currently proposing to purchase the remaining goats and sheep, and thereafter prohibit their ownership in the park. Unfortunately, their owners are generally from among the lower echelons of Sherpa society, and may suffer economic privations from this action. Fenced plantations have been established by the Himalayan Trust, and the World Heritage technical co-operation project, started in 1981, has supported the construction of stone enclosures.

In addition to reforestation, regulations restricting the collection of green wood, and control of the locations where wood can be cut have been instituted. Stemming from recognition of local villagers' familiarity with the Khumbu forests and the importance of their participation in conservation efforts, measures are now being taken to reinstate the *shunga naua*, the indigenous village fire-wood-resources management committee, which was discontinued after the forests were nationalized in 1957.

In spite of the large total volume of firewood consumed, and the harsh climate, park residents are remarkably sparing with their use of wood, generally building small fires and extinguishing them after use. Thus, further attempts at reducing the amounts burned have been largely unsuccessful. Most stove modifications reduce the quantity of radiant heat that is available to the occupants and airtight stoves allow the inefficient combustion of green wood.

Because of the World Heritage technical cooperation project, efforts are underway to test out and introduce alternative sources of energy for cooking, heating and lighting. Solar cooking technologies suffer from restrictions of cooking time, inconvenience, inefficiency when cooking large amounts and the belief that food cooked out of doors can be infected by witches' spells. Solar waterheaters, however, have been economical for houses that use large quantities of hot water. Auxiliary "wetback" waterheaters — flat metal water-tanks buried in the backs of traditional hearths — have proved to be even more popular than solar heaters. For those installations where the owners have had to pay cash for firewood, solar water-heaters have been distinctly cost effective.

For isolated locations such as Sagarmatha National Park, where the labour costs are relatively low, high-head mini- and micro-hydroelectric plants (less than 100 kilowatts) can compete economically with large river schemes, which would normally benefit from economies of scale. The Unesco World Heritage Fund is currently assisting the construction of a 33 kW micro-hydroelectric facility near Namche Bazaar to provide lighting (night-time only) to 110 houses and cooking (day-time only) to 10 lodges. In the short term, an estimated one tree per day will be saved from being used for firewood. Electrical transmission and distribution is entirely underground in order not to affect the architectural integrity of the village.

It is clear that a combination of reforestation, control of local resource use, alternative-energy technologies and other well-planned, environmentally sound forms of park-management activities will be necessary to preserve the unique ecological and cultural heritage of Sagarmatha National Park. As this example in Nepal demonstrates, conserving and safeguarding World Heritage sites is a multi-dimensional commitment. Nevertheless, a small amount of support from the World Heritage Fund can provide long-term benefits.

Bibliography

VON FÜRER-HAIMENDORF, Christoph. *The Sherpas of Nepal*. London, John Murray, 1964.

BJONNESS, Inger-Marie. Animal Husbandry and Grazing, A Conservation and Management Problem in Sagarmatha National Park, Nepal. *Norsk geogr. Tidsskr* (Oslo), Vol. 2., 1980.

SHERPA, Nima Wangchuk. *A Report on Firewood Use in Sagarmatha National Park, Khumbu Region, Nepal*. Kathmandu, Department of National Parks and Wildlife Conservation, 1979.

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