DRAFT ENVIRONMENTAL REPORT
ON NEPAL

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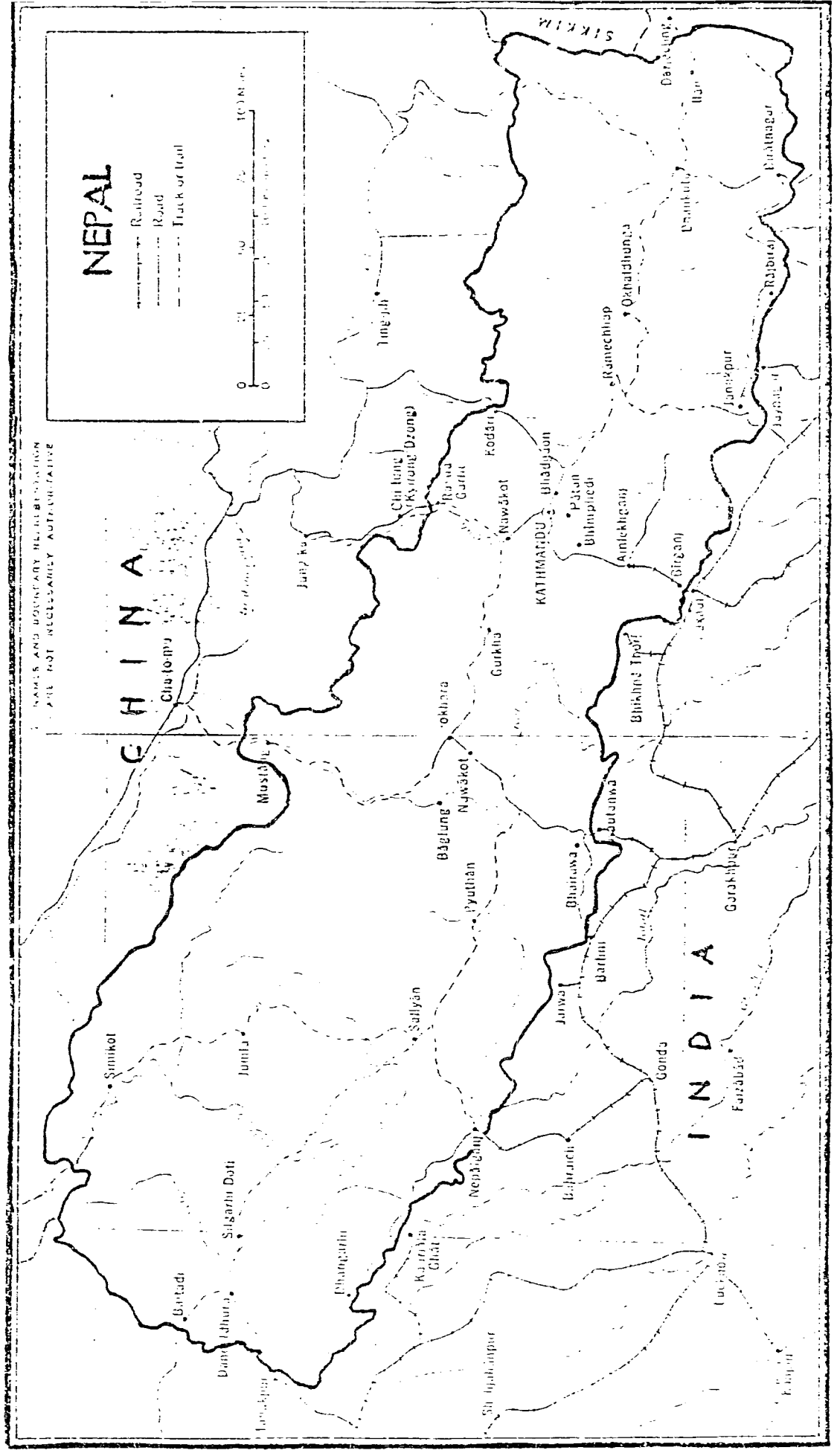

DRAFT ENVIRONMENTAL PROFILE OF NEPAL

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0.0 INTRODUCTION AND SUMMARY

Located between northern India and Tibet, Nepal has a climate that varies from tropical to arctic in the space of just 100 miles from south to north. Nepal can be divided into three distinct climatic and geographic zones: the flatlands of the Tarai, the northernmost portion of the Indo-Gangetic plain, up to 100 meters (m) in height; the hills, encompassing the bhabar, the Siwalik or Churia hills, the midlands, and the Mahabharat Lekh range, up to 3,500 m; and the mountains, including the lesser Himalayas, the Great Himalayas (up to Sagarmatha, or Mt. Everest, at 8,848 m), and the transhimalayan zone, part of the Tibetan plateau, at 4,500 m. Nepal's environment is dependent upon three factors: the altitude, the amount of rainfall, and the topography or position of the mountains. Nepal receives rain from June through September from the southwest monsoon out of the Bay of Bengal; rain generally decreases from east to west and from south to north. The main crop grown in Nepal is rice, followed by corn, wheat, barley, and millet; the main cash crops grown are jute, sugar cane, tobacco, oilseeds and potatoes. Ninety-five percent of Nepal's 13.8 million people are engaged in agriculture, and agriculture is the determining factor in Nepal's economy. Sixty percent of Nepal's population lives in the hills and the mountains; however, the eradication of malaria in the jungles of the Tarai in the 1960's opened the area to increasing immigration from the hills as well as from nearby Indian states.

Most agriculture in Nepal is done by hand on small family plots. An average farm family feeds itself on the produce of only 4 hectares, and two-thirds of farm families in Nepal require supplementary income of some kind to survive. Nepal is considered to be a "relatively least-developed country"; infant mortality at 152 per thousand is one of the highest in the world, and life expectancy is only 44 years. Nepal has little in the way of resources except for vast, as yet underutilized hyrdoelectric potential in its three major river systems. In the past, Nepal was virtually covered with forests; today, experts estimate that, if deforestation continues at the present rate, all of Nepal's forests will be gone by the year 2000. Agricultural production has declined during the past two years, and as the population grows, Nepal will soon require all of its rice production to feed its own population, leaving little to be exported. Erosion, a result of deforestation, grazing, and cultivation in the hills and on steep mountainsides, carries away 240 million cubic meters of topsoil annually, limiting Nepal's agricultural productivity and causing loss of life and damage to lands both in the Tarai and in northern Indian states as well.

Nepal was virtually closed to outsiders until 1951 when the fall of the hereditary Rana rulers returned the country to a constitutional monarchy. Under the Constitution of Nepal (1962), the King has the power to set up ministries to oversee development activities in the country. At present no one ministry has the power over all such actions, but the Ministry of Forests and the Ministry of Water and Power do cover most of the natural resources and environmental problems that face

Nepal. There are many laws and regulations affecting natural resources and the environment, particularly wildlife and forests, although little is known about the degree of enforcement in inaccessible areas. There is little industrial production in Nepal, and no legislation dealing with air or water pollution from industry. (See Section 3.0 on legislation.)

MAJOR ENVIRONMENTAL PROBLEMS

The major environmental problems of Nepal are deforestation, erosion, declining agricultural productivity, impure water, and the rate of population growth.

1) Deforestation - Although estimates vary, most authorities agree that the forested area in Nepal is rapidly disappearing. In 1964 an estimated 15.7 million acres of land in Nepal was regarded as forested land; in 1975 that figure was down to 8.9 million acres. Recent estimates made made with ERTS satellite data show a reduction of forested land from 30 to 22% of Nepal's total land area. The Food and Agriculture Organization of the United Nations estimates that if present rates of deforestation continue, Nepal's forests will be gone in just 10 years. Deforestation in Nepal is caused by:

   Clearing land for agriculture - As population grows, more land is needed for food crops. Because nearly all the land suitable for crops is already under cultivation, marginal lands are cleared, planted for a few seasons, then abandoned to erosion when productivity falls.

   Collecting firewood and fodder - The average person in Nepal uses 546.3 kilograms (kg) of firewood a year; the estimated sustainable yield from Nepal's forests is 77.9 kg per year. Firewood provides 87% of the fuel needs of the Nepalese; as forests are pushed back for agriculture, more time is spent collecting it. Living trees are stripped of branches and leaves for fodder for livestock, further reducing the ability of trees to reproduce themselves, and any natural reproduction is eaten by animals grazing along the forest floor.

   Cutting of timber and collecting other forest products - Contracts are sold by His Majesty's Government to timber concerns to cut timber in Nepal's forests, and timber is one of Nepal's export products. Little effort is made to reforest such areas, and even coarse grass is cut and sold for basket making in India. Saw mills in the Tarai are one of the few industries in Nepal; government development projects have first priority for sawn timber.

2) Erosion - Erosion, a result of deforestation, causes the loss of 240 million cubic meters of topsoil a year from Nepal, its "most precious export." Erosion is a natural process in the young and geologically unstable Himalayas, but at least 50% of the landslides that occur during construction of roads and other development activities are the result of man's disregard of environmental factors such as cutting across watersheds or building bridges without regarding height of the flood stage of the

river. Erosion can be controlled if good soil and water conservation measures are adopted. Farmers often do not have knowledge of basic conservation measures such as contour plowing or strip cropping which could reduce erosion on steep hillsides.

3) Declining agricultural productivity - Until recently, Nepal was a food grain surplus country, exporting rice to India. However, agricultural productivity declined for the last two years as a result of the cultivation of marginal lands, inefficient farming practices, and limited supply of improved seed and fertilizer. Even though Nepal's economy is based on agriculture, only 10% of the land is flat or gently sloping where cultivation would have little detrimental effect; the rest is hilly and with steep slopes.

4) Impure water - Nepal has vast quantities of water in three major river systems, but there are few drinking water resources that are not contaminated. As of 1973 there were no public water supply systems in Nepal, nor any system of sewage disposal outside of large towns. Only 8% of Nepalese have access to safe and convenient sources of drinking water. High counts of coliform bacteria have been found as high as 4200 m near Mt. Everest.

5) Rate of population growth - Most of Nepal's environmental problems can be traced to overpopulation. At present, with a population of 13.8 million, Nepal has a growth rate of 2.5% per year. Some sources estimate that the population will reach 22 million in the year 2000, a 58% increase in just 22 years. Expanding populations require ever more land for agriculture and more wood for fuel. Recently a new phenomenon was reported that makes this more meaningful: farmers are starting to burn animal manure for fuel rather than place it on fields as fertilizer. This is the beginning of a destructive circle that can only result in further environmental destruction.

1.0 POPULATION CHARACTERISTICS

1.1 General Information

Nepal is a landlocked, mountainous country about the size of the State of Wisconsin with a population more than three times greater. Nepal's population has risen from 8.2 million in 1952/54 to 13.8 million in 1979 (based on projections from the last official census, 1971). In 1972 Nepal was divided into four development regions:

Eastern Development Region - Mechi, Kosi, and Sagarmatha Zones
Central Development Region - Bagmati, Narayani, and Janakpur Zones
Western Development Region - Gandaki, Lumbini, and Dhaulagiri Zones
Far Western Development Region - Rapti, Bheri, Karnali, Mahakali, and Seti Zones.

Population estimates are based on these development regions and on geographic distribution in the Tarai (Terai), hills, and mountain regions.

Table 1. Distribution of the Population of Nepal By Development Region and Subregion

Regions	1952/54		1961		1971	
	Persons	%	Persons	%	Persons	%
Eastern Region	1,930,508	23.4	2,273,496	24.2	2,797,500	24.2
Hills and Mts.	1,104,540	13.4	1,317,750	13.4	1,409,942	12.2
Tarai	825,968	10.0	955,746	10.2	1,387,558	12.0
Central Region	2,685,164	32.6	3,072,596	32.6	3,865,753	33.5
Hills and Mts.	1,296,205	15.7	1,747,178	18.6	2,095,517	18.1
Tarai	1,388,959	16.9	1,325,418	14.1	1,770,236	15.3
Western Region	1,779,191	21.6	1,998,663	21.2	2,465,540	21.3
Hills and Mts.	1,414,613	17.2	1,580,482	16.8	1,870,430	16.2
Tarai	364,578	4.4	418,181	4.4	595,110	5.2
Far Western Region	1,840,216	22.3	2,068,241	22.0	2,427,190	21.0
Hills and Mts.	1,515,712	18.4	1,698,083	18.0	1,834,128	15.9
Tarai	324,504	3.9	370,158	3.9	593,062	5.1
Nepal	8,235,079	100.0	9,412,996	100.0	11,555,983	100.0
Hills and Mts.	5,331,070	64.7	6,343,493	67.4	7,210,017	62.4
Tarai	2,904,009	35.3	3,069,503	32.6	4,345,966	37.6

Adapted from: Central Bureau of Statistics. 1977. The Analysis of the Population Statistics of Nepal. National Planning Commission, HMG Nepal.

1.2 Population Statistics

Present population growth rate: 2.3 to 2.5

Years to double population: 30

Population under 15: 42%

Population over 64: 3%

Projected population for year 2000: 22.1 million

1.3 Population by ethnic membership

Nepal is the only official Hindu kingdom in the world. Nepal's population is derived from two major groups - the Indo-Nepalese and the Tibeto-Nepalese. The Indo-Nepalese are Hindus and make up 60% of the total population, while the Tibeto-Nepalese, who are Buddhists, make up 20%. There is no great distinction made between Hindus and Buddhists in Nepal and they share common beliefs and systems. Adherents of one faith often participate in celebrations of the other, and accept certain similar gods and caste structures although they may name them differently. This may cause confusion during censusing since many Nepalese could just as easily call themselves Hindu even though they are derived from Buddhist ethnic groups.

Table 2. Percentage Distribution of Population by Religion

Religion	Year 1952/54	1961	1971
Hinduism	88.9	87.7	89.4
Buddhism	8.6	9.3	7.5
Islam	2.5	3.0	3.0
Others	0*	0*	0.1

*Less than 0.1%
Source: Tuladhar, Jayanti M. et.al.

Within the two major groups are many smaller ethnic groups or tribes. These include:

Indo-Nepalese (80%)
- Pahari
- Newar
- Tharu
- Indians of the Tarai

Tibeto-Nepalese (20%)
- Tamang
- Magar
- Rai
- Gurung
- Sherpa
- Sunwar
- Limbu
- Bhote

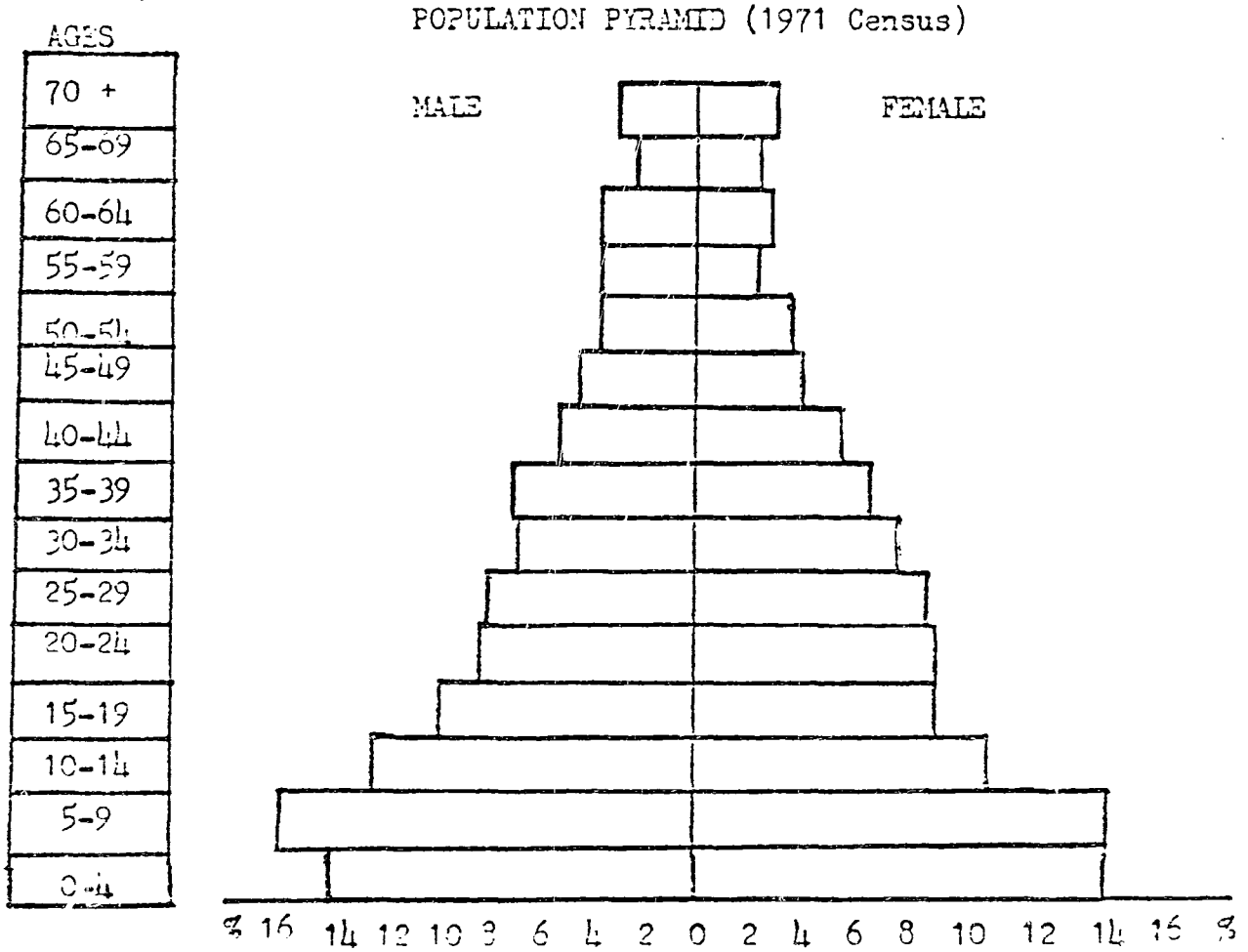
Most Indo-Nepalese live in the Tarai and lower hills, while the Tibeto-Nepalese live in the higher hills and mountains. The Pahari are the largest single group in the population. Their mother tongue is Nepali, now the language used in schools and for commerce, although most ethnic groups speak their own language as well. There are 30 languages and 5 regional groups of local dialects in Nepal, due to the relative isolation of groups and their ancestry.

Table 3. Percentage Distribution of Population by Mother Tongue

Mother Tongue	YEAR 1952/54	1961	1971
Nepali	48.7	51.0	52.4
Maithali	16.8	12.8	11.9
Bhojpuri	0.2	6.1	7.0
Tamang	6.0	5.5	4.8
Abadi	4.4	4.7	2.7
Tharu	4.4	4.3	4.3
Newar	4.7	4.0	3.9
Magar	3.3	2.7	2.5
Rajkirati	2.9	2.6	2.0
Gurung	2.0	1.7	1.5
Limbu	1.8	1.5	1.5

Adapted from: Tuladhar, Jayanti M. et.al.

Figure 1.



Adapted from: Central Bureau of Statistics. 1977. The Analysis of the Population Statistics of Nepal. National Planning Commission.

1.4 Rural-urban distribution of the population

In Nepal, 95% of the population is engaged in agriculture, with 60% living in the hills and the mountains and 40% in the Tarai. Population densities per square mile of cultivated land vary greatly, with densities of 2,600 in the high mountains, 2,725 in the hills, and 890 in the Tarai. The Tarai contains 73% of the total cultivated land in Nepal and produces 60% of the gross national product. Approximately 50,000 people permanently migrate to the Tarai each year from the hills and the mountains, while it is estimated that one million people migrate temporarily in search of seasonal employment and to trade. The total labor force is estimated at 4.1 million.

Only 5% of Nepal's population live in urban areas. The urban growth rate was 6.4% in 1960, 4.0% in 1970, and 5.6% in 1973.

1.5 Educational characteristics of the population

In the 1971 census, 14% of the population over five years of age are recorded as literate (able to sign their name). Primary school is free and compulsory at prescribed ages (under the 1962 Education Act). All schools are to be taught in Nepali under this Act. It is estimated that 34% (1973) of the primary school age population attends school, but only 7% (1970) of those old enough to attend secondary school do attend. Normal school curricula offer 10 years of school excluding technical or vocational school after secondary school.

Table 4. Proportion Literate 10 Years of Age and Over, 1971

Region	% Total	% Male	% Female
Eastern Development Region	15.76	26.77	4.33
Mechi	17.78	28.97	5.57
Kosi	18.57	30.09	6.31
Sagarmatha	12.99	23.46	2.52
Central Development Region	14.56	24.12	4.54
Janakpur	10.94	19.50	2.30
Bagmati	18.71	29.64	7.17
Narayani	12.90	21.60	3.46
Western Development Region	16.99	30.71	3.65
Gandaki	18.32	34.09	3.58
Lumbini	16.53	28.99	3.33
Dhaulagiri	14.04	25.71	3.02
Far Western Development Region	9.51	17.27	1.52
Rapti	9.96	18.59	1.54
Karnali	6.43	11.64	0.80
Bheri	9.12	15.70	1.98
Seti	7.46	13.78	1.05
Mahakali	14.26	25.96	1.91
NEPAL	14.32	24.72	3.66

Adapted from: Central Bureau of Statistics. 1977. The Analysis of Population Statistics of Nepal. National Planning Commission, HMG Nepal.

Nepal has one university and 40 colleges that offer degrees in science, commerce, art, music, and languages. There are several technical and vocational training schools, including the Nepal Engineering School, the Agricultural College, the Nepal Medical Institute, Nursing School of Bir Hospital, Technical Training School, and Vocational Training Institute, all located in Kathmandu, Nepal.

Tribhuvan University is the only university in Nepal that conducts examinations and awards degrees. The University was established in 1959 and expanded in 1971 to include all the colleges associated with it. As part of the degree program, every student must give one year of service to the National Development Service (Corps) before he can receive a diploma. The National Development Service is Nepal's volunteer corps that works in local and village development projects throughout the country.

1.6 Health characteristics of the population

1.6.1 Vital Statistics

Crude birth rate: 46.3 per thousand

Crude death rate: 27.8 per thousand

Infant mortality rate: 152 per thousand live births

Life expectancy at birth: 44 years

The general health level of Nepalese population is low. Nepal is considered to be a "relatively least-developed country" (UN sources) and for most of the rural population improved health programs have primarily dealt with the control and eradication of malaria, smallpox, leprosy and tuberculosis. Provision of general health services is hampered by the inaccessibility of many villages and the lack of trained medical personnel.

1.6.2 Medical facilities and health personnel

Until a few years ago, most health services were only available in the Kathmandu Valley and a few other big towns. Recently the government has begun to emphasize rural health services, and the construction of rural health posts. However, Nepal more than many other developing countries has severe shortages of medical equipment, facilities, and personnel. In 1978 there were 410 health posts in operation, and 34 health centers (1971).

Hospitals in Kathmandu Valley	No. Beds
Bir Hospital	300
Royal Army	170
Shant Bhawan	135
Anandaban	100
IRL Maternity	90
Kanti	50
Tokha	50
3 others	60
Total 10	1,000

Hospitals in Selected Towns	No. Beds
Biratnagar	100
Dharan (British)	50
Rajbiraj	50
Janakpur	50
Birgunj	50
Pokhara	50
Shining	50
Butwal	50
Banke	50

Health Personnel

Doctors	325 (1978)
Nurses, Midwives	481 (1971)
Auxilliary Health Workers	405 (1971)

1 MD per 33,000 people (1975)
1 MD per 6,500 people in Kathmandu Valley
1 nurse/midwife per 23,000 people (1971)

Health programs are directed by the Department of Health, Ministry of Health. The Ministry administers existing hospitals and rural health centers, develops and constructs new facilities, supervises and trains nurses and health professionals, promotes health education, and directs the malaria control program with WHO cooperation (incidence of malaria was drastically reduced under this program; however, in 1975 incidence of malaria in the Tarai climbed). There are also private hospitals such as Shanta Bhawan which is affiliated with the United Medical Mission, a tuberculosis sanitarium, two leprosaria, and a maternity and child welfare center. Hospitals are generally understaffed, overcrowded, and ill-equipped. Electricity is unreliable, and x-ray facilities are few. Three regions of Nepal have no hospitals and 10 districts have no clinics.

Traditional Medicine

Many villagers in Nepal rely on local shamans for the treatment and cure of sickness and disease, believing that sickness is caused by ghosts, evil spirits, planetary influences and their ancestors. The Ayurvedic system of medicine is also practiced, based upon treatment with medicinal plants, roots, and herbs. There are approximately 140 Ayurvedic doctors and 34 dispensaries in Nepal, and a National College of Ayurvedic Medicine. The Department of Medicinal Plants is investigating many of these traditional plants for their effectiveness.

1.6.3 Health problems

In general, sanitation is very poor in Nepal, and potable water is not prevalent; gastrointestinal diseases are endemic. Hepatitis, amoebiasis, cholera, tuberculosis, and typhoid are widespread. Information is lacking about diet of Nepalese people, but it is clear that protein deficiencies and malnutrition are prevalent, especially among the children and in the Hill areas. In the north there is a high incidence

of cretinism and deaf mutism. Malaria in the Tarai was brought under control in the 1960's but in 1975 there was another serious outbreak, possibly due to the migration of people never exposed to malaria, and the development of resistence to pesticides in mosquitoes.

1.6.4 Sanitation and Water Supply

No public water supply systems have been developed in Nepal (1973), but the Sixth Five-Year Plan (1981-85) calls for the development of approximately 18,500 shallow tube wells in the Tarai region of the Central and Far Western Development Regions, and for 16,500 shallow tube wells in the Eastern and Western Development Regions. Water supply plans also call for the stationing of a Sanitary Inspector in each of the 75 districts by 1985. These programs are to be undertaken by the Department of Water Supply and Sanitation, Ministry of Water and Power, and the Local Development Department of the Ministry of Home and Panchayat. A newly-formed National Group on Water Supply will coordinate the national program for the International Drinking Water Decade of the World Health Organization (1979). Several pilot projects are currently underway to supply water to district headquarters. There are intermittent and chronic water supply problems in both urban and rural areas in Nepal, and many piped water systems suffer from low pressure. Even when wells, springs, and rivers supply enough water, it is often contaminated by untreated sewage. Water in Nepal used for industries such as jute and sugar cane mills may also be contaminated, but no information on this pollution source was available.

There are few facilities for sewage disposal in Nepal; the Sixth Five-Year Plan also calls for latrine programs, and solid waste disposal improvements are being undertaken on a pilot level in Bhaktapur. The Nepal Solid Waste Management Board, Ministry of Public Works and Transport, is developing a solid waste management scheme for the greater Kathmandu area. At present there are few facilities for sewage disposal, except in the urban area around and in the Kathmandu Valley.

Facility in Kathmandu Valley	% of Dwellings with facility
Access to Piped Water	47.7 (1961)
Access to Toilets	37.2 (1961)
Access to Excreta Disposal	14.0 (1975)

1.6.5 Family Planning and Birth Control

Although the family planning program in Nepal was begun in 1965, family planning services have been available since 1956. Services are offered through the Maternal and Child Health Section of the Department of Health. In 1968 the program came under the aegis of the Nepal Family Planning/Maternal and Child Health Board (FP/MCH). The goal of the FP/MCH is to reach those in the remote areas of Nepal as well as those in urban areas, train paramedical personnel, and provide immunizations for children in clinics. According to World Bank data, the percent of married women using contraceptives under the program has risen from 0.3% in 1969 to 17.0% in 1976. In 1978 the number of new couples who accepted different methods of contraception was only 5% of the group from 15 to 44 years of age. The proportion of couples who continue the use of contraceptives after initial acceptance, however, is estimated to be only 35% after one year.

2.0 ORGANIZATIONS WITH INTEREST IN ENVIRONMENT AND NATURAL RESOURCES

2.1 GOVERNMENT AGENCIES

The Kingdom of Nepal is a constitutional monarchy (Constitution of Nepal 1962, amended 1967) headed by His Majesty King Birenda Bir Bikram Shah Deva. The executive functions of government are performed by the King with the advice of the Palace Secretariat, the Council of Ministers, the Council of State, and the National Guidance Council. Legislative functions are performed by the National Panchayat, a body representing the top level of a four-tiered panchayat system, although laws can only be enacted by the King. Judicial functions are performed by the Ministry of Law and Justice with final authority resting in the Supreme Court. There are between 7 and 17 Ministries and Departments in the top levels of administration in Nepal, depending upon the functions allocated to them by the King. Of these, 8 have functions relating to environment and natural resources (as of April 1979).

NOTE: The panchayat system in Nepal is based upon village assemblies of all adults. There are four levels: village and town, district, zone, and national assemblies. The goal of this system as stated by the King is to foster the growth of democracy from the people by enlisting their active participation and cooperation in administration and economic development. All citizens over age 21 are members of village assemblies (lowest level) which elect village councils or panchayats. Towns (population 10,000 or more) also have assemblies and elect town panchayats. District assemblies are composed of one representative from each village and town panchayat in that district (there are 75 districts in Nepal; the number of village and town panchayats per district range from 2 to 126). District assemblies elect district panchayats. All members of district panchayats are also members of zonal assemblies (14 zones) which elect zonal panchayats. Zonal assemblies also elect a portion of the National Panchayat membership. The National Panchayat consists of 125 members, of which 90 are elected by zonal assemblies, 19 are representatives of class and professional organizations, and 16 are appointed by the King. The National Panchayat works with the King giving advice and consent to the enactment of laws.

2.1.1 National Planning Commission

The National Planning Commission was formed to operate as the highest supervisory body in Nepal in regard to development planning and education. The Commission advises the King and the National Panchayat on all aspects of economic development, including surveys and compiling statistics on population distribution, literacy, and health.

2.1.2 Ministry of Food, Agriculture, and Irrigation

The Ministry of Food, Agriculture, and Irrigation is responsible for the formulation of agricultural and food policy, research, survey, and the development of cultivation of food grains, oil seeds, lentils, fruits, vegetables, and other commercial crops and of dairy farming

and animal husbandry. This includes functions relating to protection of grains from pests, veterinarian services, fish farming, and agricultural chemistry, engineering, extension and education. Some of the departments under this Ministry are:

Department of Agriculture
Nepal Agricultural Service
Nepal Food Corporation
Agricultural Inputs Corporation
Agricultural Youth Program
Agricultural Development Bank

The Ministry also administers agricultural research farms, village-level agricultural education programs, survey and improvement of different food grains, fruits, and vegetables, and the development of pastures for improved breeding programs for domestic animals. An affiliated national institution is the Agricultural Projects Services Center (APROSC) which is responsible for project formulation, evaluation, and training in agriculture and rural development. It is headed by Thakur Nath Pant.

Minister: Lal Bahadur Khadayat (June 1979)

2.1.3 Ministry of Forest

The Ministry of Forest is responsible for the formulation of forest policy, survey, measurement, mapping and demarcation of State and other forests, forest protection, afforestation, and utilization of forests. The Ministry also is responsible for protection, use and supervision of wildlife, including National Parks, sanctuaries, and preserves (some of these functions may be under the National Parks and Wildlife Conservation Office, which is part of the Royal Palace). Other functions include planting and protection of trees on roads and parks in urban areas, watershed and other multipurpose projects relating to proper land utilization, and botanical survey and policy. Departments and offices in the Ministry of Forest include:

Department of Soil and Water Conservation
Forest Department
Department of Medicinal Plants
Nepal Forest Service
Royal Botanical Gardens and Herbarium
Royal Pharmaceutical Laboratory
Museum of Natural History

The Ministry also administers the following (as of 1976):

Koshi-Tappu Wildlife Reserve
Sagarmatha National Park (Mt. Everest)
Royal Sukla Phanta Wildlife Reserve

Training and training schools for forestry are also under this Ministry.

Minister: Netra Bikram Thapa (June 1979)

2.1.4 Ministry of Home and Panchayat

The Ministry of Home and Panchayat is concerned primarily with law and order in Nepal, including police, jails, traffic control, and all matters relating to citizenship. Of interest to environment and natural resources are its responsibilities for community development, inaccessible regions and local development, and relief operations during natural disasters. All panchayat affairs and legislation are performed by this Ministry. Any function of His Majesty's Government that is not specifically assigned to any other secretariat or Ministry is the responsibility of the Ministry of Home and Panchayat.

Minister: Jog Mehar Shrestha (June 1979)

2.1.5 Ministry of Industry and Commerce

The Ministry of Industry and Commerce is responsible for the formulation of industrial policy, industrial exploration, research and survey, and administration of industrial legislation, training and industrial associations. It is also responsible for formulation of commercial policy, research, exploration and survey. Some of the Ministry's functions include:

Cottage industries
Industrial facilities
Tourism
Exports and Imports
Commercial facilities
Mining policy
Minerals development, research and survey
Administration of mining legislation

Under this Ministry are the Departments of Commerce, and of Mines and Geology, the Industrial Licensing Board (1970), and the Industrial Services Center (1971), and the Trade Promotion Center.

Minister: Hari Narayan Rafauria (June 1979)

2.1.6 Ministry of Land Reform

The Ministry of Land Reform is responsible for arrangements relating to land, land administration, land tax collection, and survey and measurement of lands, as well as resettlement and land reclamation. Several of the departments under this Ministry are periodically transferred to the Ministry of Food, Agriculture, and Irrigation, with their appropriate functions. Under the Ministry of Land Reform is the Survey Department, headed by Arjun Bahadur Basnyat (1978).

Minister: Hem Bahadur Malla (June 1979)

2.1.7 Ministry of Public Works and Transport

The Ministry of Public Works and Transport is responsible for new construction and repair and maintenance of State roads, bridges, buildings, airports, and ropeways. Transportation services including airports, railways, highways and main roads are administered by the Ministry. The Ministry is also responsible for town planning, housing projects, engineering schools, the Transport Corporation and Organization, and the Nepal Engineering Service.

Minister: Pashupati S.J.B. Rana (June 1979)

2.1.8 Ministry of Water and Power

The Ministry of Water and Power is responsible for the formulation of policies governing the control and utilization of water resources and the promotion, planning, implementation and maintenance of multi-purpose schemes relating to water resources. This includes casual functions relating to water resources to be performed by HMG. Functions of the Ministry include:

- Irrigation and minor irrigation
- Water supply
- Flood control
- Sewage control
- Electricity supply and the Electricity Corporation
- Hydrology
- Meteorology

Under this Ministry is the Department of Irrigation, Hydrology, and Meteorology, headed by Bhubaneshwar Kumar Pradhan (1978).

Minister: Marich Man Singh (June 1979)

2.1.9 Other Governmental or Semi-governmental Agencies

2.1.9.1 Center for Economic Development (CEDA)
Tribhuvan University, Katnmandu.

The Center for Economic Development operates as a research and development center and conducts studies both as part of government programs and with other private groups and foreign agencies.

2.1.9.2 Institute of Agriculture and Animal Science (IAAS)

The Institute of Agriculture and Animal Sciences was set up to serve as a training center for mid-level agricultural technicians. It is staffed partly by professionals deputed from the Department of Agriculture and partly by professionals from India. The IAAS trains junior technicians and degree personnel for agricultural institutions in Nepal, trains vocational agricultural teachers, and provides short courses and pilot programs with villages to meet the needs of the local farming community. The first students received their diplomas in agricultural education in 1976.

2.2 NONGOVERNMENTAL ORGANIZATIONS

2.2.1 Nepal Nature Conservation Society

The Nepal Nature Conservation Society is an affiliate of the National Audubon Society, U.S.A. It is headed by Dr. Dibya Deo Bhatt, Botany Department, Institute of Science, Tribhuvan University, Kathmandu.

2.2.2 Nepal Research Centre (Thyssen House)

- no other information available.

3.0 LEGISLATION DEALING WITH ENVIRONMENT AND NATURAL RESOURCES

Most legislation in Nepal is enacted by His Majesty King Birenda Bir Bikram Shah Deva on the advice and with the consent of the National Panchayat. Each Act gives the power to frame rules to carry out the provisions of the Act to His Majesty's Government; however, the Department or Ministry charged with doing so is not always identified. Rules and Regulations are framed within 2 or 3 years. Occasionally no rules are framed to carry out the Act, in which case it is likely the Act is not enforced. Acts and Rules are both amended by the National Panchayat and by King Birenda. Acts, Rules, and Amendments are published in the Nepal Gazette (in Nepali) to inform the public.

3.1 RENEWABLE RESOURCES

3.1.1 Water Resources

There are very few regulations in Nepal that deal with water quality or conservation. The laws primarily deal with the use of water for irrigation, electricity generation, or for public health purposes.

3.1.1.1 Irrigation, Electricity and Related Water Resources Act. 1967

Provisions: To regulate use of rivers, streams, falls, and underground water resources; ensure development of electricity and regulate its output and supply; and to provide for irrigation to ensure its development in a proper manner. According to this Act, no one may use water resources without a license except for:

- meeting daily personal needs
- operating wind mills for cottage industry purposes
- operating water mills or irrigation channels
- irrigating lands through underground water by tube wells.

No license is needed for drawing water for irrigation from gullies, aqueducts, streams, ponds, wells, lakes, canals or dams through the labor and resources of local people as long as "no adverse effect is created on any hydroelectric or irrigation project of His Majesty's Government constructed before or after the commencement of this Act."

Applications to obtain licenses to use water for other than the above purposes must include information on volume of water sought, purpose, area where water will be utilized, and place where the utilized water will be released. Licenses are issued by the prescribed authority (HMG designates the authority by notification in the Nepal Gazette) and cannot be sold or transferred without permission.

This law also allows His Majesty's Government to: acquire lands for dams and irrigation channels; lay pipelines; establish reservoirs or water supply centers; develop any water source directly and distribute it without a license; send inspectors to examine any licensee; and order any licensee in the public interest (licensee must comply). Under this Act, HMG is given power to frame rules pertaining to:

- quality and standard of water to be supplied
- prevention of harmful effects of survey, control, and utilization of water resources and the use of water
- prevention of the contamination of water
- water wasted in the course of utilization for industrial, commercial, or other purposes.

Implementation: Under the Ministry of Water and Power. This Act repeals: Irrigation Act, 1961; Electricity Act, 1963; Electricity, Motor or Power (Transfer and Removal) Act, 1961. Liabilities and rights of the Nepal Electricity Board accrue to HMG.

3.1.1.2 Canal Management Rules, 1974

These Rules were framed under the 1967 Irrigation, Electricity, and Related Water Resources Act (above).

Provisions: His Majesty's Government is given the power to construct canals with the objective of utilizing any water resource for irrigation. Under these Rules, any person who wants to utilize water in a canal, irrigation channel, reservoir, dam, sluice, field channel, drain or any other structure linked to a canal, irrigation channel or reservoir must submit applications to the Canal Officer, Irrigation Office, Department of Irrigation and Hydrology. The Canal Officer may allot water for irrigation by turn in such quantities as he deems reasonable considering the area, type of crops, type of soil, and quantity of water available in the canal. Persons irrigating their land with canal water must pay a water cess (tax). Local Panchayats must provide laborers for repair and construction of canals if workers are not available or if the canal is exposed to danger.

The Canal Officer may prohibit, for the safety of the canal, any alterations or closures of any canal, or unauthorized entry into the canal. He may also prohibit:

- reduction or increase in the volume of water flowing from any canal or tampering with it
- spoiling or soiling of the water of any canal in such a manner as to render it less useful for the purpose for which it is supplied

- permitting cattle to move about, graze, or wander in the canal area
- uprooting, felling, or destruction of trees, plants and grasses in the canal area
- encroaching on land situated along any river, stream, waterfall, pond or lake if water flows through or is stored there naturally.

Canal Officer must notify village and district panchayats and public if any of these actions are prohibited.

Implementation: By the Irrigation Office, Department of Irrigation and Hydrology, now under the Ministry of Food, Agriculture and Irrigation (as of 1974).

3.1.1.3 Town Panchayat Act, 1962

This Act makes arrangements and provides for the formation of town panchayats under Article 93 of the Constitution of Nepal.

Provisions: Under this Act, the duties and powers of the Town Panchayats in the areas under their jurisdiction are detailed. Duties and powers of Town Panchayats that deal with water resources include:

- making arrangements for safe and clean drinking water
- constructing, repairing and cleaning roads, bridges, drains, outlets, lavatories and urinals
- cleaning up unused water spouts, wells and ponds
- constructing and repairing water taps and tanks for animals
- constructing and maintaining tanks, wells, dams, and irrigation channels
- making arrangements for electricity and water supply.

Implementation: Town Panchayats have autonomous governmental functions as part of the panchayat system and implement duties and powers directly.

3.1.1.4 Other Laws Relating to Water Resources

No information was available on the following legislation dealing with water resources:

Water Tax Act, 1966
Aquatic Animals Protection Act, 1961 (see 3.1.3)

3.1.2 Forest Resources

All of Nepal's private forests were nationalized in 1957, but several sources mention that some private forests are now in existence. No confirmation of that was found, however. Nepal has many laws that deal with forest resources. Only those

provisions that affect environment and natural resource use are detailed here.

3.1.2.1 Private Forests (Nationalization) Act, 1957

Provisions: To prevent the destruction of national wealth and to nationalize private forests for their adequate protection, maintenance and utilization. In this Act, private forests include all land wholly or partially revenue-exempt or on which rights have been acquired by individuals and utilized by them, as well as waste land within the boundaries of such forests. Forests not to be considered private for the purposes of this Act include:

- Stray trees in the midst of cultivated lands and orchards situated withing residential compounds or separately
- Plantations of trees exceeding 25 ropanis in the Kathmandu Valley and hills, or 5 bighas in the Tarai that were planted and maintained by a person with his own labor*.

Decisions as to whether a forested area is private or included in a private forest, demarcation of forest boundaries or area of any private forest will be made by an officer appointed by HMG.

Under this Act, the ownership of all private forests in the entire country accrues to HMG, and no claims for compensation may be made.

Implementation: By the Ministry of Forests.

3.1.2.2 Forest Act, 1961

Provisions: This Act deals with the demarcation of State forests, actions prohibited in State forests, export of timber and other forest products from State forests, and penalties imposed for prohibited actions. State forests are defined as all forests other than forest parks and panchayat forests, including waste lands, streams, ponds, and paths. Forest parks are defined as groups of trees planted by any person through his own labor on land owned or possessed by him. Forest products are defined as wood, trees, bark, lac (resin), leaves, fruits, herbs, floral materials, charcoal, oil extracted from wood, and wild animals and their parts and products.

Under this Act, HMG may order any authority to demarcate the boundaries of State forests in the area (authority may be Forest Officer, Divisional Forest Officer, or Ranger). Lands within State forest boundaries are to be included in the forest, and landowners will be compensated. HMG may classify forests for utilizing or protecting them for specific purposes. Forests kept for one purpose may not be used for another except by order of HMG.

*1 ropani = 0.125 acres
1 bigha = 1.67 acres

No person has a right to State forests except when such rights are granted by HMG through contracts or permits. Actions prohibited in State forests include:

- deforestation, plowing or cultivation
- setting fire or leaving or carrying fire in the forest in such a manner that fire may spread
- grazing cattle or releasing them
- carelessly causing any kind of damage while cutting, felling, dragging or exporting trees
- cutting or clipping trees or plants, cutting their branches, stripping their bark or causing any damage to them
- taking out stone, manufacturing charcoal or lime
- taking out any forest products.

Penalties for these prohibited actions range from a fine of Rs. 20 for grazing an elephant on State forest lands to imprisonment for a maximum of one year for deliberately setting the forest on fire. Persons who change, erase, or destroy markings on trees or change boundary markers are liable to imprisonment up to two years or a fine of Rs. 1,000 or both.

Panchayat Forests - A State forest in any area or any part of it may be entrusted to any Village Panchayat by HMG for the benefit of villagers for use in the prescribed manner (above); these forests are called Panchayat Forests. HMG however still owns the forest and they may not be cleared and settled; HMG may resume control if necessary.

Groves - Any person who wishes to plant a new grove of trees on land which is under his title and possession may do so up to 25 ropanis (Kathmandu Valley and hills) or 5 bighas (Tarai). HMG may prohibit or control the clearing of any grove, the reclamation* of waste lands, grazing of cattle, burning of lands, or the transportation or clearing of leaves and grasses in groves if it is necessary to do so for:

- protection from storms, winds, washouts, floods, or avalanches
- prevention of soil erosion in hilly areas and expansion of gorges and ravines
- protecting the land from being covered by sand, gravel, soil, or lakes
- maintaining the volume of water in sources of streams and lakes
- protection of roads, bridges, dams, canals, railway lines, and telephones

*In Nepalese laws the term "reclamation" refers to the clearing of lands in forested areas for use as farms and habitations; that is, lands are reclaimed for use by people directly.

-protection of public health.

Export and Import of Timber - HMG is given power to frame rules relating to the export or import of timber or other forest products from State forests, including prescribing the routes for movement of timber, inspecting and marking timber, issuing licenses. In particular, HMG may frame rules to:

- ensure that streams and banks are not closed for floating timber or that no obstruction is caused by throwing grass or foliage on such streams
- prohibit cutting or sawing of timber, the manufacture, burning, or drying of charcoal and the alteration or erasure of markings.

All timber floating in streams, thrown on banks or not marked is property of HMG. Forest Officer or police may use force to prevent offenses under this Act, search any place after serving notice, impound tools, vehicles and forest products if suspect. Forest officer may arrest without warrant a suspect who may escape; such person must be brought to trial within 24 hours (excluding time of travel from forest to nearest authority).

Implementation: Forest Officers, police, Divisional Officers, employees of the Ministry of Forests, and any other authority as designated by order of HMG.

3.1.2.3 Forest Protection (Special Arrangements) Act, 1967

Provisions: To make special arrangements for the protection of forests and wildlife in order to maintain law and order as well as the economic welfare and morality of the general public. Under this Act, no person may take or attempt to take the following actions without prior written permission of the District Forest Officer or other officer in any forest in Nepal other than groves and panchayat forests:

- remove any forest product of a value exceeding Rs. 50
- reclaim land in any manner or build a hut within the forest
- cut off, fell, or enclose any tree or plant within forests, extract the bark in such a manner as to cause trees to wither, chop branches, or set forests on fire
- attempt in any manner to cause harm to forests, forest products, wild animals and lands situated within forest areas.

It is the duty of local people, panchayats, and government employees to prevent any person from committing

the above offenses, apprehend such persons, and prevent their escape. The Forest Officer, while discharging his duty, may, if his own life is in danger, shoot at an offender below the knee. If any person has reclaimed lands inside a State Forest, the Officer may demolish any buildings and confiscate the crops. Penalties for offenses range from Rs. 200 and one month imprisonment to Rs. 500 and six months imprisonment depending on crime committed. Accomplices will be awarded the same penalty as person who actually committed the crime.

Implementation: Employees of the Ministry of Forest, including Forest Protection Officers, Conservators, Divisional Forest Officers, Rangers, Forest Guards, and armed employees; local panchayats; and the general public.

3.1.2.1 Panchayat Forests Rules, 1968

Provisions: If a government forest adjoins a village panchayat in any hill area, HMG will allocate a portion of such forest for the village panchayat according to the population of the area and its needs. (Hill areas are defined as areas to the north of the watershed line of the Mahabharat hills other than the Kathmandu Valley and the Trisuli watershed project area.) Village panchayats, under the general supervision of the Chief Conservator of Forests, are responsible for the protection of panchayat forests and for:

- proper utilization of panchayat forests
- planting and growing of seeds or saplings within panchayat forests
- preventing reclamation of or resettlement in panchayat forests
- protection of State forests.

Village panchayats must comply with directives of the Minister of Forests, use a permit system, and maintain records. Forest products needed for inhabitants of the village panchayat shall be made available only from panchayat forests; residents shall not be entitled to use any forest products other than foliage from State forests without permission. Timber or other products from panchayat forests may be sold or distributed to local people in accordance with the 1970 Forest Products Rules. Fifty percent of the income from panchayat forests is to be used for protection and conservation (along with afforestation) of panchayat forests.

Implementation: Village Panchayats under the supervision of the Chief Conservator of Forests, Ministry of Forest.

3.1.2.5 Forest Products (Sale and Distribution) Rules, 1970

Provisions: No person may enter a forest area to procure forest products without obtaining permits under these rules from the empowered officer, or take timber obtained under permit without having it marked with the official seal. No permit is necessary for collecting herbs and drugs in any forest in the hill area north of the Mahabharat range. Under these rules, HMG may grant permits to persons who submit applications giving the name of the forest area, name of forest product desired, category and quantity of forest product, description of marking to be affixed, and price of forest product to be sold. HMG may also:

- sell forest products for public development purposes
- give priority to the Timber Corporation, saw mills, catechu factories, match factories, and similar industrial concerns in allotment of marked forest lots and sell them at prices determined by evaluation
- sell firewood to the Fuel Corporation
- sell forest contracts or supply forest products on the basis of a contract.

Fuelwood is defined as wood which is less than 5 feet long and 2 feet in circumference, or is bent, twisted, hollow, dry or rotten, or wood which cannot be used except as fuelwood even if it is longer or has a larger circumference. Wood of the following species is not to be considered fuelwood unless it is hollow, rotten or decayed:

catechu (Acacia catechu)
sisau (Dalbergia sissoo)
satisal (Dalbergia latifolia)
dar (Bomorea regulusa)
okhar (Juglans regia)
champ (Michelia sp.)

Schedules attached to these rules identify species of trees, grasses and other forest products used as fuelwood and the prices to be charged for each, categories of timber, costs for pasturage by type of animal and number, and the method of calculating the volume of timber.

3.1.2.6. Forest Areas Lands Act, 1971

Provisions: All rights and titles of any landowner to lands within forest areas where this Act is enforced (Morang, Sunsari, and Jhapa districts, 1971) will lapse if such lands have not been cultivated by him personally and are instead cultivated by tenants. Landowners whose title has thus lapsed will be paid compensation at 5 times the amount of land tax paid on that land. (No compensa- paid on unregistered land.) Lands within these forest areas will be sold to peasants who have settled there

and who have been cultivating for at least one year at a rate of 4 bighas per family. Lands left over after sale or distribution will be sold or distributed by prescribed authority. No one may sell, give or donate such lands to any person until land is paid for except to the Agricultural Development Bank or other institution.

Implementation: Commissioner of the Resettlement Department, HMG.

3.1.2.7 Forest Areas Lands Rules, 1971

Provisions: These rules detail procedure to be followed for the sale and distribution of land, the amount of compensation to be paid, and define a landless peasant as a landless family which has adopted agriculture as its occupation and is so engaged.

Implementation: The Land Administrator of the district is authorized to sell and allot lands, register them, and dispose of cases arising from these duties. Other authorities may be designated by HMG.

3.1.2.8 Forest Products Development Board (Formation) Order, 1976

Provisions: This Order establishes the Forest Product Development Board whose duties include:

- formulation of policies regarding execution and operation of projects
- execution of specific projects
- opening depots for sale or supply of forest products including timber and firewood
- making forest products available to forest-based industries
- conducting research on short and long term demand and supply of timber and firewood

The Board is responsible to the Ministry of Forests. They may appoint staff and advisors for projects and perform other functions. Board members are as follows:

Chief Conservator, Forest Department - chairman
Project Chief - secretary and member
Representatives from:
Ministry of Forest
Ministry of Industry and Commerce
Ministry of Home and Panchayat

Any officer of HMG or foreign advisors may be invited to Board meetings as observers.

Implementation: The Board is under supervision of the Ministry of Forest, and must submit reports to the Ministry.

3.1.3 Wildlife Resources

3.1.3.1 National Parks and Wildlife (Protection) Act, 1973

Also called: National Parks and Wildlife Conservation Act, 1973

Provisions: To make arrangements for national parks, protect wild animals and birds and their habitat, regulate hunting, protect, conserve, develop and make proper use of places which are of special importance from the viewpoint of natural beauty. According to the major provision of this Act, HMG may, if it so deems necessary, declare any area a national park or preserve by notification in the Nepal Gazette indicating the boundaries of such park or preserve. Once an area has been declared a national park or preserve, HMG may alienate or transfer ownership or alter the boundaries by notification. For the purposes of this Act:

National Park - means an area reserved for the protection, management and use of wildlife, vegetation and landscape along with the natural environment.

Regulated Natural Preserve - means an area which is of importance from the scientific viewpoint and is reserved for scientific studies.

Wildlife Sanctuary - means an area reserved for the protection and management of wild animals and birds and their habitats.

Hunting Preserve - means an area reserved for the management of wild animals and birds for the purpose of allowing hunters to hunt them.

Preserve-- means a regulated natural preserve, wildlife sanctuary and hunting preserve.

Wildlife - means vertebrate animals of any species other than domesticated species.

Game - means the living or dead body of any wild animal or bird or any such part as can be identified.

Hunting - means the act of chasing, capturing, torturing or killing any wild animal or bird by any means, or of attempting to do so, or of extracting any part of its body or exterminating it or of taking out or destroying its eggs or removing, destroying or disturbing its nest.

National Parks: No one may enter a national park without obtaining an admission card or written permission of the designated officer. It is prohibited in national parks without written permission to:

- hunt wild animals or birds
- construct or possess a house, shelter or any other structure with any material
- occupy, clear, reclaim or cultivate any part or grow or harvest any crop
- graze any domesticated animal or bird, or water it
- clear, fell, remove or block trees, plants, bushes or any other forest product, or do anything to render any forest product dry, set it on fire, or otherwise harm or damage it.

- dig out mines, stones or remove any mineral, stone, boulder, earth or any other similar material
- cause loss or damage to forest products, or wild animals or birds or to any forest land
- block or divert any stream or river flowing through the park or any other source of water or use any harmful or explosive materials in the water
- carry arms, ammunition or poison personally.

HMG may give contracts for operating hotels, lodges, public transport services in national parks or may do so directly.

Regulated Natural Preserve: No person may enter a regulated natural preserve without written permission from the prescribed officer, nor take any of the actions prohibited in national parks without written approval of such officer. Any person who enters into a national park or preserve is liable for his own loss, damage or injury including death, and HMG is not liable for any compensation.

Hunting Preserve: The hunting of the following wild animals and birds is strictly prohibited:

Rhinoceros	Wild yak
Wild elephants	Swamp deer
Onager	Red bear
Tiger	Little boar
Spotted leopard	Red panda (Hokarpa or Habre)
Snow leopard	Hispid hare
Musk deer	Gauri gai
Krishnasagar	Chauka
Nayan	Sos
Chiru	Thulo dhanesh
Floriken (Fakrans)	Impeyan pheasant (damphe)
Crimson-horned pheasant (monal)	

Wild elephants which have run amuck and maneaters may be hunted on the orders of the prescribed authority.

Persons may obtain a license to hunt the following wild animals and birds in numbers determined by the prescribed officer based upon wildlife censuses:

Bear	Rattel
Otter	Phya
Stag	Porcupine
Red deer	Chogadha and Muse kharayo (rabbit)
Axis deer (chital)	
Hog deer (laghuna)	Flying rat (koiralo)
Blue sheep (naur)	Bearcat
Himalayan tahr (jharal)	Simetas
Serow (thar)	Wildcat and lynx
Ghoral	Monkey
Blue bull (ghodgadha)	Leopard
Wild boar	Clouded bear
Fox	Python
Crocodile (gohi)	All species of birds other than those prohibited above

HMG may revoke licenses to hunt at any time, and may, by notification in the Nepal Gazette, fix a time during which hunting will be prohibited in certain areas and for how long. Officers of HMG may, for the proper management of parks or preserves, hunt or remove any natural product or perform other functions inside parks or preserves. Officers may issue licenses to persons wishing to collect samples inside any national park or preserve for scientific purposes. Such persons may hunt any animal not prohibited in this Act or collect any insect, bacteria, fish or other natural product subject to prescribed conditions.

Further Provisions: Anyone securing game under a license must show the game to the licensing authority to record the game and to be issued a certificate to show that license was complied with. Game that has no certificate may be confiscated by HMG. To export or import game, a person must have written recommendation of Forest Ministry, HMG.

If a wild animal or bird attacks a person or domesticated animal and their lives are in danger, a person may use arms or take any necessary measures to prevent the attack. If a wild animal is thus killed, no offense will be considered to have been committed. (Not applicable to those disobeying this Act.)

If an officer believes a person has taken actions against this Act, he may secure a warrant and search and arrest that person, and take him before authority within 24 hours. If an offender or accomplice resorts to violence in order to free him or prevent his arrest or if the life of the officer is in danger or he must use arms, he may fire aiming below the knee.

Penalties Levied: Fines of Rs. 5,000 to 15,000 or imprisonment for 2 to 5 years or both may be levied against offenders if:
- offender hunts without a license inside any national park, regulated natural preserve, or wildlife sanctuary
- offender possesses rhinoceros horn unlawfully
- offender hunted protected wild animals or birds.

Accomplices will be given half of the penalty levied on the offender except if the offense was against tigers, elephants, or rhinoceros, in which case punishment will be equal.

Implementation: Officers designated by HMG in the National Parks Office, Preserve Office, or Wildlife Protection Office, or in the Forest Office. Investigations into offenses may be done by Rangers and police officers.

3.1.3.2 National Parks and Wildlife Protection Rules, 1974
Framed under the National Parks and Wildlife (Protection) Act, 1973

Provisions: These Rules further define the manner in which hunting may be done, types of hunting licenses, and the quotas

of particular animals and birds that may be taken under each kind of license. It also states that no person with or without a license may shoot any bird or wild animal if the animal is a female and is pregnant or has young, during seasons when hunting is prohibited, or at night. No person may hunt any wild animal or bird without the written permission of the Chief Officer of the National Parks and Wildlife Protection Office by:

- lying in ambush at water holes or salt licks or where animals take shelter
- laying nets, traps, nooses, or snares of any kind
- using poison or intoxicants
- using calls
- showing torches or lights
- using cars, jeeps, trucks, carts, tractors, aircraft including heliocopters.
- setting fire to grass or forest
- using dogs and domestic birds for hunting.

Any above method may be used to hunt maneaters or mad elephants except fire.

The rules also identify the types of arms that may be used to hunt particular types of animals.

Categories of Hunting Licenses:

District Hunting License - Licenses issued to Nepali citizens only by Chief Forest Office, Forest Division Office, or Chief District Officer. Valid for 2 weeks. Recipient may shoot maximum 4 wild animals other than hare (chaughada) and maximum of 10 birds from a given list. Issued only once a year to same person.

Ordinary Hunting License - Issued to Nepali or foreigner. Valid for 21 days. Recipient may hunt maximum of 6 wild animals other than hare and 20 birds from a given list. No more than 5 birds may be killed in one day.

Supplementary Hunting License - Issued to anyone with an ordinary hunting license to extend period of validity by up to 9 days. Valid for hunting animals in a given list upon payment of fees.

Bird Hunting License - Issued to Nepalis and foreigners. Valid for only one hunting season. Recipient may hunt maximum of 15 birds on a given list in one day.

Prohibitions: Only people with valid licenses for arms will be issued hunting licenses. The Chief or any officer appointed by HMG may fix an annual quota of wild animals which may be killed in a hunting sanctuary; hunting licenses will not be issued over this quota. HMG may lower the number of wild animals or birds which may be hunted in any district, hunting sanctuary, or any other place or suspend the issue of licenses for such hunting in case it becomes necessary to do so for the proper protection of any wild animal or bird.

Other Licenses: The Chief may issue professional hunters' licenses to anyone with experience in arranging necessary supplies and equipment for hunting and travel expeditions. Valid for one year. Person is not allowed to hunt any wild animal in any circumstances except when his life is in danger, or if an animal wounded by his party is escaping. A hunting guide license may be issued to anyone who is familiar with wildlife of an area where he wants to work. Hunting guide may guide hunters only in districts stated in license. Guides may not hunt animals except in self-defense or if a wounded animal is escaping.

No one may have more than one hunting license at a time except for supplementary and bird hunting licenses. Licenses may also be issued for capturing or collecting animals, birds, insects, fish or other natural products for the purpose of scientific research to officers of zoos or scientific laboratories, except for prohibited animals. License is valid for 3 months; may be extended by Chief.

Fees: Fees are due for capture of birds, wild animals, or insects, and may be collected from licensee before and after capture. Every hunter must also carry a hunting register in which he shall maintain accurate records of all birds and wild animals wounded or killed. Records must state place, date, sex of every bird or wild animal and be written in indelible ink within 12 hours. Fee schedules follow Act.

Implementation: Licenses are issued and cases are heard by all levels of Ministry of Forest employees depending upon type of license and offense committed, including Assistant Wardens, Wardens, Rangers, Divisional Forest Officer, Conservator of Forests, and Chief District Officers.

3.1.3.3 Royal Nagarjun Forest (Entry and Sale of Forest Products) Rules, 1975

Provisions: These Rules identify the need to obtain entry permits to enter the Royal Nagarjun Forest, fees payable for entry, fines for entering forest without a permit, and fines for damaging or demolishing the enclosures, walls, boundaries or markers of the forest area.

Implementation: Any officer designated by the Royal Wildlife Protection Department, Royal Palace.

3.1.3.4 Royal Chitawan National Park Rules, 1974

Provisions: These Rules identify the need for a pass to enter the Royal Chitawan National Park, fees payable for entry, driving, camping, use of services of guides, and carrying of domestic animals into the park and for fishing in the waters of the park. Prohibited actions

in the park without written permission of the Warden or other HMG employees include all of the actions prohibited in the National Parks and Wildlife (Protection) Act, 1973 (section 3.1.3.1) and the following:

- spend nights or camp at places other than those reserved for camping
- make a fire at places other than those reserved for camping or those prescribed by the Warden
- possess or carry arms, ammunition, explosives, bows and arrows, traps, nets, or poison or dry or fresh meat of any wild animal into the park
- hunt, kill, catch, chase, terrify or injure any wild animal or bird or remove, destroy or disturb the egg or nest of any bird within the park
- search for or excavate or remove any earth, stone, sand or other minerals within the park

Fishing is allowed on streams and ponds in the park subject to the conditions set by the Warden and on payment of fees. Persons living in or near the Rapti, Narayani, and Riu Rivers which form boundaries to the park may engage in fishing subject to the Warden's conditions.

No person may throw any poison or chemical which kills insects, intoxicants or poisonous substances inside or at the park from outside, or drop the same in rivers, streams, or any other source of water flowing through the park, or otherwise place such poisonous substances in such a way that they reach the park.

Boundaries: The Royal Chitawan National Park is situated between the Rapti River in the north and the Nepal-India border on the south, and between the Churs range in the east and the Narayani River in the west (not part of the original Act, the boundaries were added by notification in the Nepal Gazette in 1973).

Implementation: Warden of the Park, appointed by HMG.

3.2 NONRENEWABLE RESOURCES

3.2.1 Mineral Resources

3.2.1.1 Nepal Mines Act, 1966

Provisions: The Act states that mineral resources or deposits existing or discovered in any land belonging to any person are the property of His Majesty's Government. The Act deals primarily with the issuance of licenses and permits for prospecting mineral resources; contracts for exploiting, refining, transporting, selling and supplying minerals; appointment of Mines Inspectors; and conditions of service for workers in mines. Mines are defined as places where drilling has been conducted or is being conducted for the purpose of exploiting or

exploring mineral deposits, including natural gas and oil wells.

Implementation: Mines Inspectors, Ministry of Industry and Commerce, HMG.

3.2.2 Land Use and Agriculture

3.2.2.1 Land (Survey and Measurement) Act, 1963

Provisions: To make arrangements for the survey and measurement of lands and for determining their grade in order to maintain good relations among people of different classes, communities or regions in Nepal. HMG may survey and measure lands in Nepal in order to determine area, grade, and to register land in Nepal. Measurement of area are made as follows:

1 ropani = 5,476 square feet (an area 74 x 74ft.)
1 bigha = 72,900 square feet (270 x 270 ft.)

Areas are to be measured in the unit that is most commonly used there.

Grade of Lands: The designated authority will determine the grade of lands based on the following:

Dhanahar or khet

Abal - paddy sown or transplanted, irrigation always available, soil not mixed with sand or gravel and of best quality, two crops sown yearly.

Doyam - irrigation not always available, crops sown with help of rain, soil not mixed with sand or gravel and of good quality, two crops sown yearly.

Sim - no irrigation available, cultivation depends on rainwater, soil slightly sandy, one crop sown.

Chahar - soil sandy, gravelly or dry, crops sown only with rainwater, water dries up quickly, land at high level or terrace , only one crop sown. Paddy grown only in intermittent years.

Bhith or pakho

Abal - soil good and fertile, maize, millet, mustard and ghaiya can be cultivated instead of paddy.

Doyam - soil mixed with sand or gravel, poor quality, land steeply inclined, crops sown every 1 or 2 years. Instead of paddy, maize, kodo, ghaiya, mustard are grown.

Sim - soil sandy or gravelly, land steeply inclined, or on slope, plows not used, crops grown every 1 or 2 years. Only maize, kodo, ghaiya, mustard grown. Land covered with snow for a brief period.

Chahar - all lands except common pastures maintained for growing khar grass of for grazing cattle.

Urban lands will be graded by HMG through notification in the Nepal Gazette.

Implementation: Chief of Survey, Survey Inspectors, Surveyors, of the Department of Survey, HMG.

3.2.2.2 Land (Survey and Measurement) Rules, 1967

Provisions: These Rules further identify units of measurement for determining boundaries of lands and registering them. Additional units of area are:

Less than one bigha:
1 kattha = 1/20 bigha
1 dhor = 1/20 kattha
1 kanuwa = 1/4 dhor
0.5 kanuwa and up = treated as 1 kanuwa
Less than 0.5 kanuwa = ignored

Less than one ropani:
1 anna = 1/16 ropani
1 paisa = 1/4 anna
1 dam = 1/4 paisa
0.5 dam and up = treated as 1 dam
Less than 0.5 dam = ignored

The Rules detail procedures for marking the boundaries in panchayats and wards, notification, and keeping records (land registration).

Implementation: The authority to determine grade of lands is the Survey Inspector, Department of Survey. First and second fines for landowners who do not appear for registration are levied by the Settlement Officer, Land Reform Office; third time, by the Chief District Officer.

3.2.2.3 Land (Survey and Measurement) Rules, 1975

Provisions: These Rules give the procedure to be followed if a complaint is filed during registration of lands that have not been registered before. Also listed are the grades of urban lands, which are determined by a committee consisting of the Survey Officer, a representative of the Town Panchayat, the Tax Officer of the local tax office. Urban lands are graded as:

Zone A - lands situated in commercial areas and shopping centers where urban facilities are available.
Zone B - lands situated in residential and industrial areas where urban facilities are available and which adjoin Zone A land.
Zone C - residential and industrial areas with urban facilities not near Zone A land.
Zone D - lands situated in ordinary commercial and industrial areas where some urban facilities are available but far away from shopping centers.
Zone E - lands situated in residential areas where some urban facilities are available but far away from shopping centers in areas where shops dealing with consumer goods are located.

Urban facilities are defined as water supply, telephones, electricity and transportation.

Implementation: Complaints are heard by a committee composed of the Survey Officer, the Land Reform Officer or the Land Administrator, and the Chief of the Revenue Office.

3.2.2.4 Land Acquisition Act, 1961

Provisions: To amend and consolidate existing Nepal law relating to the acquisition of land and to provide for powers to acquire land needed for public welfare on payment of reasonable compensation. This Act states that HMG may acquire land for any public purpose (land includes permanent buildings, trees on the land, etc.). HMG may appoint an officer to visit the land under consideration for acquisition and do the following:

- measure the land, dig, bore, demarcate, and prepare designs for buildings to be constructed there
- cut, demolish or remove any crops, enclosures or trees and plants while surveying the land

Landowners whose land is acquired have the right to compensation. Compensation is based upon local opinion polls to determine reasonable value of the land, the expenses incurred by concerned person for relocating, and the loss of trees and crops on the land. Compensation is paid from HMG treasury.

Implementation: Officer appointed by HMG for the purpose of land acquisition.

3.2.2.5 Highway (Construction Arrangement) Act, 1964

Provisions: To make arrangements for acquisition of land for the construction of highways. HMG may declare any road which has been or is being constructed a highway by notification in the Nepal Gazette. Notices are to be posted along route of proposed highway for 15 days, after which the land is considered to be acquired. No compensation will be paid for this land, but crops and other objects on the land may be taken away by the landowner.

Implementation: Officer appointed by HMG as published in the Nepal Gazette.

3.2.2.6 Highway (Construction Arrangements) Rules, 1968

Provisions: These Rules deal with the amount and type of compensation to be paid to people in the construction of highways if the house, building or more than 50 percent of their land falls withing the highway boundaries. A Compensation Assessment Committee is directed to decide how much should be paid to landowners for such property. The Committee consists of:

Chairman of District Panchayat
Chief District Officer
Land Administrator (or head of Revenue Office)

Engineer in charge of project or local technician designated by HMG
Nonofficial person from the district nominated by HMG.

Compensation will be either in cash or in land based upon the price of the house or land, extent of loss of standing crops or trees, and extent of loss due to relocation of residence or business.

Implementation: Under the Ministry of Public Works, Communications, and Transport.

3.3 OTHER LEGISLATION CONTAINING ENVIRONMENTAL PROVISIONS

3.3.1 Tourist Industry Legislation

3.3.1.1 Mountaineering Expedition Regulation, 1976

Provisions: Any mountaineering team desiring to carry out an expedition to any Himalayan peak of Nepal must obtain a license from the Ministry of Foreign Affairs. The Act gives procedures for obtaining licenses, fees, hiring practices for liaison officers, porters, and guides. The Act also states that:

- the team shall not do any activity that may harm the customs, usages, religious, social and cultural traditions of local people of the area or route of the expedition
- where the team finds any rare object during the expedition, such object must be turned over to the liaison officer
- the team shall pitch tents and camp only at places acceptable to local people or allowed by HMG
- the team shall burn or bury all containers and boxes of materials used at a camp before leaving in such a way that the "clean environment of the river banks, religious places or places of public importance may not be adversely affected."
- the team shall not damage or destroy any tree, products of any tree, or other forest resources surrounding the area or route of the expedition.

Implementation: Locally, by the liaison officer appointed by HMG; otherwise, the Ministry of Foreign Affairs.

3.3.1.2. Ancient Monuments Protection Act, 1956

Provisions: To acquire and protect ancient monuments and historical or artistic objects of archaeological importance by maintaining control on the protection of ancient monuments, trade in archaeological objects, and excavation of the sites of ancient monuments. The Act defines ancient monuments, gives procedures for declaring protection of monuments, and details manner of pro-

tecting monuments. Provisions that deal with the environment include:

- HMG may restrict construction of tunnels or blasting of earth by dynamite in the area around ancient monuments
- HMG may punish with fines or imprisonment any person who destroys, demolishes, removes, alters, disfigures or uses any ancient monument for unauthorized purposes.
- HMG may ban export of historical, artistic, or archaeological objects from Nepal.

Implementation: Archaeology Officer and officers appointed by him locally.

3.3.2 Industry and Commerce Legislation

3.3.2.1 Mills Act, 1965

Provisions: This Act deals with the establishment of mills which process rice, lentils, flour or molasses or which saw timber through the use of oil, steam, or electricity. The licensing process includes a provision for examining the site of a proposed mill to determine:

- whether or not the operation of the mill at the desired place will cause any inconvenience to educational institutions, hostels, hospitals, or other institutions, offices and roads and paths of public importance in the area
- whether or not the place suggested is at least 3 miles from the Nepal border.

Implementation: Licenses are issued by the Department of Industry, and inspections are done by District Panchayats.

3.3.2.2 Export and Import (Control) Act, 1956

Provisions: HMG can, on order, prohibit or control the export of any commodity throughout the Kingdom of Nepal. This Act gives HMG the power to issue export and import licenses, appoint authorities, regulate and provide facilities for export and import industries.

3.3.2.3 Export and Import (Control) Rules, 1963

Provisions: These Rules detail the procedures for obtaining licenses for export and import for trade with countries other than India (with whom special trade agreements exist).

3.3.2.4 Export and Import (Control) Rules, 1967 Including Licensing System for Trade with India, 1967

Provisions: These Rules list the items that are covered by import controls under the 1956 Export and Import (Control) Act, items that are banned from import, items that are banned

from export, and the composition of the Import Regulation Board. Items of interest that may not be exported include:
- cows and bullocks
- horn, skin and bone of rhinoceros
- boulders to be used for road construction.

Implementation: Licenses issued by the Export-Import Controller, Ministry of Industry and Commerce.

3.3.2.5 Gift Parcel Rules, 1972

Provisions: These Rules give the allowances for gift parcels for Nepali citizens and foreign tourists and the amount or value of parcels allowed to be exported. Parcels may not contain the following unless a license is obtained:
- hides and skins of wild animals of all kinds
- mica, processed and semi-processed stones
- peacocks' feathers
- bristles, human hair, and artificial hair.

Implementation: Under Ministry of Industry and Commerce.

3.3.2.6 Narcotic Drugs (Control) Act, 1976

Provisions: To control cultivation, production, manufacture, sale, purchase, storage, traffic, consumption, export and import of narcotic drugs. The Act applies to Nepalese and foreigners. Under this Act, no person shall:
- cultivate hemp (ganja), opium or coca
- produce hemp, opium or coca leaves or any other narcotic drug
- manufacture, process, sell or distribute narcotic drugs
- export or import, purchase, store, possess, consume or traffic in narcotic drugs.

Exceptions: Collection, storage, sale and purchase of chares from wild hemp in the western hilly regions of Nepal may be done for a specified time with licenses from HMG.

Implementation: Narcotic Control Administration, under the Ministry of Home and Panchayat.

NOTE: There are no laws in Nepal governing the use and marketing of pesticides or fertilizers, air and atmosphere, or fisheries except as cited above.

4.0 RESOURCES

4.1 Climate

Nepal is a mountainous country in the middle Himalayan Mountains, bordered on the south and west by India, on the north by Tibet (China), and on the east by Sikkim. Located between latitudes 26°22' N and 30°27' N, and between longitudes 80° E and 88° E, Nepal is roughly rectangular with an area of 145,305 km^2. Nepal's climate varies from tropical in the flatlands of the Tarai (Terai) to arctic in the high Himalayas. Climate in Nepal depends upon topography, altitude, and the amount of rainfall received from the southwest monsoon which arrives from June through September from the Bay of Bengal.

4.1.1 Topography and Altitude

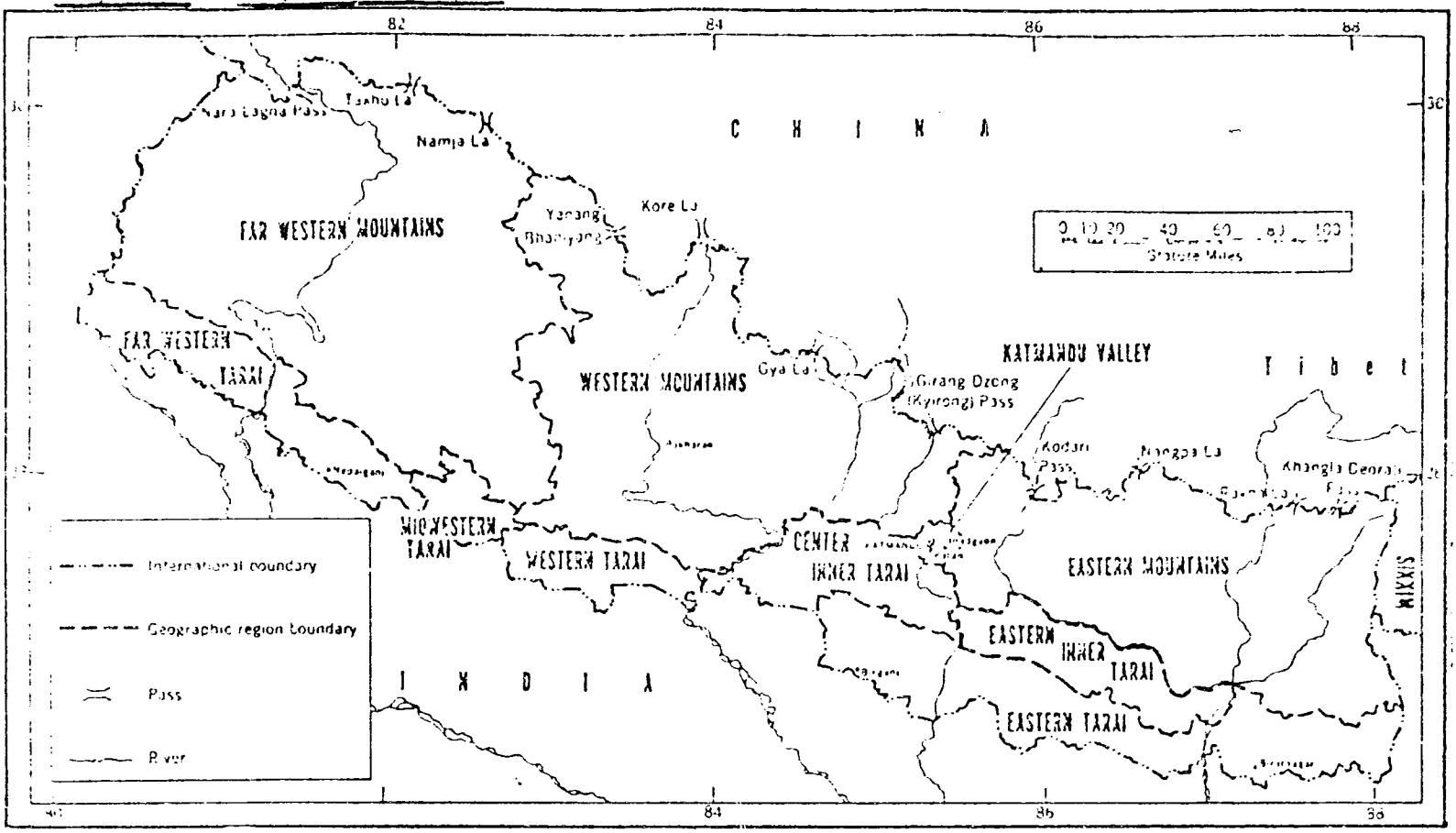
Nepal can be divided into three major topographic regions - the Tarai, the hills, and the mountains.

Tarai - The Tarai is the northernmost portion of the Indo-Gangetic plain, and is generally lower than 100 meters (m) in altitude. The Tarai can be further divided into eastern, eastern inner, center inner, western, midwestern, and far western sections (see Figure 2). The Tarai region varies in width from 0 to 45 km. The climate of the Tarai varies from subtropical to tropical, and is generally hot and humid, with vegetation of the wet monsoon type.

Hills - The hills of Nepal are composed of three sections - the Bhabar and Siwalik hills, the midland belt, and the Mahabharat Lekh range. The Bhabar is a narrow strip of land adjoining the northern edge of the Tarai with a humid tropical climate. The Siwalik (Churia Lekh) range rises above the Bhabar to a height of 1,000 m. A row of valleys (duns) lies between the Siwalik range and the Mahabharat range. The Mahabharat Lekh has an average altitude of 3,500 m. These hill areas have a cool but humid climate. North of the Mahabharat Lekh are the midland valleys of Nepal, nine wide valleys drained by branches of Nepal's major rivers. The Kathmandu Valley, one of these areas, has a very distinctive climate with three seasons - rainy, hot, and cold.

Mountains - Above the midlands rise the lesser Himalayas and the Great Himalayas. The Great Himalayas, an area 25 to 30 km wide from north to south, have an average altitude of 7,000 m, with 6 peaks at 8,000 m or higher. Sagarmatha, or Mt. Everest, is the highest mountain in the world at 8848 m (29,028 ft.). The climate in these mountains consists of long and severe winters with some permanent frost, and a relatively cool short summer. There is a wet alpine zone up to 4,500 m, and a dry alpine zone as elevations rise higher. The snowline varies from 3,600 m to 4,200 m. North of the Himalayas lies the Transhimalaya zone at an altitude of 4,500 m. This area, part of the Tibetan plateau, is an arid zone without trees and very open. Vegetation in the Transhimalaya zone is limited to alpine steppe types.

Figure 2. Regions of Nepal



Source: Harris, George L., et.al. 1973. Area Handbook for Nepal, Bhutan, and Sikkim. Second Edition. Foreign Areas Studies, The American University, Washington, D.C.

4.1.2 Rainfall Patterns

The amount of rainfall in Nepal decreases from east to west, and from south to north. The southwest monsoon travels west and north across Nepal, losing intensity as it goes. Rainfall is affected greatly by topography, with those areas in the southeast generally receiving more rain and rain of a longer duration. The country where the plains meet the hills receives higher amounts of rainfall, especially at the base of the main Himalayan range. Pokhara, which lies along the southern side of the Annapurna range, receives more rainfall than any other place in Nepal where records are kept.

Average Monthly Rainfall in Pokhara, 1957-65 (cm)

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
3.5	3.0	4.9	8.2	17.4	65.4	80.4	91.5	51.5	17.0	2.2	1.4	347.7

Moist monsoon air is forced upwards along the southern face of mountains in Nepal where much of its moisture is lost as precipitation. As a result, the northern faces of mountains receive substantially less rain. The Himalayas also block moisture-laden winds from reaching high valleys especially in the west. In some valleys rainfall is greatly reduced because

of strong upstream winds. The gap through which the Kali Gandaki river passes between the Dhaulagiri (8157 m) and Annapurna (7937 m) peaks provides an example of this reduction. The village of Jomson, at 2740 m in this gap, has the lowest recorded rainfall for any station in Nepal.

Average Monthly Rainfall in Jomson, 1957-63 (cm)

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
2.8	2.4	3.0	2.8	0.6	1.4	4.6	4.5	4.0	2.9	0.2	0.3	29.5

Altitude also has an effect on rainfall. A considerable part of the total rainfall at the lower altitudes is a result of heavy downpours, while at higher altitudes rainfall is less intense but more continuous, occurring as a perpetual drizzling mist and cloud. The heavy downpours in the foothills, though quite brief, are very intense. During these periods streams rise to fill their broad gravel beds and carry vast amounts of sediment and debris downstream.

As a result of the many deep gorges and steep mountains in Nepal, rainfall patterns vary greatly over short distances. Rainfall records only show rainfall for the immediate area and cannot be relied upon for determining rainfall over a large area of Nepal.

Average Annual Rainfall for Selected Areas

Biratnagar	150 cm
Barah	250 cm
Dudh Kosi	166 cm
Khumbu glacier	39 cm
Gadavari	250 cm
Kathmandu	170 cm
Nepalgunj	112 cm
Bilauri	100 cm

4.1.3 Temperature and Humidity

Temperatures in Nepal range from an average of 60°F in eastern Nepal (Morang district) to 50 - 55°F in the west (Kanchanpur and Kailali districts). The warmest month is June with an average of 90°F in western Nepal; the coldest month is January, with temperatures that fall below freezing at night. Temperatures in the Kathmandu Valley are fairly equitable.

Maximum and Minimum Temperatures in Kathmandu, °F

Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Maximum	66	80	80	84	86	90	90	86	87	88	88	82
Minimum	37	37	44	46	52	60	68	69	70	58	47	41

Source: Bhatt, Dibya Deo. 1970. Natural History and Economic Botany of Nepal. Ministry of Information and Broadcasting, HMG Nepal.

Relative humdiity in Nepal varies according to elevation, with the highest humidity in the Tarai during the monsoon season. Data on humidity are only available from the Kathmandu Valley, however, where

during July and August the relative humidity is 77.8 and 78.8 percent respectively, calculated on an average of four years.

Table 5. Monthly Average Relative Humidity of Kathmandu, %

Months	Year 1959	1960	1961	1962
January	60.5	59.6	60.1	66.7
February	54.1	53.4	60.0	75.6
March	44.9	-	46.6	56.4
April	43.2	-	51.6	51.9
May	61.6	-	45.3	57.9
June	-	66.9	56.0	75.4
July	76.1	83.0	77.1	75.0
August	75.6	75.7	79.8	84.8
September	75.7	76.0	74.1	75.7
October	71.0	69.4	69.7	60.1
November	63.4	55.9	65.3	62.3
December	62.3	60.1	64.2	64.4

Adapted from: Bhatt, Dibya Deo. 1970.

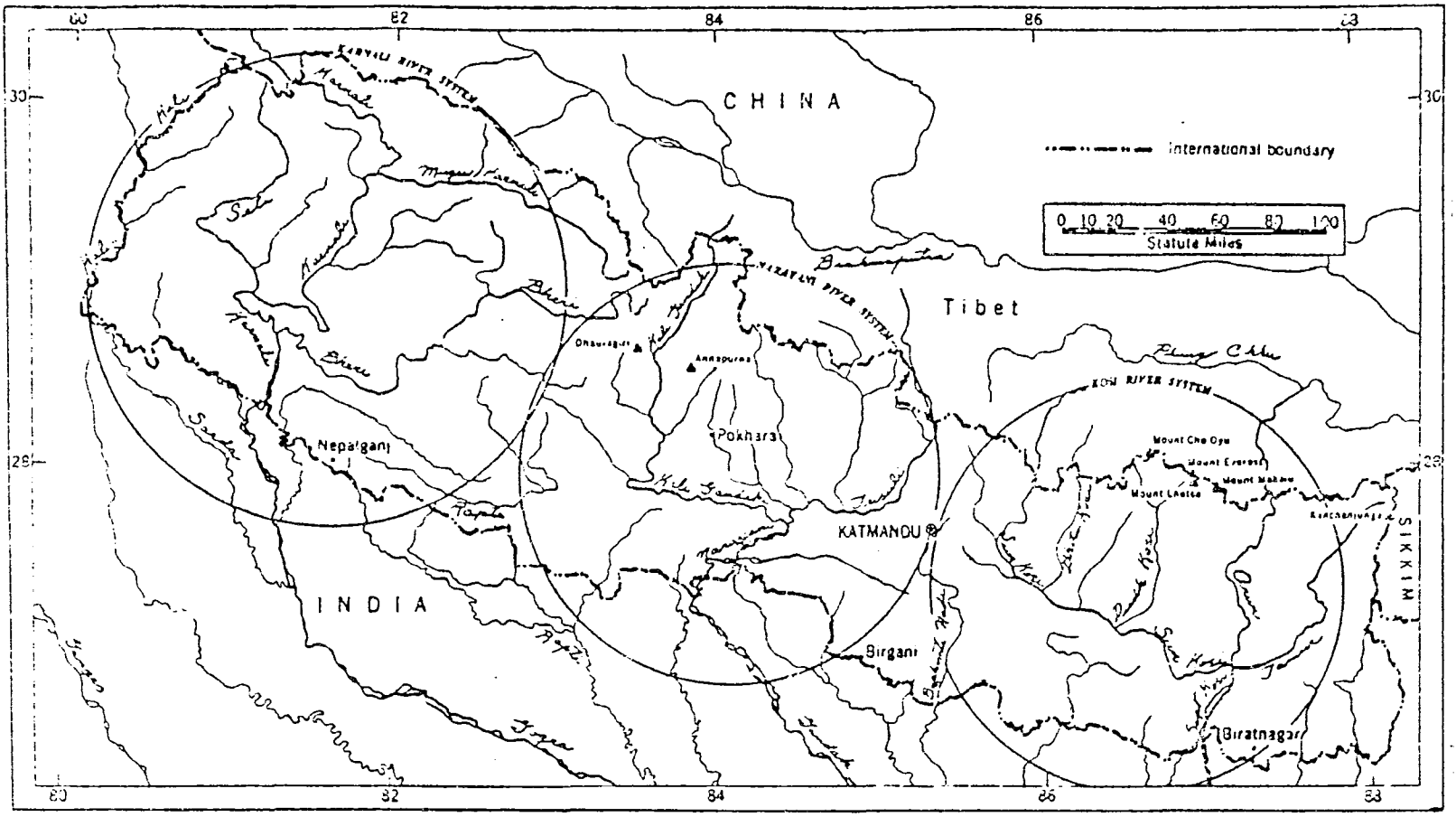
4.2 Water Resources

Nepal has an abundance of water both in lakes and in rivers. There are twenty-seven large lakes in Nepal, of which the most well-known are Fewatal in Pokhara (area 3 km^2) and Fuksundo in the Dolpa district (area 7.7 km^2). There are many smaller lakes and glacial lakes in the high Himalayas.

The three major rivers in Nepal are the Kosi, the Narayani, and the Karnali; between them, they drain the entire country (Figure 3). All three have their headwaters on the Tibetan plateau north of the highest peaks. Most rivers in Nepal travel south from Tibet until they reach the midland valleys and the Mahabharat Lekh, which deflects them eastward and westward to join these three major rivers. These three turn eastward, eventually joining the Ganges River on the Indian plain. During the monsoon season, these rivers carry vast amounts of sediment and debris and deposit them on the fertile floodplain. This raises the beds of rivers and their tributaries, worsening floods later on. Some estimates show that the river beds of rivers on the Tarai plain are raised by 15 to 30 cm each year (National Planning Commission, HMG Nepal, 1974). This also changes the course of rivers, and deposits worthless sand and gravel on very fertile agricultural land along rivers.

Kosi River - The Kosi drains the eastern third of Nepal. It is composed of 7 major tributaries, beginning as the Arun 100 miles inside Tibet. The Sun Kosi and the Tamur flow eastward and westward, joining the Arun north of the Mahabharat Lekh to form the southward-flowing Sapta Kosi (sapta means seven). Its floodwaters flow across the Tarai with no defined banks from June to September each year and leave heavy deposits of alluvial soil. This river is nicknamed "Bihar's Sorrow" in reference to the floods it causes in India's Bihar State.

Figure 3. The Major River Systems of Nepal



Source: Harris, George L. et.al. 1970.

Narayani River - The Narayani cuts through the western (central) mountains of Nepal northwest of Pokhara. It has the deepest gorges in the world. The Kali Gandaki, its major tributary, has a streambed at 1100 m where it flows between Annapurna and Dhaulagiri, the two highest mountains in the region. This river has a great potential for hydroelectric power because of the great distances water falls. The Narayani is navigable in its lower reaches by small barges during the winter or when the river is not in flood.

Karnali River - The Karnali is the longest river in Nepal, formed by three rivers, the Karnali, the Bheri, and the Seti. Rivers that form the Karnali are characterized by deep gorges that are too wide to be crossed by local suspension bridges, and the currents are too rapid to be negotiated by dugout canoes. The Karnali thus tends to isolate settlements along its course, and hinders travel to other areas.

The rivers in Nepal have a potential for generating hydroelectric power estimated at about 186,400 Kws. In 1964, three hydroelectric plants were in operation with a combined capacity of 2,250 Kws. By 1977, several new power plant projects increased this installed capacity to 33.4 megawatts (Kosi River project, Trisuli River project, Panaoti project), although the huge Karnali project (capacity 3,600 megawatts) had not begun as of 1978.

There is little information on groundwater resources in Nepal. People do use tube wells for drinking water purposes, but most water for domestic and farm uses comes from rivers, streams, and irrigation canals. Groundwater supplies have not been studied extensively in Nepal, although some work has been done on supplies in the Tarai and in the Bhabar regions (see Section 4.4). From 1952 to 1962, 3,700 wells were dug under village development programs to provide water for irrigation. Most of the water in Nepal is contaminated (see Section 1.6.4 on water supply and health).

4.3 Forest Resources

There are only a few estimates of the amount of forested land in Nepal. According to government data, the forested area of Nepal is estimated at 15.8 million acres, or 45% of the total land area; of this, 70% is located in the mountains or hills, and 30% is in the Tarai. Another estimate gives 8.986 million acres as the forested area (1975), a decline from 15.7 million acres (1964). Estimates made from satellite imagery (ERTS) indicate a decline over the last decade of forested land from 30 to 22% of total land area. Whatever figure is used, it is clear that the forests are disappearing in Nepal. The Food and Agriculture Organization of the UN estimates that if present rates of deforestation continue, Nepal's forests will be gone in just 10 years (1978 estimate). Other estimates put this figure at 15 years for the mountain and hill forests, and 25 years for the forests of the Tarai.

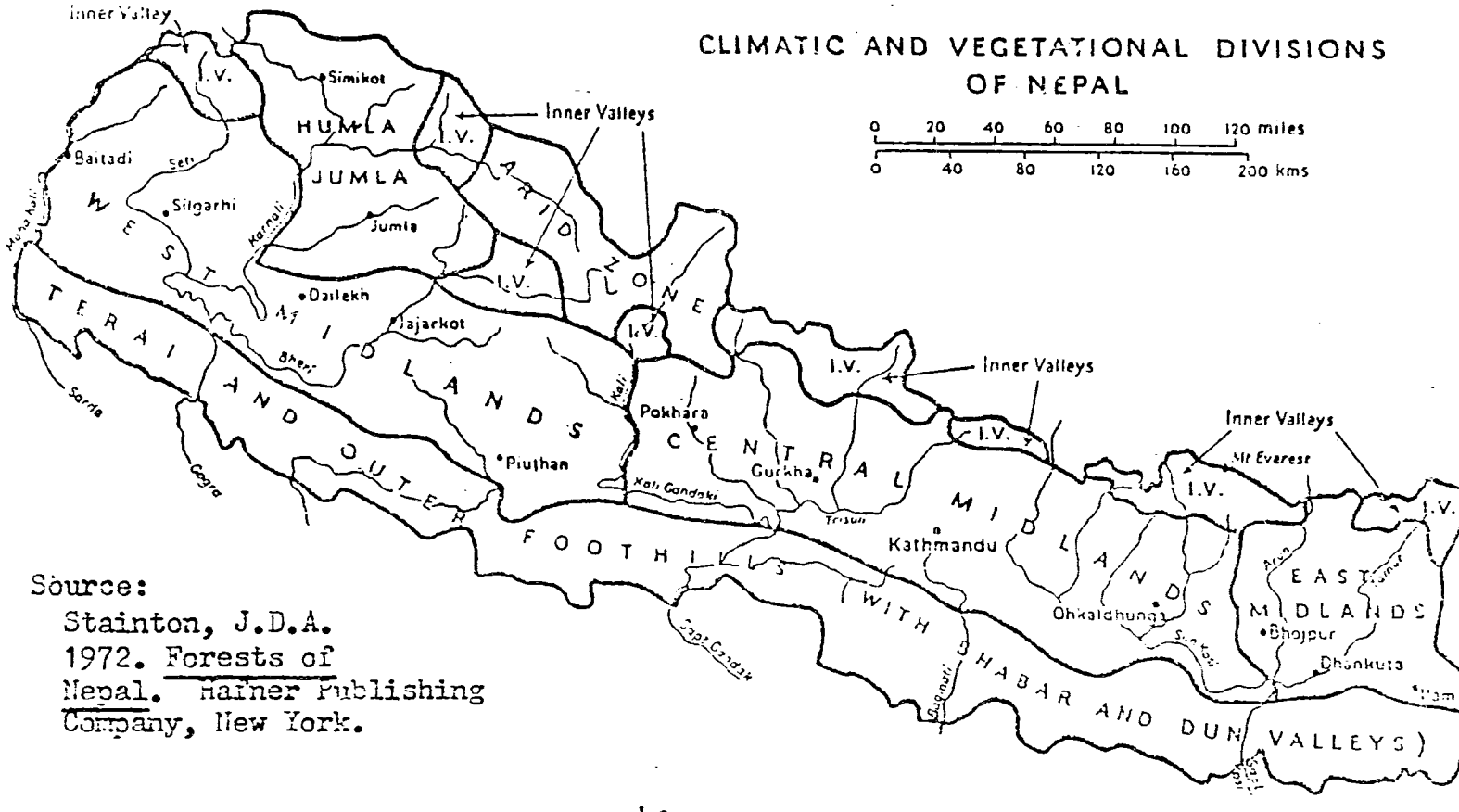
Several factors are responsible for this trend. Population is expanding at a rate of 2.3 to 2.6 percent a year in Nepal. As the population grows, forests are cut to provide more land for cultivation of food crops. In forests near villages, people cut trees for timber and firewood, and even cut branches and leaves for fuel and for fodder. Fragile mountain soils, deprived of the protection of the forest cover, rapidly lose the little fertility they had and are washed away by monsoon rains. Farmers are forced to move farther into the forests for new agricultural lands, abandoning unproductive ones. This ever-widening circle is responsible for much of the forest lost each year. Experts agree that all the land that can support agriculture in the hills is already under cultivation. In the Tarai, government settlement plans and illegal migration from the hills and from nearby Indian states are putting increased pressure on the existing forests. There are only a few small-scale reforestation programs in Nepal which must compete with the desire of farmers and the government alike to continue cutting Tarai forests for timber and farmland.

Firewood is another problem in Nepal. Firewood is used at a rate of 546.3 kg per capita per annum in Nepal. The estimated sustainable yield of firewood production from Nepalese forests is only 77.9 kg per capita per annum (1978). This represents a loss to the nation of 6.5 million tons of wood a year. With firewood scarce and expensive, the Nepalese are beginning to use dried animal manure for fuel, which results in lowered fertility on fields that previously were fertilized with manure. In addition, fewer people are boiling their drinking water, and eating hot meals because fuel is too precious. This leads to greater health problems because of poor nutrition and contaminated water.

4.3.1 Types of Forest

There are several types of forest in Nepal, roughly corresponding to the topography and climate found in various parts of the country. There are tropical and subtropical forests in the Tarai and Bhabar zones, temperate and broad-leaved alpine forests in the Mahabharat and midland zones, and temperate and alpine conifer forests in the lower and middle mountainous zones. Tropical forests are dominated by the Sal forest, a teak-like tree (Shorea robusta) that is used for construction. The bhabar zone contains sal and other valuable timber trees such as khair (Acacia catechu) and sissoo (Dalbergia sissoo). The forests of the bhabar are very important to the Tarai and are still fairly complete. The bhabar zone has a soil that is mainly gravel, boulders, and sand brought down from the Siwalik hills and the Mahabharat Lekh in monsoon-fed streams. The bhabar forest serves as a sieve to filter out this debris so that it is not deposited on the fertile Tarai floodplains. The Siwalik and Mahabharat ranges support sal forests as well, but above 900m sal gives way to oak and pines. Above 3,000m on the Mahabharat Lekh there are more temperate species such as walnuts, maples, horse chestnuts, wild cherry, birches, rhododendron, larches, firs and bamboo species. The mountain slopes on the south have oaks while the shady, drier northern slopes have conifers and oaks. Up to 3,300 m oaks are mixed with maples, spruce, fir, and bamboo. Above 3,600 m oaks are mixed with juniper and ash. There are birches up to the tree line (3,900 to 4,200 m). Above 4,200 m there is stunted vegetation, and finally only mosses and lichens on bare rock.

Figure 4.



Source:
Stainton, J.D.A.
1972. Forests of Nepal. Harner Publishing Company, New York.

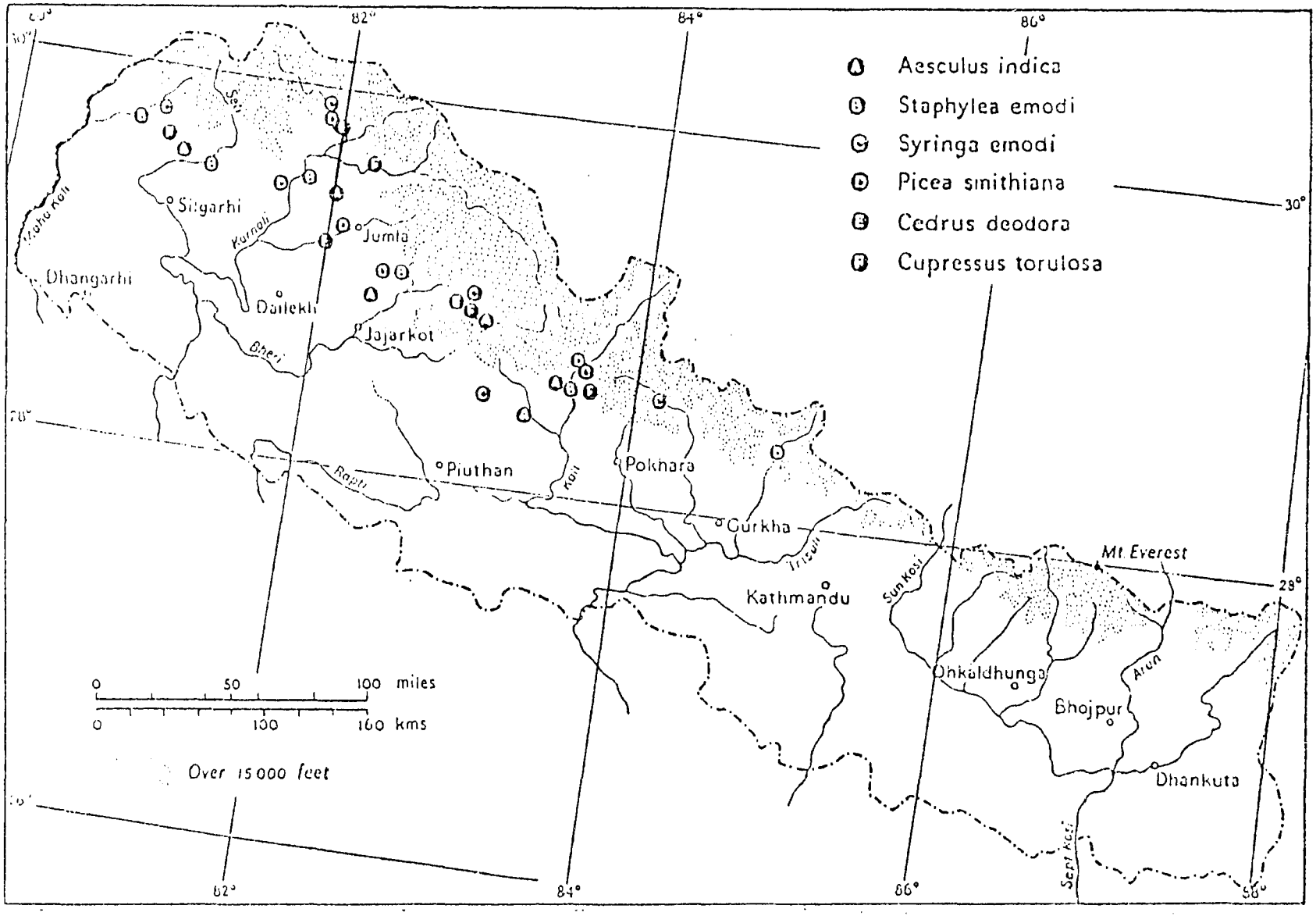


Figure 5. Distribution of West Himalayan species
Source: Stainton, J.D.A. 1972. Forests of Nepal.

4.3.2 Forests as Wildlife Habitat

The forests of Nepal support a wide variety of wildlife from crocodiles in the Tarai jungles to the snow leopard in the high Himalayas (see Section 4.5 for wildlife resources). The largest number and populations of animals and birds were found in the jungles of the Tarai where few people lived until the last few decades. The Tarai jungle was noted for big-game hunting (elephant, tiger) in areas reserved for the royal family and their guests. Today Chitawan National Park preserves that original habitat for the people, although the land outside park boundaries is barren. In parks and forests around the country various species are protected from hunting, but the real threat to their continued existence is disappearing habitat as the jungles and forests are cleared. (See Section 3.1.2 for forest rules and legislation.)

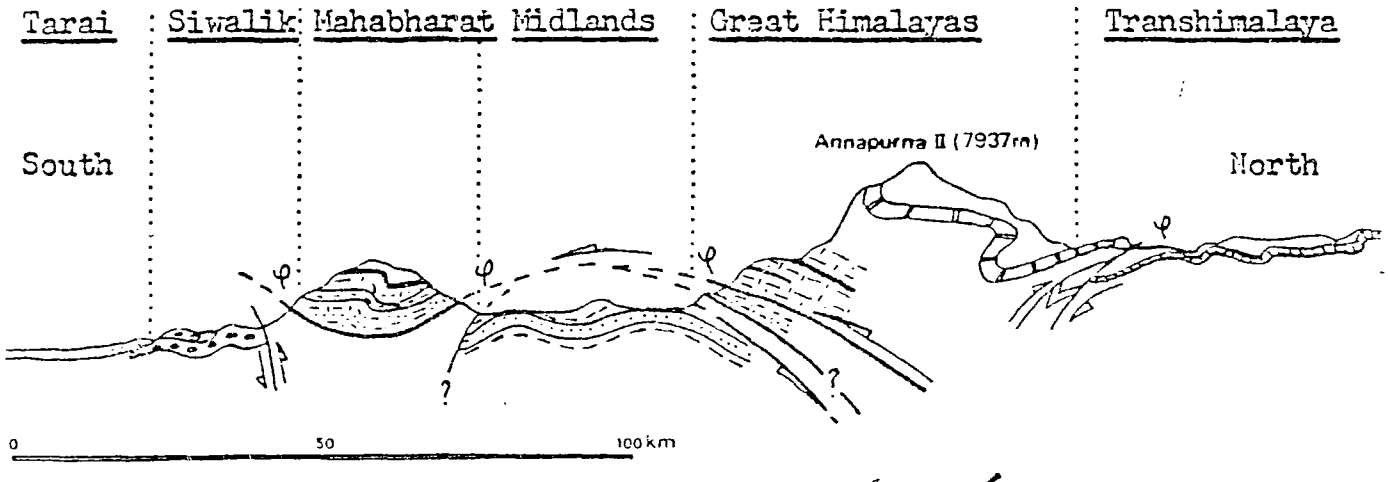
4.3.3 Forest Utilization

Most houses in Nepal use some wood along with stone, slate, and tile and thatch. Some forest products such as charcoal, resin, bark, and timber are marketed in Nepal and in India. There are several saw mills in operation in the Tarai, built to utilize the forests that were being systematically cut under contract with HMG. (See Section 3.1.2.2 on export of timber.) The government wants to establish local forest industries such as pulp, paper, turpentine, plywood, and medicinal herbs to diversify the economy and to ease the pressure on forest lands. Collection of firewood is a major use of forests in Nepal (Section 4.3). Some species of trees have limited protection from utilization as firewood, such as catechu, sissoo, satisal (Dalbergia latifolia), dar (Bomorea regulusa), okhar (Juglans regia), and champ (Michelia sp.). (See Section 3.1.2.5 for forest industry regulations.)

4.4 Soil and Erosion

Nepal's soils are derived from several different geological sources. Soils in the Tarai are mainly alluvial, deposited on the plain by

Figure 6. Geological Structure of Nepal, North to South



Source: Dobremez, Jean-François. 1976. Le Népal - Écologie et Biogéographie. Éditions du Centre National de la Recherche Scientifique, Paris, France.

Nepal's river systems, and sometimes show strata of finely ground silt, clay or sand. The soil is poor in organic matter and contains a low amount of nitrogen, although potassium and phosphorus are adequate. The Siwalik soils are made of tertiary sandstone and clay; in their northern parts soils show podzolic and brown earth characteristics. Soils in the Bhabar are porous, coarse sand and gravel, mixed with large boulders. Water from the mountains soaks into the bhabar soils and disappears, only to appear again as springs in the Tarai. In the mountains there is little organic matter, and soils are formed by the breakdown of gneiss, quartz, and mica schist. Valleys in the mountains may have sandstones, limestones, and clay. Along lower mountain slopes soil is often red or yellow where pine trees occur, but it is succeeded by brown or gray podzolic soils at higher altitudes. Sal forests are usually associated with red soils.

The soil of the Kathmandu Valley has been studied more intensively than soils elsewhere in Nepal. The soil is clayey with a lot of organic matter, but has no distinct soil profile. There is peat in the valley which is dug out and burned as fuel. Kathmandu Valley was once a huge lake (200,000 years ago), and water logging, leaching and low temperatures are responsible for the formation of peat. The water table in the Valley is rather high, and soil pH varies from 5 to 9.

4.4.1 Erosion

Nepal's Himalayas are the longest, largest, and youngest mountains on earth. Geologically they are very unstable, and erosion of the steep mountain slopes is a natural process that is continually breaking down the mountain rock into soil. It is estimated by FAO that 50% of the landslides that occur in Nepal are natural geologic occurrences. Wind and rain contribute to this natural erosion. However, mounting population pressures are beginning to account for more erosion than natural processes. Erosion of mountain areas cleared for cultivation is the primary source of the 35 to 70 tons of topsoil lost per hectare each year. The minimum soil loss in Nepal under natural conditions is 1 to 10 tons/ha/yr. On agricultural lands this reaches 10 to 20 tons/ha/yr. Both figures are tolerable as long as soil is constantly being made. In the mountains, however, the amount of soil lost is 20 to 50 tons, while in eroded gullies it may reach 200 to 500 tons/ha/yr. This erosion leads to extreme flooding downstream, silting of reservoirs and lower productivity on agricultural lands. The annual loss of topsoil, estimated at 240 million cubic meters, has been described as Nepal's "most precious export."

The practices used by farmers can exacerbate erosion. Nepalese farmers plow up and down instead of on the contour; they plant the same crop year after year, and they leave little vegetation on fields. Erosion is also caused by development projects such as road and bridge construction, and by logging, mining, transmission lines, and reservoirs. The government of Nepal, recognizing these problems, has established a Department of Soil and Water Conservation in the Ministry of Forests to promote better land management practices. Together, erosion and deforestation are Nepal's two worst environmental problems.

4.5 Wildlife Resources

Nepal has a wide diversity of wild animals and birds, ranging from species found in tropical humid jungles in the Tarai to alpine and tundra species in the high Himalayas. Many of the species in Nepal are presently described as vulnerable to extinction, threatened, or endangered. Nepal has made progress, however, in protecting several of these species, particularly the Great Indian Rhinoceros, Rhinoceros unicornis and the swamp deer, Cervus duvauceli duvauceli. The National Parks and Wildlife Protection Act of 1973 gave the government the power to designate national parks, preserves, and sanctuaries for this purpose, and identified 23 species of wild animals and birds that are totally protected (see Section 3.1.3.1 for complete list). This Act also designates 28 other species that may only be hunted with licenses and in numbers determined by HMG officers as a result of wildlife censuses.

4.5.1 Birds

By 1950, 563 species of birds were listed in Nepal, of which 150 were new to the Indian subcontinent (Ripley, S. Dillon. 1950. Peerless Nepal. National Geographic, Vo. XC. VII. No.1). Among the birds of Nepal are the spiny babbler, magpie robin, Tibetan skylarks, crimson-horned pheasant, hawk-eagle, and the national bird of Nepal, the damphe (Lophophorus impeyanus). Other birds found throughout the country are sparrows, finches, partridge, thrush, lark, woodpecker, warblers, king-fishers, owlet, shrike, heron, duck, and cattle egret. Several bird species are totally protected, including the damphe and the crimson-horned pheasant or monal. However, all other bird species not identified as protected in the National Parks and Wildlife Protection Act may be hunted with licenses based upon censuses.

4.5.2 Wild Animals

The forests of the Tarai have in the past sheltered some of the finest game animals. During the Rana period in Nepal (1846-1951), hunting in the jungles of the Tarai was a privilege reserved for the royal family. An account of the first Rana's hunting party included: 21 elephants, 31 tigers, 7 stags, 1 rhinoceros, 1 boa constrictor, 11 wild buffaloes, 10 boars, 1 crocodile, 4 bears, 20 deer, 6 pheasant, and 3 leopards. There are many wild animals in Nepal that are listed as endangered or threatened*, including the following:

Canis lupis	Wolf
Cuon alpinus	Asiatic Wild Dog
Melursus ursinus	Sloth bear
Neufelis nebulosa	Clouded leopard
Panthera pardus	Leopard
Panthera tigris tigris	Indian tiger
Elephas maximus	Asian elephant
Sus salvanius	Pygmy hog
Moschus moschiferus moschiferous	Himalayan musk deer
Panthera uncia	Snow leopard

*International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland and the U.S. Fish and Wildlife Service.

Presbytis entellus	Entellus langur
Prionodon pardicolor	Spotted linsang
Rhinoceros unicornis	Great Indian Rhinoceros
Cervus duvauceli duvauceli	Swamp deer
Bubalus bubalis	Asiatic buffalo
Bos gaurus	gaur
Bos grunniens	Wild yak

Two of these species, the rhinoceros and the swamp deer, though endangered, have experienced a resurgence in populations in Nepal. The rhinoceros is totally protected within Chitawan National Park in the Rapti Valley, part of its original range, and it is estimated that 250 of the animals now live in and around the park. Trade in rhinoceros products is severely restricted, and poaching has declined greatly due to punishment meted out to illegal hunters. The swamp deer is also totally protected in the Sukla Phanta Sanctuary (Preserve) where its numbers are estimated at 1,000. The swamp deer population in this sanctuary is especially important as a food source for the 15 to 20 tigers that inhabit the area.

There is little information on reptiles and amphibians in Nepal. Only the gohi (crocodile) and the python are protected by law, but both may be killed with licenses.

4.5.3 Fish

In the Tarai there are many kinds of fish in streams and rivers, including the catla, rohu, and bowari. Fishes found in the Phewa Tal, Pokhara, include several kinds of carp, murrel, gar, and spiny eels. Two important game fish are the mahaseer (Barbus puttitora) and the "snow trout" asla (Oreinus richardsoni). Some of the species of fish in Nepal are distinct to the area, such as the Diptychus annandalei, while others are found throughout India. The Fisheries Department has introduced the mirror carp into the country, but suggestions for introducing Tilapia species have been rejected. In the Tarai are many small fish ponds (less than 2 acres) which contain catfish and murrel. The Government of Nepal has established several fish farms at Hetauda, Parwanipur, and Bhairawa in the Tarai to produce fish for market in the urban areas. Government biologists are also looking at cultivation of Chinese carp in the temperate regions of the country.

4.5.4 Wildlife Utilization

Wild animals and birds are hunted for food by local people throughout Nepal, although some of this has been restricted by law. Hunting is generally not allowed in parks, forest, and preserves, but under certain conditions and with official permission, hunting can still be done. In the past the rhinoceros was hunted almost to extinction for its horn, which it was believed had aphrodisiac properties. It is allowed in Nepal to kill wild or mad elephants that "run amuck" and cause damage as well as man-eating tigers and leopards. However, most hunting is done on a small scale by farmers for their immediate family's needs. Certain wild animal products are not allowed to be exported from the country (see Section 3.3.2.4 and 3.3.2.5).

4.5.5 Wildlife Protection

With the passage of the National Parks and Wildlife Protection Act of 1973, protection of wild animals and birds became a goal of His Majesty's Government. Under this Act, several national parks, preserves, forests, and sanctuaries have been designated where protection ranges from complete protection to hunting at specified times and with specified equipment (see Section 3.1.3.1 and 3.1.3.2 for complete information). Some of the areas designated include:

Chitawan National Park

Established by law in 1973, the park has an area of 80,000 hectares in the Rapti Valley. This park has an abundance of wildlife including the rhinoceros, axis, hog, swamp, and muntjac deer. It is located in the Tarai up to the hills of the outer Himalayas.

Sukla Phanta Sanctuary (Reserve)

This reserve provides total protection to the swamp deer and its predator, the tiger. It is located in a moist deciduous sal forest with neighboring grasslands, with an area of 125 km^2.

Royal Nagarjun Forest

This forest was established in 1975. Regulations for the forest include entry permits, fines for entering the forest without a permit, and for damaging walls, boundaries and markers of the forest area.

Royal Karnali-Bardia Wildlife Reserve

This reserve, in the southwestern Tarai, was one of three former royal hunting reserves designated for protection by HMG Nepal and the World Wildlife Fund's "Operation Tiger" project. The reserve protects one of the largest tiger populations left in the Tarai, swamp deer, and the gharial crocodile (Ghavialis gangeticus). The reserve also contains nilgai (Boselaphus tragocamelus) and many chital (Axis axis).

Several parks and preserves have been designated as possible Man and the Biosphere/UNESCO reserves (1975), including Chitawan National Park, Khumbu National Park (which includes Mt. Everest, sometimes called Sagarmatha National Park), Langtang National Park in east central Nepal, Lake Rana National Park in west Nepal, and two forested areas, the Kosi Tappu, a sissoo forest, and Thakurwara, a moist decidous sal forest. (See Appendix A for names of Nepal's MAB/UNESCO committee members.)

Under the 1973 Act, HMG may designate any area a park, reserve, or sanctuary by notification in the Nepal Gazette, and may later mark the boundaries in the same way. This gives the government the ability to move fairly quickly to protect certain areas if there is a need to to do so. King Birenda Bir Bikram Shah Deva is committed to a policy of wildlife protection and conservation, and under his direction that is also the policy followed by the Ministries concerned.

4.5.6 Danger to Wildlife

The primary danger to wildlife in Nepal is the loss of habitat due to population pressure. As more people clear land for cultivation, and as development projects flood valleys behind dams, or cut roads and trails through previously inaccessible areas, more pressure is put on wildlife. Some wild animals in Nepal depend upon very small, unique habitats for survival; when these are depleted, the animals either adapt, migrate or die. The creation of parks, sanctuaries, and forests where certain animals are totally protected is a commendable step, but there are many unknown species in Nepal that should also be protected. The creation of biosphere reserves under the UNESCO Man and the Biosphere program would protect all of the species, both plant and animal, in three areas in Nepal.

Another danger to wildlife in Nepal is poaching. Law enforcement officers are few, and many of the protected parks sustain poaching from local residents who are not easily caught. However, once they are caught, penalties are fairly severe. As a result of enforcement, for example, poaching in Chitawan National Park dropped to only four cases in 1973.

4.6 Mineral Resources

Although little geological work has been done in Nepal, there are known deposits of coal, cobalt, copper, gold, iron, limestone, marble, and mica. Nickel and lead are also found, as well as small quantities of zinc, gypsum, sulphur, graphite, and salt. In the Kathmandu Valley, natural gas (methane) has been struck at a few places. Exploration for oil has been carried out in the vicinity of Muktinath, Dailekh, and in some parts of the Tarai; indications are that there is some gas and crude oil. However, exploration for oil is very expensive, and many of the other mineral deposits are found in extremely difficult terrain. Nepal does export mica and a few other minerals, but in small quantities. The Bureau of Mines and the Department of Geological Survey are working to discover and exploit the mineral resources of the country. There are several old mines still in operation in Nepal, and for many years Nepal was self-sufficient in metals used for utensils and ornaments.

5.0 ECONOMY OF NEPAL

5.1 General Economic Picture

GDP*: US$1.3 billion at 1977/78 prices

Per capita GDP: US$100

Real growth rate: 3.2% (1976/77), 2.0% (1977/78)

Monetary conversion ratio: Nepalese rupees NRs 12.0 = US$1 (March 1979)

Nepal's economy is based primarily upon agriculture, in which 95% of the population is engaged. The growth rate of the GDP in 1977/78 declined for the second consecutive year in 1978; this decline reflects the falling agriculture output due to poor weather and the cultivation of marginal lands. Nonagricultural sectors of the economy have been expanding at high rates in recent years, but their growth rate also slowed in 1978 because of a shortage of key raw materials and power. The National Planning Commission, HMG, published a draft of the Sixth Five-Year Plan (for 1981-1985) which anticipates a growth rate of real GDP above 5%, and an increase in the outlay for development (up to 20% of the GDP). The average rate of inflation increased in 1977/78 to 11%.

During the decade ending in 1976/77, the harvested crop and the total agricultural output of Nepal grew at an annual rate of 2%; the real GDP also grew at a rate of 2%. However, the population growth rate for this same period was 2.2%, thus the per capita output declined. As a result, less rice was exported. Agriculture produces over 60% of Nepal's GDP, and 80% of the export earnings; thus, the performance of the agricultural sector is the overall determinant of the country's rate of economic growth.

5.2 Agriculture

The main crops in Nepal are rice, corn, wheat, sugar cane, and oilseeds. Although Nepal's economy is based upon agriculture, only 10% of the total land area is flat or gently sloping, where agriculture can be carried out with little environmental disturbance. Since 60% of the people live in the hills and the mountains, farming is done on hillsides and by terracing steeper slopes in the mountains. Farming and field work are primarily done by hand, although oxen and water buffalo are used to pull plows in the Tarai. Land in the hilly areas is extensively terraced and is fertilized by animal manure, crop residues, and oilcake. Food supplies in Nepal are not well distributed; there is usually a deficit in the mountains, and a surplus in the Tarai. Agriculture's low growth rate is contributed to by the lack of irrigation, small size of most farms, inefficient farming practices, and limited seeds and fertilizers. A typical farm family in Nepal lives off of the production of only 4 hectares of land. Farming is basically on a subsistence level. Nearly two-thirds of the farm families in Nepal must have a supplementary

*GDP refers to Gross Domestic Product

income to survive. Until recently Nepal was a food grain surplus country, but population pressures are changing that rapidly.

Rice is the most important crop in Nepal, occupying 55% of the land under cultivation. Corn has the widest distribution, and is grown from the Tarai up to high elevations; it is of most importance in the mountains on drier lands not suited for rice. Wheat and barley are grown at higher altitudes, and wheat is an important winter crop. Potatoes are also important in the hills and mountain areas. A wide variety of fruits and vegetables are also grown, including mangoes, bananas, peaches, oranges, plums, guavas, and jackfruit. Commercial crops include jute and sugar cane.

Table 6. Agricultural Production and Yields, 1977/78

	Production (1,000 tons)	Area under crops (1,000 ha)	Yields (tons/ha)
Food Grains	3,575	2,215	
Rice	2,282	1,264	1.80
Wheat	401	360	1.11
Barley	22	25	0.88
Maize	740	445	1.66
Millet	130	121	1.07
Cash Crops	741	244	
Sugarcane	337	20	16.85
Tobacco	6	8	0.75
Jute	57	45	1.27
Oilseeds	65	119	0.55
Potatoes	276	52	5.30

Source: HMG Nepal. 1979.

5.3 Industrial Production

The main industries in Nepal are based upon agricultural products and include rice, jute, sugar cane, and oilseed mills, and match, cigarrette, and brick factories. Manufacturing industries are primarily in the public sector and have been expanding at a much faster rate than the overall economic growth rate, but they only contribute 4% to the real GDP and employ only 1% of the labor force. Cottage industries are privately owned; their share of the real GDP is constant at 6-7%. In 1978 Nepal exported rice, jute, timber, and foodstuff (amounting to US$82 million) and imported manufactured consumer goods, fuel, construction materials, and foodstuff (US$206 million). Their major trade partner is India (80%), with whom they have special trade arrangements. Other trade partners include the United States, the Soviet Union, the People's Republic of China, and Pakistan.

The development of industry is a major goal of HMG Nepal, but the mountainous terrain, lack of roads and communications networks, and unavailability of credit makes this difficult. Factories that make consumer goods depend upon imported raw materials; when these are in short supply, the industry does without. A lack of reliable electric power and water supplies also is responsible for the slow growth of domestic industry in the country.

Table 7. Production of Principal Industries 1977/78

Jute (1,000 tons)	15.4
Cotton textiles (1,000 meters)	3,796
Sugar (1,000 tons)	26.5
Cigarrettes (billion sticks)	1.6
Matches (1,000 gross)	677
Tea (tons)	403
Cement (1,000 tons)	35.8
Brick and tile (million pieces)	30

Source: HMG Nepal. 1979.

5.3.1 Tourism

One industry that has grown is the tourist industry. In 1978 the number of tourists visiting Nepal increased by 20% to 156,000. In that year Nepal earned US$26 million from tourism alone. Tourists accounted for over 35% of the total merchandise exported from Nepal in 1977/78. The average stay of a tourist in Nepal has risen to 11 days, and over the past two years the number of hotel beds has doubled to 4,900. However, in some respects this may be a mixed blessing since many of the tourists are interested in trekking and climbing in the mountains along fragile trails. Too many tourists can have negative impacts upon the environment. Nepal's officials are aware of this, and efforts have been made to control tourism while at the same time expanding the services available. (See Section 3.3.1.1. for prohibitions on mountaineering expeditions in Nepal.)

5.4 Animal Husbandry

It is estimated that there are 14 million grazing animals in the mountains of Nepal. However, only cattle, buffalo, yaks, sheep, goats and poultry are considered significant economically. In general, livestock production is considered to be secondary to farming by Nepalese farmers, and most keep only a few animals to produce milk, butter, meat and hides for their immediate family. The buffalo is the source of most of the milk, cheese, and ghee (clarified butter) produced in the country. Their milk yield is fairly high - up to 1,000 pounds during a 10-month lactation period. Cattle are raised for manure and for draft animals. Cattle are sacred to Hindus and they are not killed nor eaten by them. In the high mountains, there are many herds of cattle, yaks, and sheep and in those areas herding is much more important.

One of the biggest problems in mountain areas is overgrazing, which contributes to soil erosion on steep slopes. As populations expand, farmers increase the size of their herds, and these animals are released in forest areas to graze beneath the trees. Farmers also cut off branches and leaves of trees for fodder since there is no land available to use for pasturage. In the dry season, animals exist on grasses, weeds, and crop residues, and as a result livestock are often sickly and have a low productivity.

5.5 Gathering

One other important source of income in Nepal is gathering of wild drugs and herbs, edible roots, wild fruits, nuts, and honey. Nepal has many medicinal plants, including aconite, pyrethrum, belladonna, ipecac, and licorice, that are gathered and sold by individuals in markets in Nepal and India. There is some research being done on medicinal plants by the Department of Medicinal Plants, and these plants are being tested to see if they can be grown on a commercial basis. Narcotic drugs (particularly coca, opium, and hemp) have been grown in Nepal but their cultivation and use has been discouraged except for the collection of wild drugs in certain areas of Nepal for medicinal purposes. (See Section 3.3.2.6 for restrictions on narcotic drugs.)

BIBLIOGRAPHY

Bajracharya, Manik Lal, ed. 1973. Nepal 1972-73 Trade and Information Directory. The Eastern Trading and Investment Company, Kathmandu.

Bhatt, Dibya Deo. 1970. Natural History and Economic Botany of Nepal. Department of Information, Ministry of Information and Broadcasting, HMG.

Brown, Lester R. 1978. The Worldwide Loss of Cropland. Worldwatch Paper No. 24, Worldwatch Institute, Washington, D.C.

Butterfield, Samuel H., Mission Director. 1979. Nepal Country Development Strategy Statement FY 1981. USAID/Nepal.

Campbell, J. Gabriel. 1978. Community Involvement in Conservation: Social and Organizational Aspects of the Proposed Resource Conservation and Utilization Project in Nepal. Office of Agriculture, USAID/Nepal.

Cannon, Timothy K. and Kenneth B. Craib, Resources Development Associates. 1978. Agricultural Resources Inventory in Nepal: A Project Appraisal. USAID, Washington, D.C.

Central Bureau of Statistics. 1977. The Analysis of the Population Statistics of Nepal. National Planning Commission Secretariat, HMG Nepal.

Colloques Internationaux du Centre National de la Recherche Scientifique (CNRS). 1977. Himalaya - Écologie - Ethnologie. Éditions du CNRS, Paris, France.

Department of Food and Agricultural Marketing Services. 1977. Agricultural Statistics of Nepal 1977. Ministry of Food, Agriculture, and Irrigation, HMG Nepal.

Dinerstein, Eric. 1979. An Ecological Survey of the Royal Karnali-Bardia Wildlife Reserve, Nepal. Master of Science thesis, University of Washington.

Dobremez, Jean-François. 1976. Le Népal - Écologie et Biogéographie. Éditions du Centre National de la Recherche Scientifique, Paris, France.

Eckholm, Eric P. 1979. Planting for the Future: Forestry for Human Needs. Worldwatch Paper N. 26, Worldwatch Institute, Washington, D.C.

Eckholm, Eric P. 1976. Losing Ground - Environmental Stress and World Food Prospects. W.W. Norton and Company, Inc., New York.

Harris, George L., et. al. 1973. Area Handbook for Nepal, Bhutan, and Sikkim. Second Edition. Foreign Area Studies, The American University, Washington, D.C.

Johnson, Hope and Janice Marie Johnson. 1977. Environmental Polices in Developing Countries. Erich Schmidt Verlag, Berlin.

Moseman, A.H., et. al. 1976. A Study of Hill Agriculture in Nepal. The Rockefeller Foundation and Ministry of Food, Agriculture and Irrigation, HMG Nepal.

Nepalese Perspective, Vol. 9. July 1973 - Oct. 1974.

Office of Foreign Disaster Assistance. 1978. Nepal - A Country Profile. USAID/ Washington, D.C.

Pant, Thakur N. 1978. Agricultural Development in Nepal - Problems and Prospects. Agricultural Projects Services Centre (APROSC), Kathmandu.

Rieger, Hans C., Fritz Bieri, Helmut Eggers, Willi Goldschalt, and Jürgen Steiger. 1976. Himalayan Ecosystems Research Mission Nepal Report. Ministry for Economic Cooperation, Federal Republic of Germany.

Shane, Jeffrey N. 1977. "Environmental Law and Technical Cooperation: Agenda for Asia and the Pacific." Presented at ESCAP/UNEP Expert Group Meeting on Environmental Legislation, Bangkok, Thailand.

Sharma, R.P. 1974. Nepal - A Detailed Geographical Account. Pustak-Sansar, Kathmandu.

Stainton, J.D.A. 1972. Forests of Nepal. Hafner Publishing Company, New York.

Sterling, Claire. 1976. "Nepal." In Atlantic Monthly, Vol. 238, p. 14.

Swiss Association for Technical Assistance (SATA). 1976. Mountain Environment and Development. Tribhuvan University Press, Kathmandu.

Tuladhar, Jayanti M., B.B. Gubhaju, and John Stoeckel. The Population of Nepal: Structure and Change. Research, Planning and Evaluation Division, FP/MCH Project.

UNESCO/MAB Report No. 34. "Regional meeting on integrated ecological research and training needs in the southern Asian mountain systems, paritcularly the Hindu Kush - Himalayas."

UNESCO/MAB Report No. 35. "Regional meeting on integrated ecological research and training needs in tropical deciduous and semi-deciduous forest ecosystems of South Asia."

Upadhyaya, D.C. and Jose V. Abueva, eds. 1975. Population and Development in Nepal. Tribhuvan University Press, Kathmandu.

Also extremely useful to the legislation section were all available issues of:

Nepal Press Digest (Private) Ltd.
Nepal Law Translation Series
Regmi Research Project Reports

APPENDIX A - National Committee for Man and the Biosphere/UNESCO, Nepal

Dr. Ratna S.J.B. Rana, Chairman
National Planning Commission
Ram Shah Path
Kathmandu, Nepal

D.D. Bhatt, Professor/Chairman
Botany Instruction Committee
Institute of Science
Tribhuvan University
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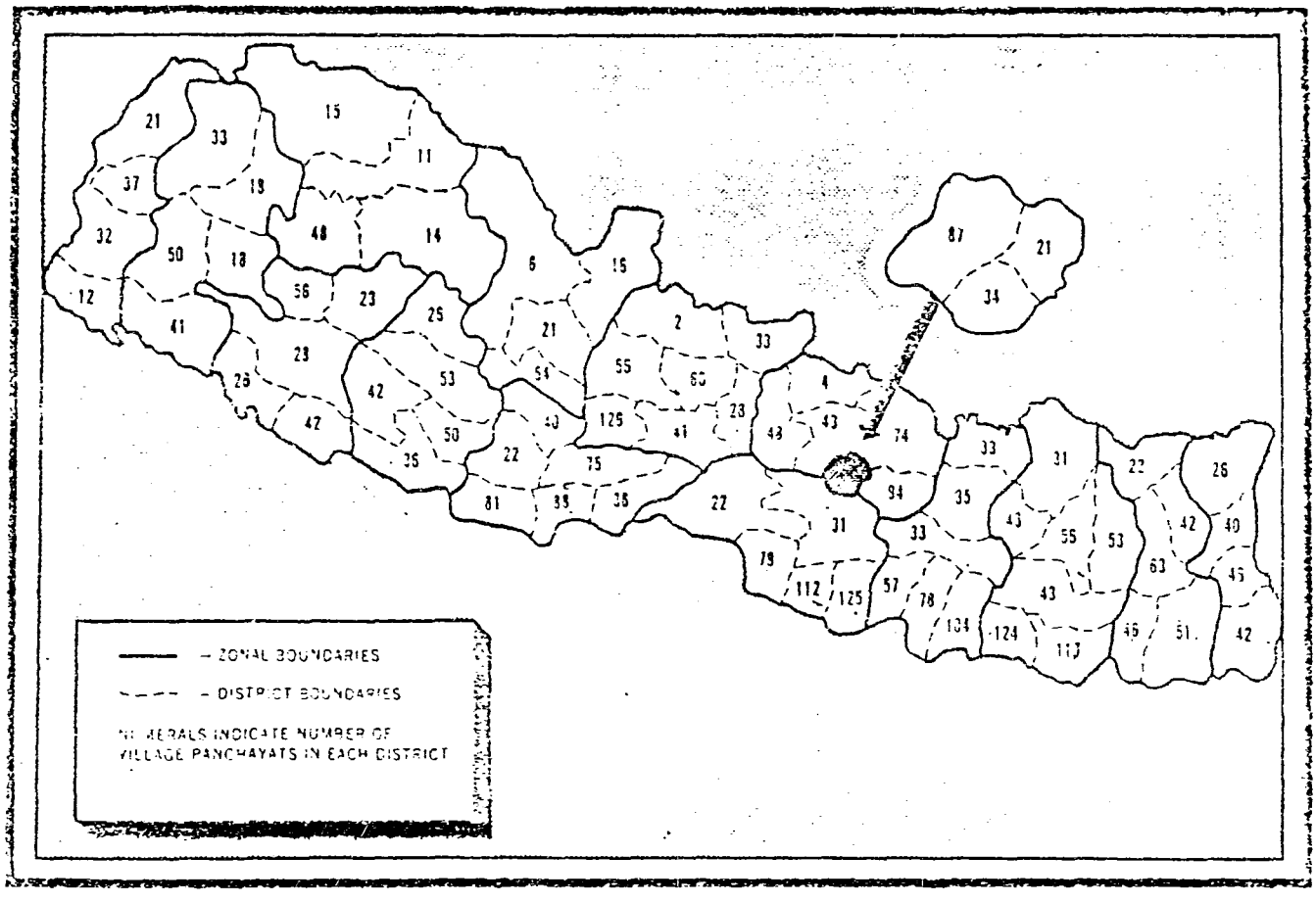
P.R. Shakya
Department of Medicinal Plants
Thapathali, Kathmandu

U.B. Shresta
Forest Resources Survey
Babar Mahal, Kathmandu

APPENDIX B - District Panchayat Boundaries in Nepal



Source: Harris, George L. et.al. 1973. Area Handbook for Nepal, Bhutan, and Sikkim.