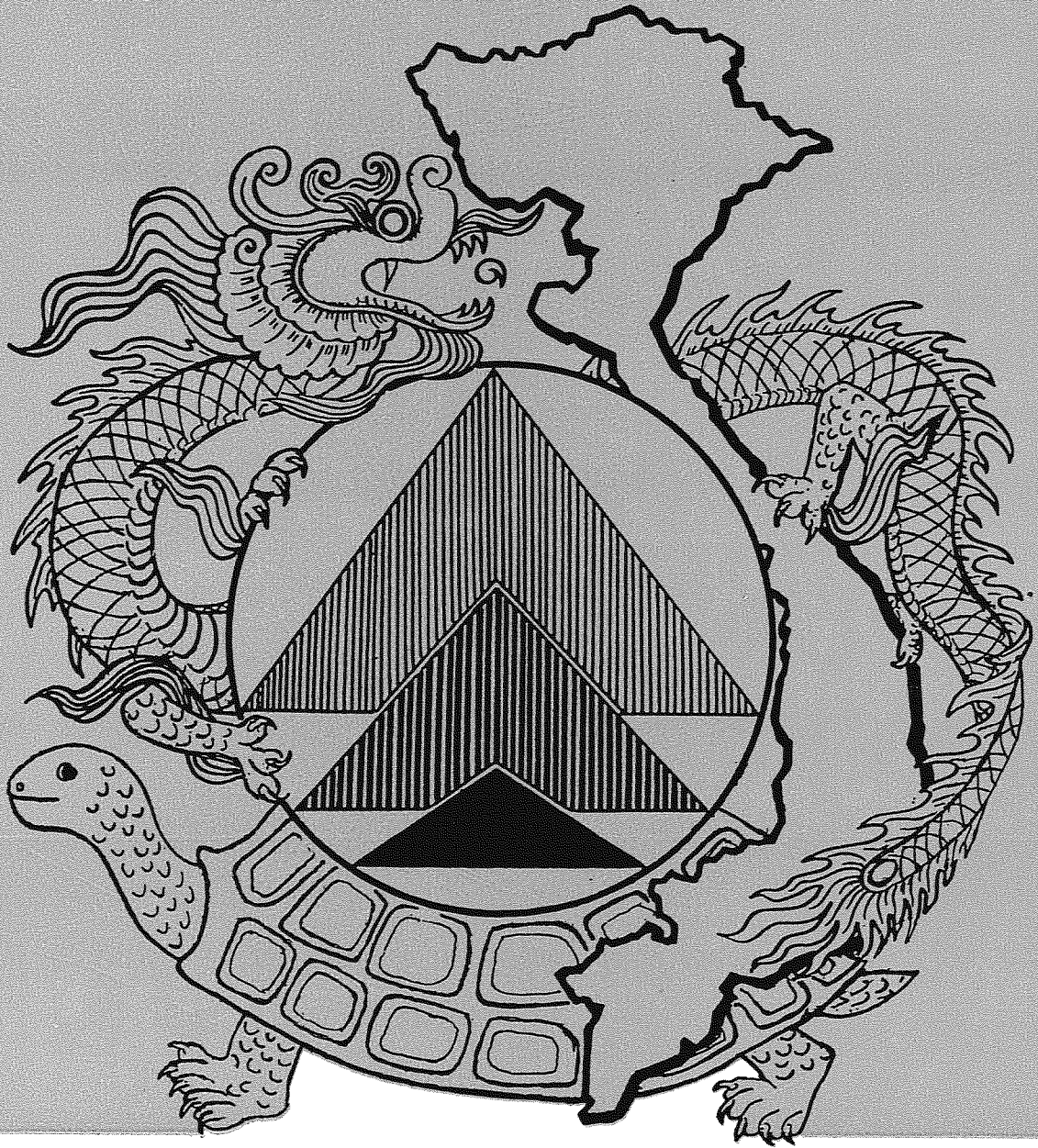


VIETNAM



NATIONAL CONSERVATION STRATEGY

(DRAFT)

IUCN
WCS
VN
001

Prepared by the Committee for Rational
Utilisation of Natural Resources and
Environmental Protection
(Programme 52-02) with assistance from the
International Union for Conservation of
Nature and Natural Resources (IUCN)

JUNE, 1985

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The symbol of the National Conservation Strategy for Vietnam shows the map, symbolising the territory of Vietnam; the dragon, symbolising the ancient traditions and culture of Vietnam; and the turtle, symbolising the strength and endurance of Vietnam, all embracing the symbol and principles of the World Conservation Strategy.

The circle represents the biosphere — the thin covering of the planet that contains and sustains life. The three interlocking arrows represent the three objectives of the World Conservation Strategy :

- maintaining ecological processes and life-support systems
- preserving genetic diversity
- sustained utilisation of renewable natural resources

"Forest is gold. If we know how to conserve and use it well, it will be very precious. Destruction of the forest will lead to serious effects to both life and productivity."

President Ho Chi Minh, 1963



President Ho Chi Minh Promoting 'Tree Planting for Tet'

President Ho Chi Minh started the popular People's Movement 'Tree Planting for Tet'

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Preface

In 1975 the people of the Socialist Republic of Vietnam finally succeeded in the reunification of the whole country after 30 years of an almost constant war for independence: first against the French and second against the United States and their local allies. During these wars, the population and environment of Vietnam suffered terribly and the countryside was exposed to such levels of deliberate destruction as to give rise to a new word in the English language 'ecocide'.

The people of Vietnam have emerged victorious from the battlefield only to find awaiting them a hard heritage—the equally challenging problems of restoring their damaged and degraded environment and rebuilding their economy and impoverished production systems.

This recovery must be well planned and based on sound ecological (conservation) and economic (development) principles. But the scale of the task is monumental.

The population of Vietnam has doubled over the last 10 years to over 60 million persons today. This gives us one of the highest mean densities for any agricultural country in the world of about 200 persons per square kilometre.

Meanwhile Vietnam's natural resources—the material basis for improving living conditions—are limited, but the needs of the people for them continue to increase. It is necessary to develop more croplands and more wood for fuel and construction. But the forests are shrinking, the soil is being eroded and its fertility declining. The area of barren land in Vietnam increases daily and already occupies almost one-third of the total area of the country. Deforestation leads to soil erosion which damages construction projects, silting up dams and reservoirs and leading to increased frequency of floods and drought, lowered water tables and decreased fishery production.

Vietnam is on the road to establishing a socialist industrial basis for economic growth and recovery. For this, it is necessary to exploit more and more of its natural resources, fuels and oil, minerals, wood, animals, water and land. As we develop our industry, the environmental conditions of the urban and industrial regions as well as some rural or new agricultural areas become polluted. As the ecosystems of the mountains, deltas and coastal and estuarine zones are submitted to strong impact of human activities, they are easily degraded.

Unless development is rationally planned and unless the productive capacity of the country's life support systems are maintained through adequate conservation measures, the land of Vietnam will be degraded and the population impoverished.

Most sectors of development have drawn up restrictions and regulations to rationalise resource use and impose sensible environmental standards, but the activities of one sector, such as forestry affect those of other sectors, for instance agriculture or hydro-energy to such an extent that cross-sectoral planning in the form of a national strategy is clearly needed.

The National Conservation Strategy (NCS) for the Socialist Republic of Vietnam attempts this task. By close linkage of *conservation* needs with *development* objectives, the strategy outlines an approach to the optimal, sustainable utilisation of the country's renewable and non-renewable natural resources for the well-being and survival of its human population.

General Vo Nguyen Giap
Hanoi, 1985

Executive Summary

After an evaluation of the numerous factors relating to the environmental conditions in Vietnam, and an analysis of the current trends in the utilisation of natural resources in the context of rapid population growth, the Committee for the Rational Utilisation of Natural Resources and Environmental Protection (Programme 52-02) is of the firm conviction that what Vietnam faces today is a grave ecological crisis.

If current trends in environmental degradation are allowed to continue unchecked, it is predicted that soon after A.D. 2000, there will be no natural forests left in the country. Deforestation will lead to a loss of water penetration in the watershed regions, which will in turn result in a number of environmental problems. These include, a high incidence of floods and drought causing massive damage to property, loss in agricultural production, seasonal failure of water supplies in some areas, heavy siltation—which can frustrate the country's costly efforts to develop hydro-power, rise in the occurrence of typhoons and consequent damage caused by them—and a shortage of fuel for domestic uses. The country will no longer be able to feed its growing population and will have little else to sell in return for food on the international market. Cities will become overcongested and heavily polluted. Internal strife will be precipitated and national security weakened.

In order to prevent this alarming scenario, it is necessary to launch a major nation-wide campaign of environmental awareness and to create a new conservation ethos among the people of Vietnam.

The National Conservation Strategy outlines the principles and means by which this environmental consciousness can be achieved. The main recommendations for priority action include bringing the population growth rate down to zero as soon as possible, launching a massive reforestation programme by planting millions of trees to restore the hydrological balance of the land, establishing a National Board of Environmental Coordination at the ministerial level with wide cross-sectoral powers to formulate and enforce new environmental legislation and regulations.

The National Conservation Strategy for Vietnam is not a fringe or luxury document. It is, in fact, a strategy for national survival. It attempts to demonstrate how to obtain the greatest lasting benefits from the nation's renewable and non-renewable natural resources.

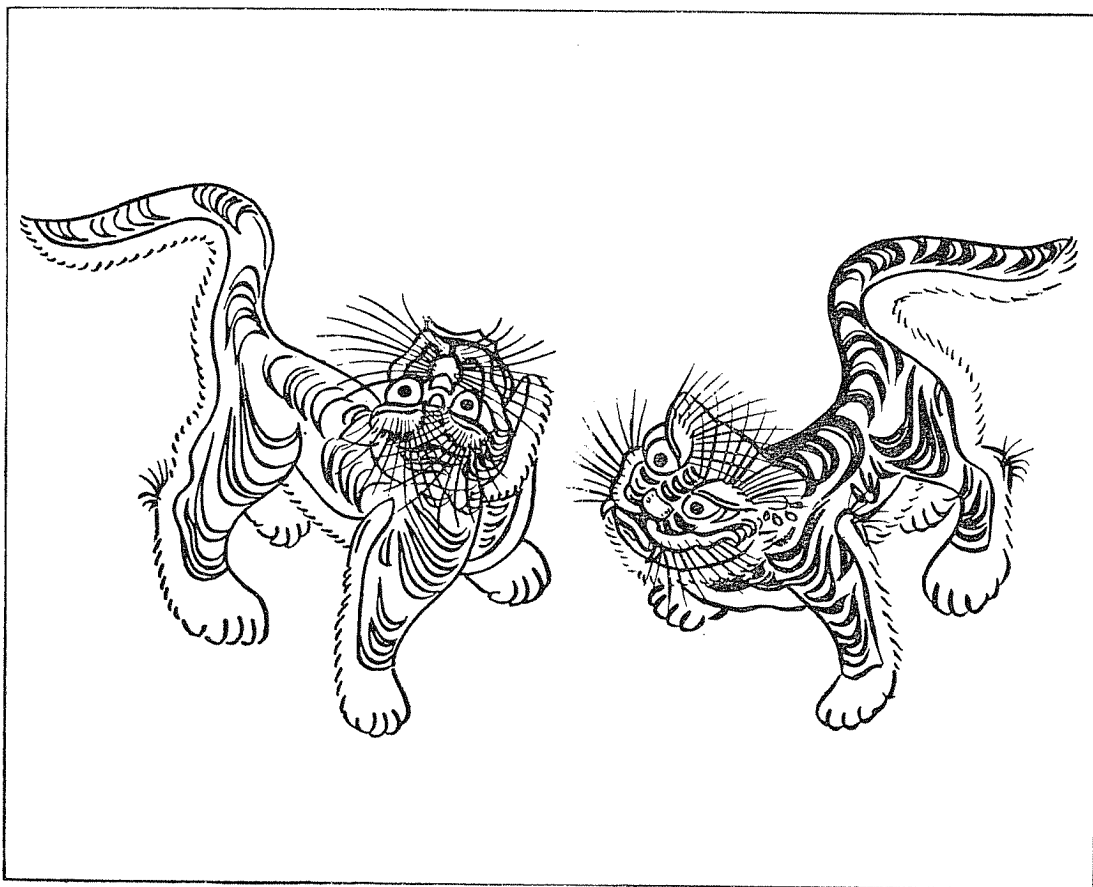
In the case of renewable resources—soil, water, forests or living species—the emphasis is placed on achieving maximum sustainable yields that do not deplete the resource base in question. These yields are limits which cannot be exceeded without causing damage to the resource base and reducing future productivity. Yields cannot be indefinitely increased to meet increasing demands. Rather, demands must be stabilised at those maximal limits by stabilising human population growth.

As regards non-renewable resources—minerals, fossil fuels, etc.—the emphasis must be on using this irretrievable wealth wisely by investing in future productivity—land improvements, terracing, irrigation, drainage, planting and industrial development. These resources should not be merely squandered on short-term increases in living standards or on encouraging unwanted population growth.

As is evident, the environmental problems are too great for the Government to tackle alone, and to enforce any solutions. This endeavour requires the fullest cooperation of the people who should be made to realise the importance of restoring and maintaining the environment. To this end, a major promotion of environmental awareness should be undertaken by means of all available media—press, radio, television, propaganda machinery, school programmes, training courses, people's movements, societies, etc. This is a long-term task and the National Conservation Strategy has been designed in such a way that it can be regularly reviewed, revised, maintained and followed up by appropriate implementation.

Some areas covered by the National Conservation Strategy relate to international issues which require the increased involvement of Vietnam in international programmes—in particular the management of many of the transfrontier resources, such as the major rivers which originate outside the country's boundaries. Conservation is a world-wide problem which cannot be tackled in isolation. The National Conservation Strategy outlines ways in which Vietnam can increase its involvement at the international level.

The National Conservation Strategy is an alarmist document, and rightly so, but it is not pessimistic. The grave environmental problems *can* be solved. The resource base *can* be recovered and the Vietnamese people do have the energy, discipline and resourcefulness to overcome these problems just as they have successfully faced the tasks of liberation and reunification.



Introduction

THE SETTING FOR THE PREPARATION OF A NATIONAL CONSERVATION STRATEGY FOR VIETNAM

In order to guarantee the steady rate of economic growth, enhance the welfare of the society and raise the standard of living of the people, it is necessary to promote development at an even faster rate. But if this development does not take place in combination with conservation, it will not be sustainable. In view of the fast worsening environmental situation in the country, this has now become a matter of grave urgency.

It is worth tracing the growing awareness of this environmental dilemma in Vietnam. For many years, the Government of the Socialist Republic of Vietnam has realised that there is an environmental problem facing the country. It has recognised that the rational use of natural resources and environmental conservation are imperative—the shared responsibility of both the government and the people. The Government has promulgated many laws and regulations and issued decrees and circular letters on the subject of increasing both the utilisation and conservation of natural resources.

Our late President, Ho Chi Minh, fought with all his strength for the conservation of natural resources, particularly the conservation of forests. To quote him :

“It is necessary to pay due attention to the problem of forest conservation. If the current situation continues whereby the people destroy one part of the forest, the state farms another and even the geological inventory destroys another, we run a very dangerous course. Destruction of the forest is very easy but putting the forest back is very difficult and takes tens of years. Destruction of the forest will lead to serious effects to both life and productivity. People say ‘Forest is gold, sea is silver’. Forest is gold. If we know how to conserve and use it well, it will be very precious.” (*Nhan dan*, 11 September, 1963).

In 1959 President Ho Chi Minh launched a campaign, ‘Tree Planting Tet’ and always followed this up each year by re-emphasising and encouraging the movement.

An important decision of the Politburo of the Vietnam Communist Party also stresses the importance of the need for combining conservation and development:

“It is necessary to promote the research work to form the basis for the effective conservation of ecosystems, for the regeneration of the natural resources in the tropical conditions of our country throughout the whole process of economic development, for the restoration of the ecosystems destroyed by war and by the unorganised exploitation of resources. It is also important to set up the counter measures against air pollution, water pollution, degradation of soil and against toxic agents in the production and in life, especially in the industrial regions and in the cities.” (Decision Nr. 37/NQTU, 1981).

In response to this decision of the Politburo the Government set up a committee to



conduct a programme for the rational use of natural resources and for the protection of the environment (Programme 52-02) under the Chairmanship of the Minister of Higher and Vocational Education.

The programme deals with the following nine problems :

- rational use and protection of forest ecosystems
- rational use and protection of coastal and estuarine systems
- rational use of midland ecosystems
- control of air and water pollution
- reparation of damage to the environment owing to war
- control of pollution caused by radioactivity
- environmental effects of the mining industry
- environmental education and promotion of environmental awareness
- environmental impact assessment and management planning

The programme has been very active in the aforementioned fields and has been supported by the work of over 300 scientists from 27 different agencies and by other ministries.

The programme convened an important international symposium in Ho Chi Minh City in January 1983 on 'The Use of Herbicides in Warfare : Long-term Effects on Man and Nature.' It also held a large national workshop in Hanoi in November 1983 on 'The Rational Utilisation of Natural Resources and Environmental Protection.'

The considerable efforts made by the Government to organise the conservation of natural resources and the preservation of the environment are expressed in the economic development plans of different sectors. There have also been several important public movements, such as 'Planting for Creating the Forest' movement and 'Cleaning the Village to Fertilize the Fields' movement, which have showed good results. Some tens of thousands of hectares of forest and some several millions of trees planted throughout the country, have visibly improved the environment and life in many regions of the country.

However, inspite of these efforts, Vietnam is facing increasingly urgent problems in the field of natural resources and environment. These problems are found in every region of the country demanding the combined efforts of the party and the people to find new solutions. For this, we need a sound strategy to guide our activities. The Government has therefore entrusted to the Committee for the Rational Use of Natural Resources and Protection of the Environment the extra task of drawing up a sound environmental strategy for the country. The Committee is aware of the lead taken in this field by the International Union for Conservation of Nature and Natural Resources (IUCN) in launching 'The World Conservation Strategy' (WCS). It has used the principles of the WCS in preparing a National Conservation Strategy (NCS) and has accepted the assistance of the IUCN in drafting such a document.

CONSERVATION FOR SUSTAINABLE DEVELOPMENT

Man lives in the biotic ecosystems within the thin covering of the planet called the biosphere. Man is an integral part of these ecosystems deriving his energy to live from two main sources: (a) the biological productivity of the earth's life-support system, (b) fossil fuels which in turn the left-over accumulation of pre-existing life support systems.

Fossil fuels are a non-renewable resource which Man now has the privilege to exploit; but these resources are limited and will, in the not-so-distant future, become exhausted. Biological productivity, on the other hand, is the result of the interaction of the planet's renewable natural resources, that is, soil, water, air, sunlight and living species, which if properly managed can continue their productivity indefinitely. If not managed properly, however, these resources can be irretrievably lost or reduced.

The productive capacity of the biological environment is limited. Production beyond these limits cannot be sustained and if it in fact takes place results in the destruction of the resource bases. This is a dilemma facing human beings—a dilemma particularly felt in

Vietnam today. Population growth, currently fuelled by the temporarily available non-renewable fossil energy resources, increasingly demands levels of production from the environment which it cannot sustain.

In 1980 the International Union for Conservation of Nature and Natural Resources (IUCN) together with the Food and Agriculture Organisation of the United Nations (FAO), the World Wildlife Fund (WWF) and the United Nations Environmental Programme (UNEP) launched the 'World Conservation Strategy' (WCS), a document outlining the world's environmental dilemma as well as the type of cross-sectoral approaches that are required to face these problems.

The World Conservation Strategy has outlined three major objectives:

- maintenance of essential ecological processes and life-support systems;
- maintenance of genetic diversity; and
- sustained utilisation of renewable natural resources.

The basic theme of the WCS is 'Conservation for Sustainable Development.'

Development is the modification of the biosphere and the application of human, financial, biotic and non-biotic resources to satisfy human needs and improve the quality of human life. For development to be sustainable, it must take account of social and ecological factors as well as economic ones; of the biotic and non-biotic resource base; and of the long-term as well as the short-term advantages of alternative actions.

Conservation is the careful and controlled management of the biosphere which ensures that levels of utilisation of renewable resources are able to provide the maximum benefits that can be sustained without threat to the renewability of the resource bases and their potential future productivity. Thus, conservation is positive, embracing preservation, maintenance, sustainable utilisation, restoration and enhancement of the natural environment. It is concerned with both living and non-living, renewable and non-renewable resources.

Conservation, like development, is for the people. While development achieves human goals through the use of the biosphere, conservation achieves them through ensuring that such use can be sustained. Conservation's concern for maintenance and sustainability is both a rational response to the renewable but destructible nature of living resources and also the response to an ethical imperative which is expressed in the saying, 'We have not inherited the earth from our parents, we have borrowed it from our children.'

Conservation and development are not, as they sometimes appear, incompatible or in conflict; rather they are the opposite sides of the same coin, essential partners in achieving maximal benefit from the earth's resources for the welfare of mankind. Far from being anti-development, conservation is an essential and constructive element of good development.

Conservation is a process that must be applied cross-sectorally and not as an activity in its own right. In the case of such sectors as agriculture, forestry, wildlife and fisheries, which involve direct management of living resources, conservation consists of all those activities that help ensure that utilisation is sustainable and help safeguard the ecological processes and genetic diversity essential for the maintenance of the resources concerned. In such sectors as health, energy and industry, conservation ensures that the fullest advantages can be achieved without damage to the resource bases upon which they are dependent. In the case of the use of non-renewable resources, conservation ensures that these resources are used at such a rate and in such a way that they really meet the current and future needs of society. Since the different sectors are highly interrelated in their needs for natural resources and are to some extent in competition for those very resources, it is essential to tackle conservation through an integrated cross-sectoral approach. For instance, if more land is demanded for agriculture, less land will be available for forestry; if more forest land is denuded, the fertility of downstream agricultural land may suffer. The two sectors must be planned together if an optimal balance is to be maintained.

The Current Situation

ENVIRONMENTAL PROFILE OF THE SOCIALIST REPUBLIC OF VIETNAM

Geographical Setting

The Socialist Republic of Vietnam is situated along the southeast margin of the Indo-Chinese Peninsula. It stretches from latitudes, 8°–24°N with a total coastline of about 3200 km and a total land area of 33 million hectares. The land border is 3700 km (1150 with China, 1650 with Laos and 950 with Kampuchea), a very long border indeed in relation to the country's size.

The country is S-shaped, broader in the north and south where it is swelled by the Red River and Mekong deltas and very narrow in the middle where in Binh Tri Thein province it is only 50 km at the narrowest point. A broad, shallow continental shelf follows the shape of the land, wide in the north and south and narrow in the middle.

Landform and Soils

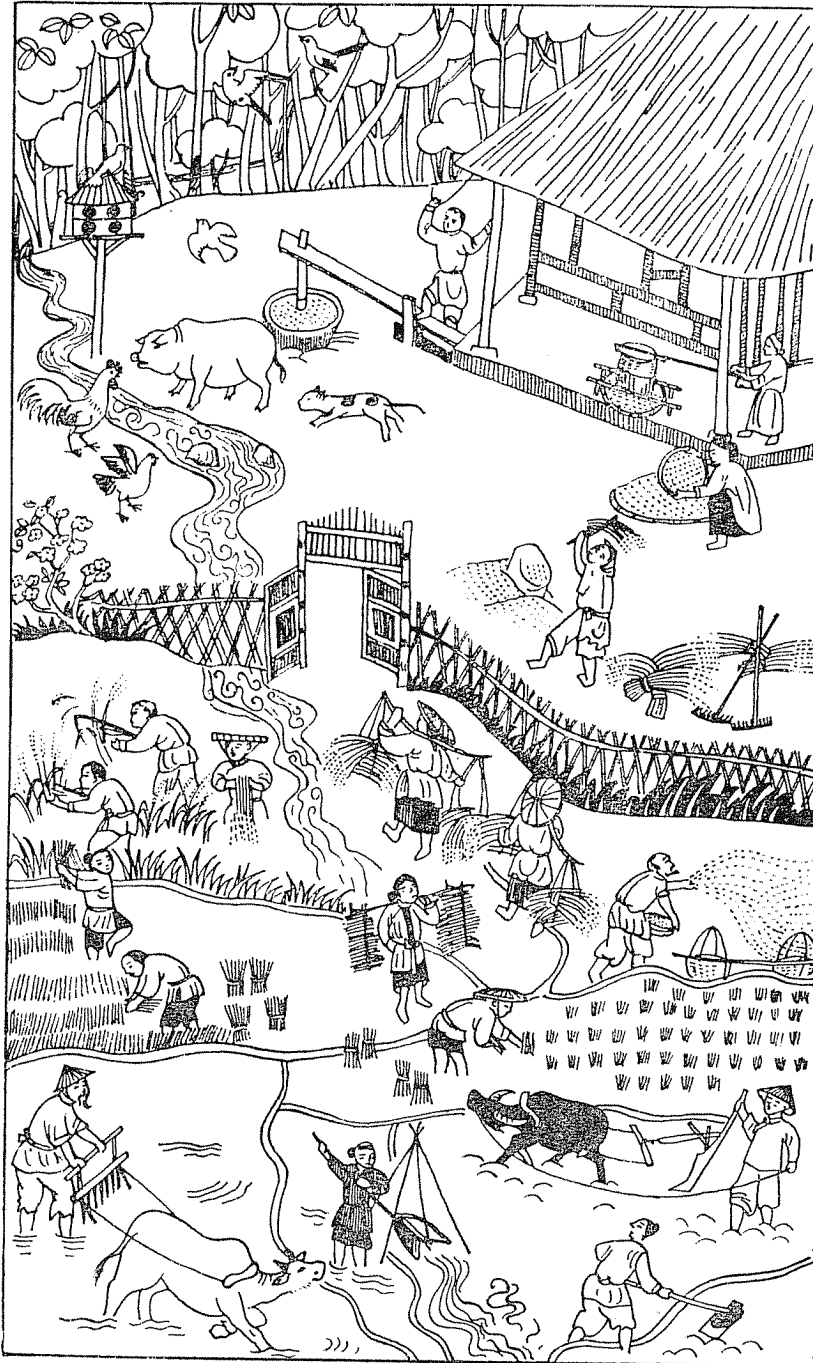
Three-quarters of the country consists of mountains and hills with the highest peaks rising to a maximum of 3144 m (Fan Si Pan) in northwestern Vietnam where they form an extension of the great Himalayan range. Ten million hectares of low-lying potentially arable land are mostly in the large fertile plains of Nam bo (6 million ha) and Bac bo (1.5 million ha), which include the Mekong and Red River deltas, respectively. The soils of Vietnam are typical of its moist tropical conditions. There are 14 groups of soil divided into 64 types. Among these, five groups are by far the most important and account for 78 per cent of the country's total area. These are given in the Table 2.1.

Table 2.1
Soil Types in Vietnam

Soil Type	Area (mha)	Area (percentage-wise)
Yellow-red soils	16	58
Red soils overlying basic rocks	3	9
Alluvial soils	3	9
Grey soils	2.5	7.4
Yellow-red humus and alpine humus soils	3.7	12

Of these, the alluvial soils have the highest potential for cultivating irrigated rice and cereals. The red basic soils are also good for agriculture, especially for growing perennial crops and for industrial plantations. Many of the upland soils, however, are very fragile and degrade quickly unless protected by dense vegetative cover.

As a result of the wide diversity of land form and the tropical luxuriance of the vegetation, Vietnam has many areas of spectacular scenery, especially in the 'sugar loaf' limestone karst areas, with water falls, grottoes, lagoons and coral reefs. These areas are valuable not only for recreation purposes and as a source of inspiration for the Vietnamese people, but also as a valuable foreign exchange earner through tourism.



Climate

Vietnam shows a diversity in climatic conditions on account of its wide range in latitudes and differing altitudes. Although the entire country lies in the inter-tropical zone, climate varies from humid tropical conditions in the southern lowlands to bracing temperate conditions in the northern hills.

The mean annual temperature at sea level is about 27°C in the south, falling steadily northwards to about 21°C in the extreme north. Similarly, there is a drop in mean annual temperature of about half a degree per 100 m rise in altitude. Since more than 30 per cent of the country is above 500 m in altitude, much of the country, in fact, enjoys sub-tropical or even temperate weather conditions.

Climatically, the whole country is relatively humid. Most areas have a positive hygrometric balance (rainfall exceeds evaporation). Most of the country receives about 2000 mm of rain per year but the mountains of the narrow central neck of the country attract the highest rainfall (about 3000 mm) and experience the highest humidity.

Three main monsoons affect the climate of Vietnam, which is in fact the meeting point of these winds. The winter monsoon comes from the northeast and is rather cold and dry with occasional light drizzle but only affects the northern part of Vietnam to the south of 16° latitude, the 'western trade winds' prevail through the winter months with a more humid tropical maritime climate. The southern or southeastern monsoon and the western monsoon both come off the sea in the summer months bringing warm damp inter-tropical weather to the entire country.

During the hot weather, typhoons sometimes develop over the eastern sea and sweep up the coastal areas of central and northern Vietnam causing considerable and often unpredictable damage. The frequency of such monsoons has increased in recent years and may be a consequence of local climatic changes relating to deforestation.

One area of unusual climate is the high mountain zone of the Hoang Lien Son region where many peaks exceed 3000m. Here the winds blow strongly and solar radiation is very intense. The peaks are largely above the cloud layer and receive little rain so that sub-humid conditions prevail and the vegetation is stunted and drought resistant.

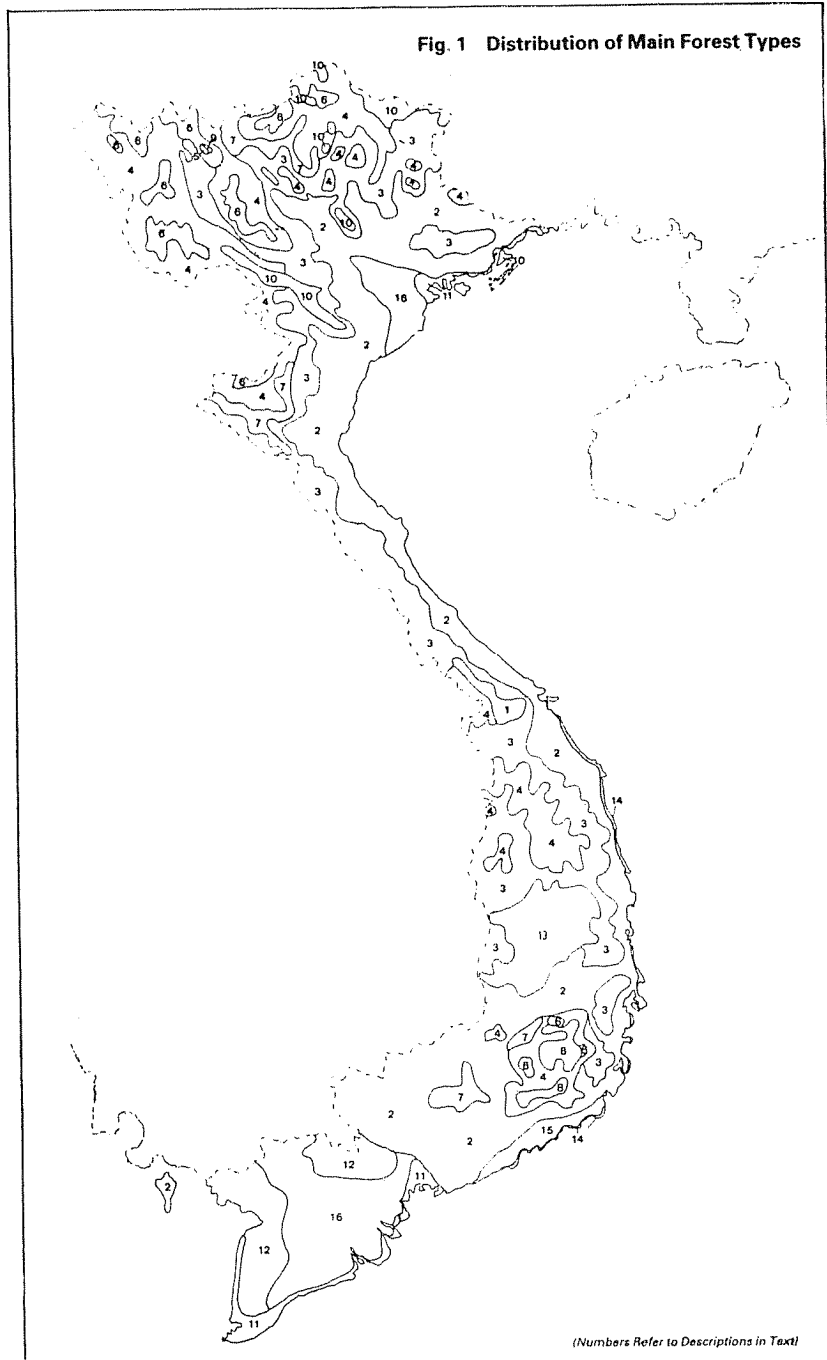
Owing to the absence of cloud cover from the coastal areas for much of the year, Vietnam receives very high levels of solar radiation averaging 130 kcal/ sq. cm./year compared with a general tropical average of 75 kcal. This makes possible high vegetative production in Vietnam, as the green plants can in theory fix about one per cent of this energy through the process of photosynthesis. This high solar radiation provides the basis for the human life-support systems in the country and is part of the reason why the country can support such a high human density.

Natural Vegetation

Originally, almost the total area of Vietnam was clothed in tropical forests. Ancient tree roots have been even found in the deltaic muds of the Mekong and Red Rivers. Most of these forest types fall into the closed tropical evergreen seasonal category and only a small area of land in Central Vietnam shows true closed tropical everwet lowland forests. Closed tropical semi-deciduous forests are found only in northwest Vietnam and a few areas in the south. From the characteristics of the surviving forests of Vietnam and the physical and climatic characters it is possible to reconstruct a vegetation map of the original natural vegetation which existed (see Fig. 1). The main forest types are as follows :

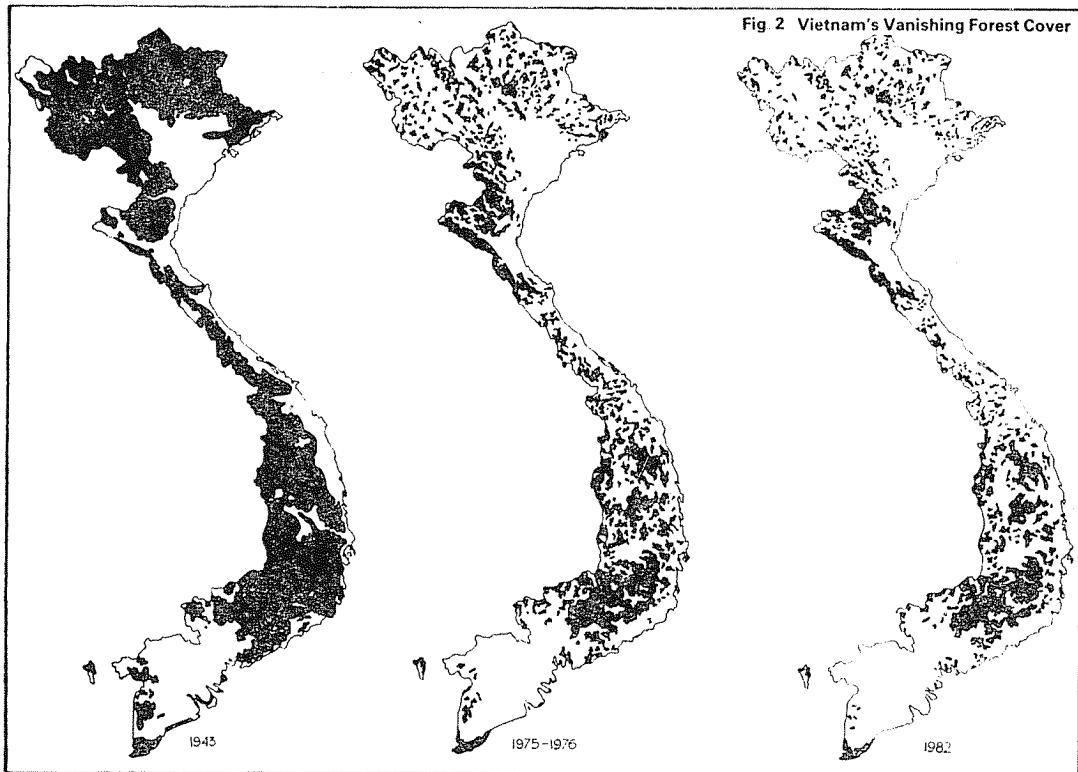
1. Closed broadleaved tropical ombrophilous lowland forest—found only in the central portion of Vietnam.
2. Closed broadleaved tropical evergreen seasonal lowland forest mostly dominated by *Dipterocarpaceae*, *Fabaceae*, *Meliaceae* and *Sapindaceae*. In the north below 300m

- and largely dominated by *Dipterocarpaceae* and *Fabaceae* in the south below 600m.
3. Closed broadleaved tropical evergreen seasonal lowland forest dominated by *Fabaceae* and *Lauraceae*—the most extensive type of forest in Vietnam found between 300-700m in the north and between 600-1000 m in the south.
 4. Closed broadleaved tropical evergreen seasonal sub-montane forest—widespread in the mountain zones of Vietnam.
 5. Closed mixed conifer/broadleaved tropical evergreen seasonal montane forest, domi-



nated by *Abies nukiangensis* and *Tsuga chinensis*—a rare specialised vegetation zone found only in the Hoang Lien Son mountains.

6. Closed broadleaved tropical evergreen seasonal montane forest, dominated by *Ericaceae*, *Vacciniaceae*—a more widespread upper montane vegetation type.
7. Closed bamboo tropical lowland and sub-montane forest—possibly all secondary in nature but so dominating in some areas as to suggest a native type.
8. Closed pine tropical forest dominated in the lowlands by *Pinus merkusiana*, now mostly secondary but obviously derived from some primary forest type and dominated in sub-montane areas by *Pinus Khasya*—a specialised type found only in the Lam Vien highlands and two small northern sites.
9. Closed broadleaved tropical evergreen (sub-dry) sub-alpine forest—a rare specialised vegetation type found only above the cloud layer (2600m) in the Hoang Lien Son mountains.
10. Closed broadleaved tropical evergreen seasonal lowland and sub-montane forest on limestone—a specialised vegetation type on karst limestone topography mostly in the north.
11. Mangrove swamps—various types of saline swamps colonised by *Avicennia*, *Rhizophora*, *Brugiera*, *Nypa* and other mangroves, found mainly in the estuaries of the Mekong and also in an impoverished form in the Red River.
12. *Melaleuca* forest—specialised freshwater seasonal swamp forest on peaty soils found only in southern Vietnam.
13. Closed broadleaved tropical deciduous lowland and sub-montane forest, dominated by *Dipterocarpus*—a specialised deciduous forest found extensively only in the Dac Lac highlands.
14. Beach forest—specialised coastal forest on sand, mainly dominated by *Casuarina*.
15. Closed broadleaved tropical deciduous lowland forest—a mixed deciduous forest type confined to the seasonally dry coastal plains of the Phan Ri Phan Rang area.



16. Swamp forest of the Red River delta and Mekong delta—now totally destroyed and no characterisation possible.

In addition, several secondary forest types of scrub deciduous vegetation obviously influenced by man can now be distinguished but these were certainly not original vegetation types.

The natural forests of Vietnam have been continually denuded and exploited by man; first in the coastal and low-lying areas and then progressively higher into the hills and mountains. This process has been accelerating as a result of war damage and increasing population growth. By 1943 only 44 per cent of the forest cover remained, while by 1975–76 it was reduced to 29 per cent and by 1983 to only 24 per cent (see Table 2.2, Fig. 2 and Fig. 3). The quality of the forest is also deteriorating; the greatest loss being in the case of 2.5 million ha of high yield forest (over 150 cu. m. timber/ha) and the 2.8 million ha of medium yield forest (80–150 cu. m./ha) rather than in the 2.5 million ha of low yield forest (less than 80 cu.m./ha).

Table 2.2
Loss of Forest Cover
(Area in thousand ha)

Area	Year	Total Area	Forest Area	Cover (%)
Bac bo (North)	1943	11,570	5,500	47.6
	1975	11,000	2,200	20.0
	1983	11,575	1,862	16.1
Trung bo (Central)	1943	14,760	6,000	40.6
	1975	15,860	6,215	39.2
	1983	15,232	5,244	34.4
Nam bo (South)	1943	6,470	2,000	30.9
	1975	6,040	1,085	17.9
	1983	6,335	704	11.1
Vietnam (Total)	1943	32,804	14,325	43.7
	1975	32,900	9,500	29.1
	1983	33,169	7,812	23.6

The current forest loss is estimated to be about 2,00,000 ha per year. About 50,000 ha of this total is owing to unplanned agricultural clearance. Another 50,000 ha is lost each year to forest fires while the destruction of the remainder is the result of the relentless collection of fuelwood and timber.

The current domestic wood demand for both fuel and construction is about 0.5–0.7 cubic metres per capita per year or a total of some 40 million cubic metres per year. In theory, this figure should be sustainably harvestable from the remaining forests. The average forest biomass is about 660 tons of dry material per hectare with an annual production of about 20–30 tons. However, the collection of wood is not evenly distributed through the forest area. Rather, it is concentrated at the forest edge, where harvesting levels greatly exceed regeneration and the forest edge continues to recede. Unless this pattern of use is changed, the forest will almost disappear by the year 2000.

The Ministry of Forestry has undertaken measures to improve the situation. It has earmarked four million hectares of hydrological protected forests (of which only 1.9 million hectares are presently forested) and plans to create 87 reserves (national parks, nature reserves and areas of cultural and tourist interest) totalling another million hectares. Fourteen of these reserves have already been approved by the Government totalling 1,60,000 ha.

Fig. 3 Causes of Forest Loss



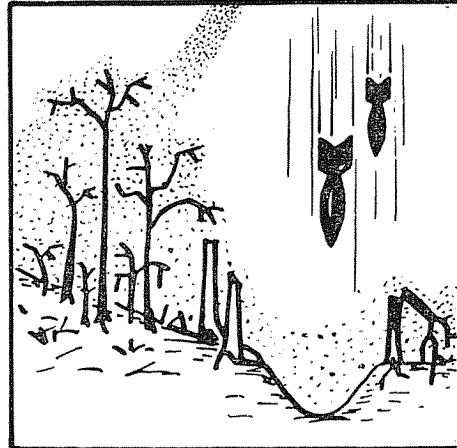
Collection of Firewood



Clearing for Agriculture and Timber



Forest Fires



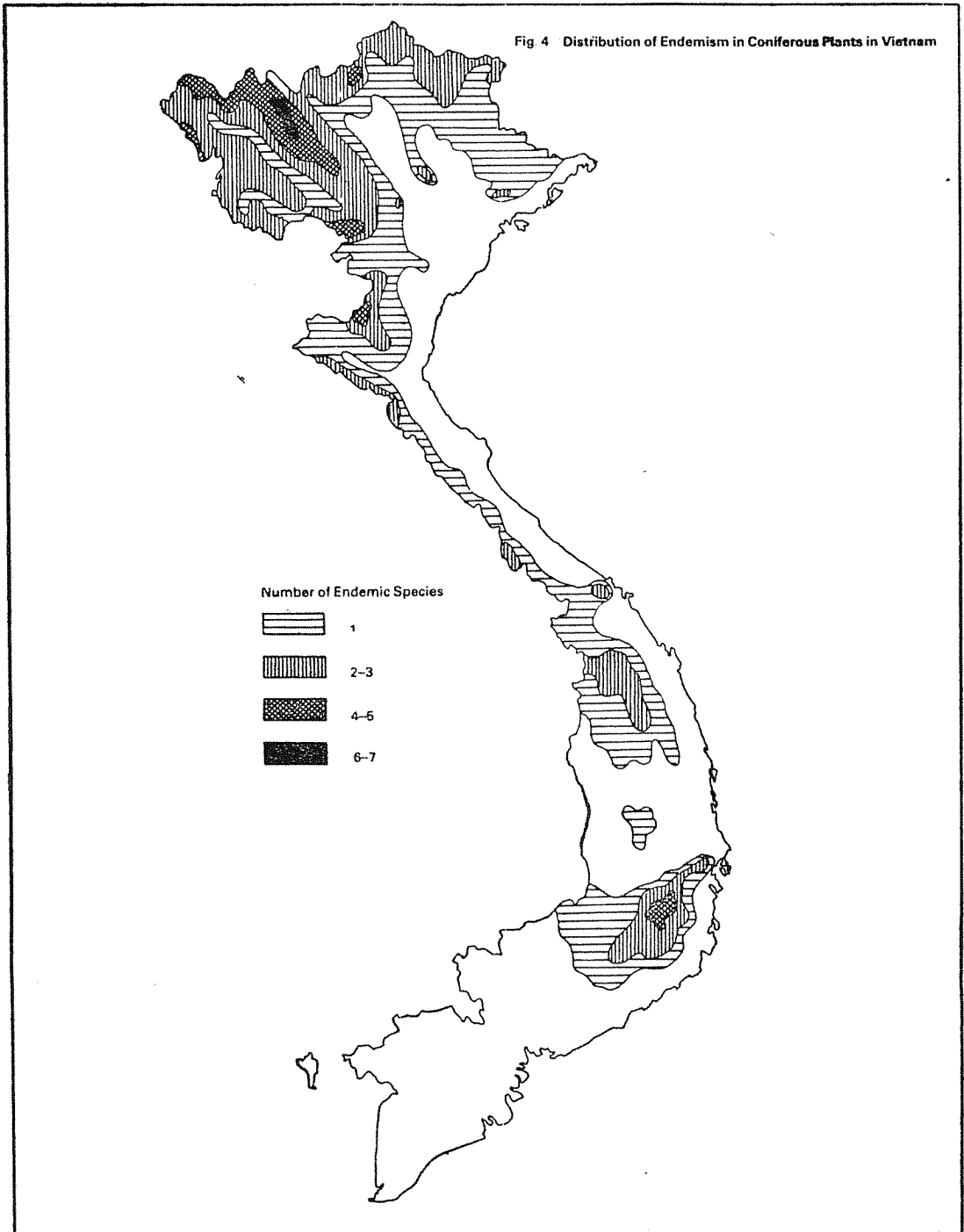
Warfare

The Directorate of Forest Protection has a forest police force of 10,000 to prevent irregularities from taking place in the forestry sector. For many years Vietnam has been actively engaged in reforestation, an activity keenly initiated by the late President, Ho Chi Minh. From 1955 to 1980, a total of 8,72,000 ha of forest was planted but an inventory in 1979 revealed that only 3,16,000 ha of this area still had realistic tree cover—a success rate of only 36 per cent. Diseases, pests and fires are the main reasons for such low success. Current reforestation efforts of 50,000–1,00,000 ha per year do not keep up with forest losses.

Wild Genetic Resources

The forests of Vietnam contain a great wealth of plant species. It is estimated that there are about 12,000 species of plants, of which over 7,000 have been identified. These contain many valuable and useful species including, some 2,300 species that are known to be used by man for food, medicines, animal fodder, wood or other purposes. The use of many other species is unknown, though certainly many more will be found to be beneficial when their properties are analysed.

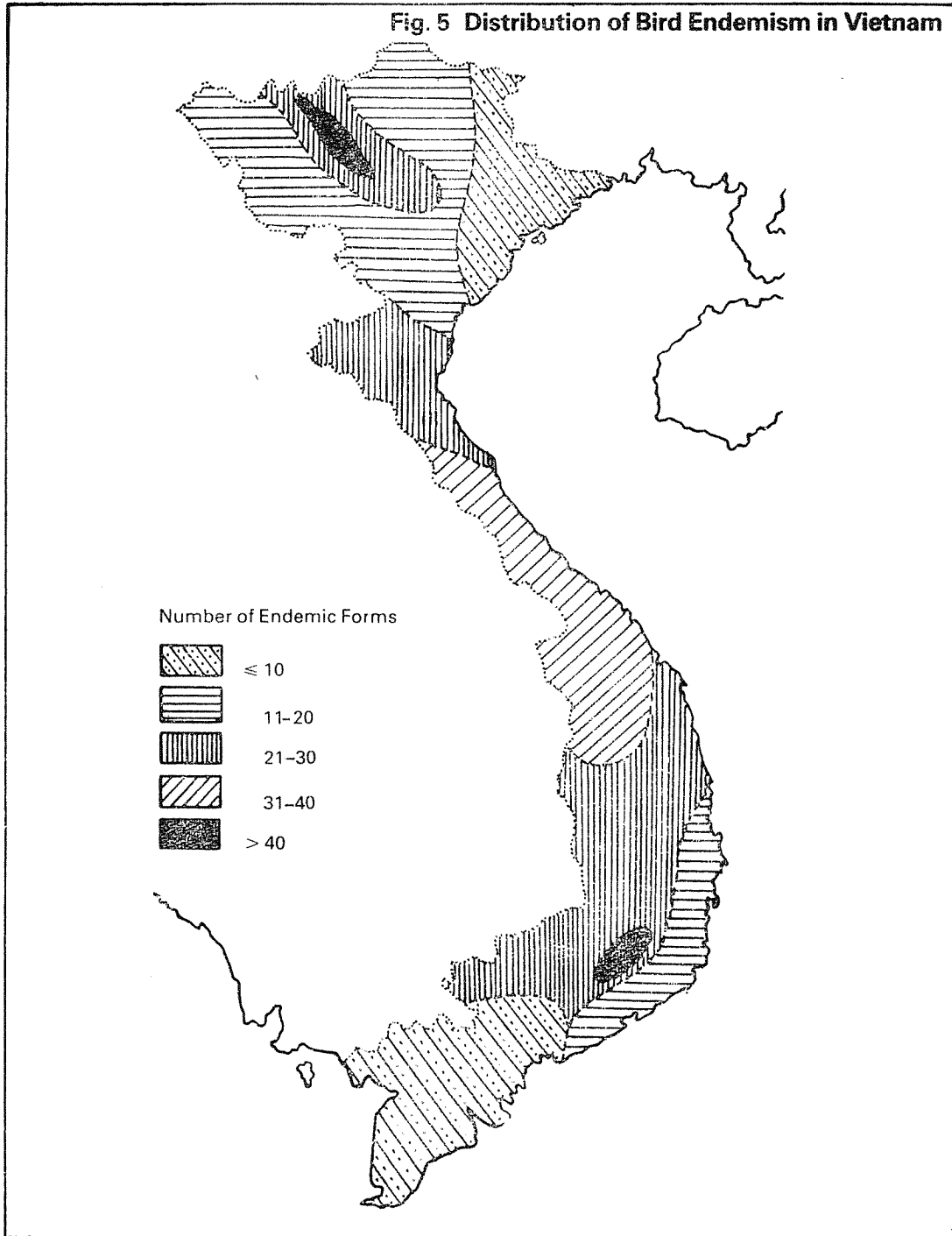
Vietnam has a very high level of local botanic distinctiveness, with many endemic species of flora centred in four main refugia of local forms. The most endemic species are found in



the alpine zone of the Hoang Lien Son mountains. Other pockets of high distinctiveness are the Ngoc Linh mountains, Lam Vien highlands and the everwet forests of central Vietnam (see Fig. 4).

Many of these species are confined to small geographical ranges and occur at low individual densities which renders them highly vulnerable as the forests are cut into smaller patches and eventually cleared completely. Several of Vietnam's most valuable types of timber are be-

Fig. 5 Distribution of Bird Endemism in Vietnam



coming scarce, such as *Afelia xylocarpa*, *Sindora siamensis*, *Morinda officialis* and some are even endangered with extinction, such as *Cupressus terbulosa*, *Dalbergia bariaensis* and *Fokiema hodginsi*.

Vietnam has also a very rich variety of wild fauna spanning a wide range of habitat from the equatorial lowlands to the high temperate plateaux and alpine peaks. There are 273

species of mammals, 773 species of birds, 180 species of reptiles and 80 species of amphibians found in the country, in addition to many hundreds of species of fishes and many thousands of species of invertebrates.

As in the case of plants, these groups of animals show a high degree of local distinctiveness in Vietnam, with many endemic forms. The mapped distribution of endemism in birds shows a pattern very similar to that of plants with the highest endemism in the isolated mountain ranges (see Fig. 5).

These lists of species include many valuable, useful and rare species of great interest to conservation—the elephant, rhinoceros, kouprey, banteng, deer, tiger, bear, snub-nosed monkey, Douc langur, concolour gibbon, crocodile, python, turtle, peacock, pheasant and many more. Some of these species are of high potential use and value to man, such as species which have been or could be domesticated. These include the jungle fowl, pig, deer, elephant, banteng, wild buffalo, kouprey, pheasant, peacock, etc. Other species can be utilised for other valuable purposes, for example, farming deer for meat and medicinal velvet, ranching monkeys for biomedical research, and farming snakes and crocodiles for reptile skins. Some species are important for human food—fish, prawns, frogs, numerous wild mammals and birds, snails, cuttlefish, etc.

Properly utilised and managed, the wild fauna of Vietnam could be a very valuable renewable resource, but the decline of the country's wildlife is taking place very rapidly. Not only is the habitat of many species vanishing as forests are cut and waterways polluted, but also the pressure of uncontrolled over-hunting has exterminated many local populations and some entire species from the country.

The tapir and Sumatran rhinoceros are now extinct in Vietnam and other species are nearly so. The kouprey, *Bos sauveli*, is thought to number less than twenty in the country and the Javan rhinoceros only five individuals. The banteng, peacock, Eld's deer and Fireback pheasants have also depleted in number. Although now there are lists of protected species and protected areas, there is still no control over hunting and almost all the population has access to firearms. The plight of wildlife in Vietnam looks very bleak unless much greater effort is made by the appropriate authorities to save these valuable resources.

Fisheries

Vietnam enjoys an extensive system of rivers, streams, lakes and ponds distributed all over the country. These water bodies have a high potential for fishery development (estimated at 20–30 thousand tonnes per year). Fisheries can be an important supply of protein for the local people, particularly in the midland and mountain regions where no seafish can be obtained. The promotion of fresh-water fish culture in these regions is being encouraged. Some fresh-water fisheries have been adversely affected by pollution by agricultural chemicals and byproducts of the American herbicidal spraying operations during the war. These fisheries have faced a reduction in species richness and productivity and will need restocking.



No proper inventory of marine fisheries has been made, but the stock is known to be rich and diverse. Some 2,000 fish species have been identified including about 100 species of high economic value. The production of marine fish is about one million tonnes per year and shrimps about 40–50 thousand tonnes a year. In addition, there is much potential along the extensive coastline and its many lagoons, reefs, estuaries and mangroves to culture many types of sea products, such as fish, shrimps, molluscs, seaweeds, algae and others.

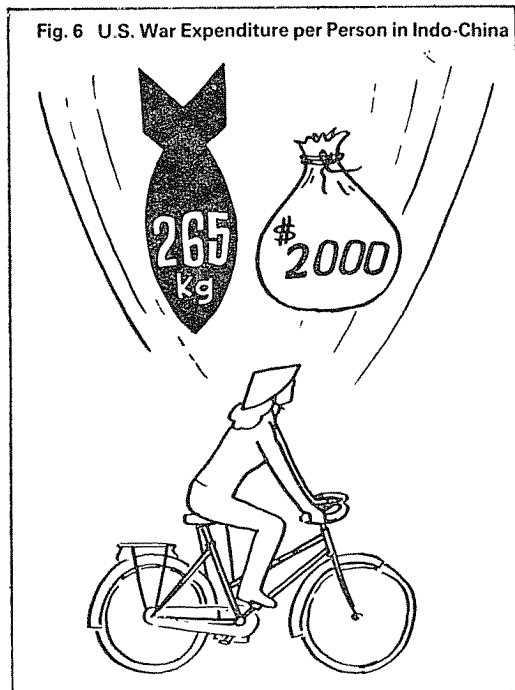
Inshore fisheries in the north and south of the country's continental shelf are probably already over-fished with the result that the unit catch per effort is decreasing. However, the

central reef fisheries and the deep sea fisheries remain somewhat unexploited. Several areas of water upwelling (with vital minerals) are known which can be expected to have high fishery potential.

Environmental Impact of the War in Vietnam

The environment in Vietnam bears severe scars resulting from the damage caused by war. During the war for the reunification of Vietnam, the U.S. military forces employed deliberate destruction of the environment as a military tactic (ecocide) on a scale never seen before in the history of warfare. This included the following:

- Spraying 72 million litres of herbicides (agents orange, white and blue) on forests and croplands (Operation Ranch Hand), resulting in the destruction of vegetation and the residual contaminant poisoning of the land by dioxin (TCDD) which has an environmental half life of many years and is still at toxic levels today, 12 years after the end of the spraying. A total of 1.7 million hectares of land are affected.

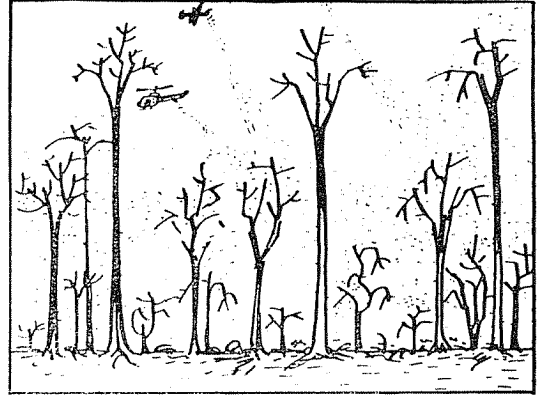


- Clearing large tracts of forests, agricultural land and even villages and cemeteries with giant bulldozers (Rome ploughs), which removed even the topsoil in Operation 'Paul Bunyan.'
- Burning inflammable *Melaleuca* forests by napalm bombing.
- Attacking the agricultural productive systems by spraying crops, bombing dykes, etc.
- Creating landslides in steep terrain by bombing and spraying of acid on limestone.
- Directing attacks on wildlife (eg. bombing and napalming of elephants with transport potential).
- Damaging land and forests from saturation bombing by more than 13 million tons of bombs equivalent to 450 times the energy of the Hiroshima atom bomb or an average of 265 kg per person in Indo-China.

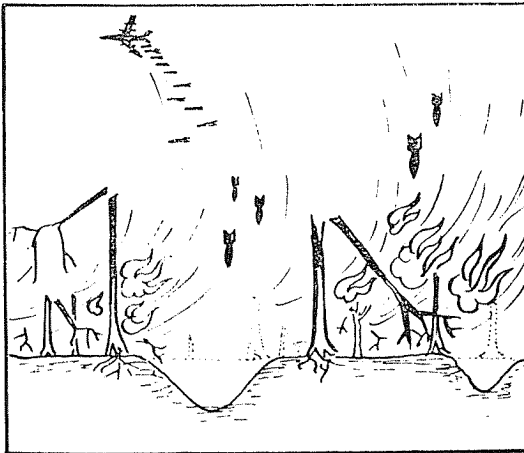
Fig. 7 Stages in Loss of Forest owing to War



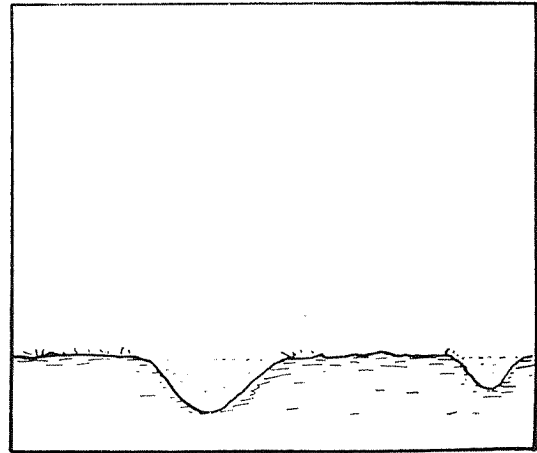
Original Multi-Storeyed Tropical Forest



Herbicide Spraying causing Temporary Defoliation, Death of Trees and Animals and Long-term Poisoning of Land



Bombing and Napalming resulting in Burning of Forests and Cratering of Land



Use of 'Rome Ploughs' clears Topsoil and prevents any Regeneration

These actions resulted in the immediate loss of more than 20 million cubic metres of commercial timber, 300 million kg of food, 1,35,000 ha of rubber plantations and the elimination of much wildlife and fisheries. The long-term effects are in fact far more serious for, more than 12 years after spraying, the forests have never recovered, fisheries remain depleted in variety and productivity even in coastal waters, wildlife has not regenerated, cropland productivity is still below former values and a great increase in toxin related diseases and various kinds of cancer is noted in the affected human population. The colossal damage from 25 million bomb craters, which caused displacement of 3 billion cubic metres of earth, led to health hazards and the disruption of water flow. The particles of sharpnel embedded in living trees renders their wood less valuable.

A major Government programme to restore the environment and repair some of this war damage has been launched. However, the scale of the problem is much too large for Vietnam's technical and financial resources to solve unaided. Much of the damage probably can never be repaired.

Land Use

The current pattern of land use of Vietnam's 33 million ha is given in Table 2.3.

Fig. 8 Intensity of Herbicide Spraying in Southern Vietnam

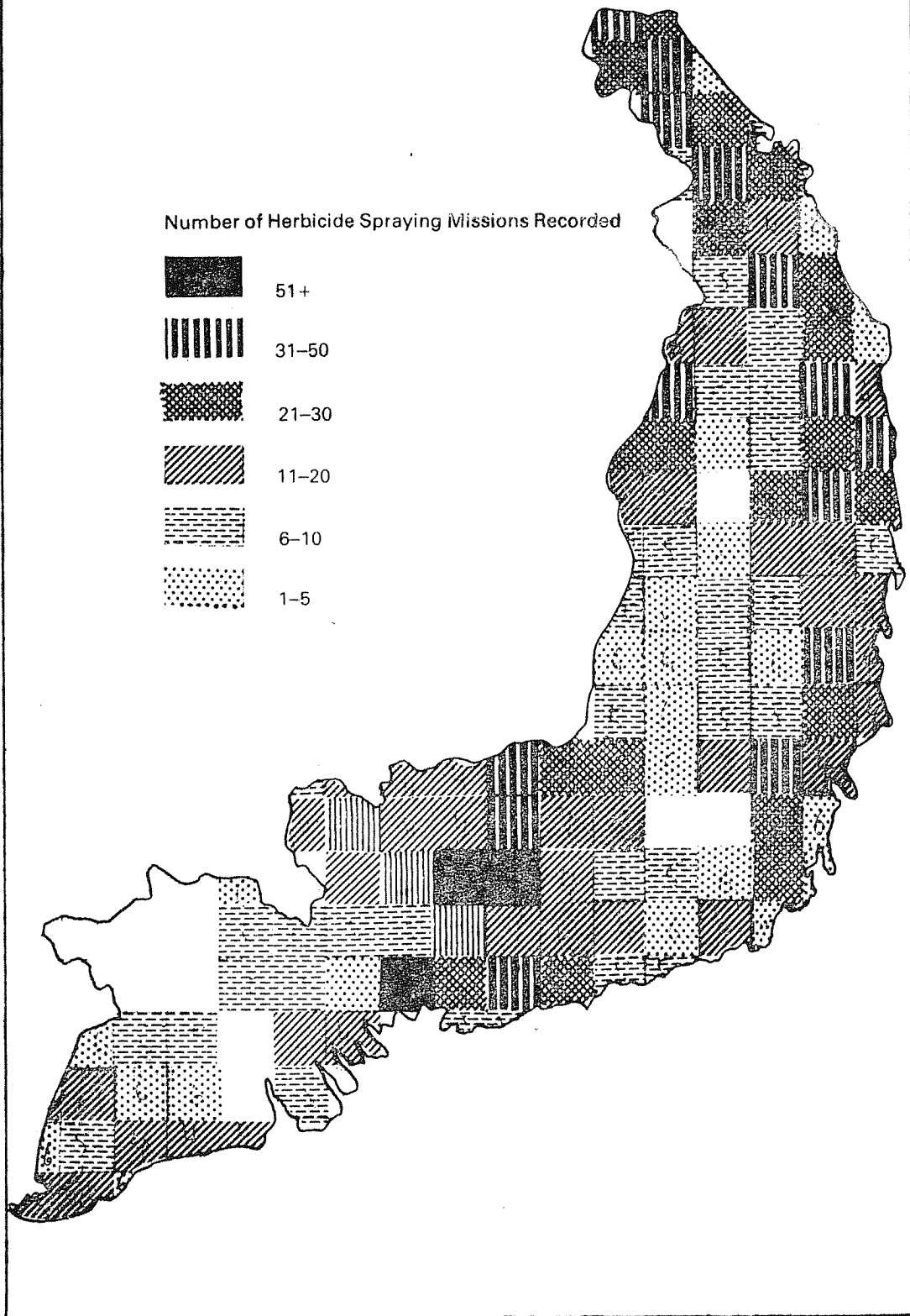


Table 2.3

Pattern of Land Use in Vietnam

Land Use	Area (in million hectares)	Percentage
Agriculture	6.9	21
Forestry	11.8	36
Towns and other special uses	1.4	4
Land of little or no productivity	12.9	39

The current agricultural area is only 0.13 ha per capita. Since this is inadequate to feed the population fully, large amounts of food have to be imported. The population rises at a rate of 2.7 per cent per year, whilst the maximum area that is thought to be suitable for permanent agriculture is only 10 million hectares or a total increase of another 45 per cent. Moreover, land which still has unused agricultural potential cannot be expected to become as productive on an average, as the land already being used which is, of course, the best agricultural land. Unless the human population in Vietnam is quickly stabilised, there will be a food crisis.

Of the land supposedly under forests, only 66 per cent is actually under forest cover. This is inadequate to meet the forestry production and hydrological protection needs of the country. Much greater reforestation programmes are needed to make up for the current net losses of 2,00,000 ha per year. It is hoped that the area under forests can be expanded again to cover 50 per cent of the country by reforesting bare midland hills which have little or no agricultural potential. Such expansion both of forestry use and agricultural use must be made in the largely degraded midlands zone. The area of these barren lands has increased very fast from about 3 million ha in (1943) to 14 million ha in 1983. These lands can be restored to productivity only if suitable methods of cultivation and tree cover can be found for the different soils and landform involved, and only if suitable investment and stimulatory policies are applied. Such a job is, however, possible given the high humidity, thermal regime and deep soil profiles of the midland areas. Certain types of high intensity land use, such as multiple cropping techniques, high yield algal culture and brackish and fresh-water fish ponds can be further expanded to alleviate the critical food conditions.

Agricultural Production

Food production is the major agricultural activity in Vietnam. The chief crop grown is rice. Small quantities of potatoes, sweet potatoes, manioc and maize are also cultivated, but their production is negligible compared to the rice harvest. Two main types of rice are grown; glutinous rice and dry rice. Both irrigated paddy culture and dry field culture are used.

Food production in Vietnam is greatly hindered by bad weather. The increasing frequency of floods, droughts, typhoons and pests cause heavy losses. In 1978, food production reached an all-time low of only 12.9 million tonnes. The food ration was cut from 18 kg to 13 kg per month (some 2 kg below the UN minimum subsistence level). The government took some land reforms to allow peasants to acquire small personal land holdings to help stimulate production. Yields have increased. The production of food stood at 14, 15 and 16.2 million tonnes, respectively for 1980, 1981 and 1982. There is still much room for agricultural improvement. Given adequate investments, irrigation facilities could reach a much larger area rather than the 25 per cent of cultivated land currently irrigated. In addition, production from the 1.6 million hectares of acid sulphate soils in the Mekong delta could be greatly increased with improved cultivation techniques.

Industrial Production

Great emphasis was placed on the development of heavy industry in the two five-year development plans, 1976-80 and 1981-85. But progress in this has been very slow as a result of shortages in fuel and investment funds. Vietnam does now make a wide range of everyday hardware commodities, but these are mostly for domestic use only. Hardly any heavy industries have been established beyond the construction and engineering (buildings and repair of bridges) industries.

It is of utmost importance to produce more goods and Vietnam has a substantial amount of raw materials and manpower to provide a good base for the 'development of socialist industrialisation' (Decision 4 of the party). Sadly, funds for developing our industry are very small and until the oilfields of the continental shelf can be tapped or unless foreign countries assist or invest in industries in Vietnam, industrial development will continue to develop slowly.

Energy Resources

The main source of energy currently utilised in Vietnam is fuelwood, harvested from natural forests. This is only a small per cent of the potential bio-energy that theoretically may be exploited.

In addition, there are coal deposits which have been exploited in the north of the country in Thai Nguyen, Quang Ninh, The Da and Nghe Tinh. There are also deposits of oil and natural gas to be explored in the Mekong delta and the continental shelf of Nam bo, but these are not yet very productive and the full extent of fossil fuel resources in Vietnam is still not explored.

Potential power from hydro-energy in Vietnam is estimated at 260 billion kwh per year. The Red river system has the highest proportion of this total (37 per cent) followed by the Da river system (19 per cent) and Dong Nai river system (15 per cent). This potential is mostly undeveloped and is in fact decreasing owing to unplanned exploitation of the forests. Many of the existing reservoirs now run dry as a result of failure of water sources while other reservoirs have very short life spans because of heavy siltation, resulting from deforestation of catchment areas.

Wind energy is used to a limited extent in the Mekong delta and in some coastal areas of Vietnam but in fact the wind strength in most areas is inadequate for this to be an effective contribution to meet energy needs.

Vietnam plans to make a start in the use of nuclear power plants but the costs of such plants are too high and the energy needs of the country still rather low. Per capita consumption of fuel energy in Vietnam is still very low owing to the equable climate, shortage and high cost of fuels and the low level of industrialisation. Much of the domestic fuel in areas with no access to forests, comes from burning rice stubble and other agricultural wastes, which remove the needed minerals from the land.

Mineral Resources

A complex geological history has endowed a small country, such as Vietnam, with an unusually wide range of minerals, including many rare and valuable deposits. The inventory of minerals is still far from complete.

The northeastern region is the richest in minerals. The distribution of minerals in the region is as follows:

- Coal is found in Thai Nguyen and Quang Ninh
- Wolfram and tin are found in the Phia Uac mountains
- Lead, zinc and silver are found in Cho Dien, Ngan Son, Lang Hit and Thanh Moi
- Antimony is found in Ha Tuyen and Cao Lang provinces

- Mercury in Ha Tuyen province
- Gold in Cao Lang and Bac Thai provinces
- Magnetite in Bac Thai and Cao Lang provinces
- Pyrite at Cho Dien and Cho Don
- Nickel and asbestos in Cao Bang
- Manganese, bauxite and lignite in Cao Lang province
- Apatite in Lao Kai
- Oil and gas have also been found

In the northwestern part of Vietnam, deposits are less well explored. Their distribution is as follows:

- Silver, copper, lead, nickel, iron, antimony, rare metals, bitumin and bauxite have been found in the Da syncline
- Polymetals, copper, cassiterite, nickel and gold are found in the Lai Chau fault
- Chromium is found in Co Dinh
- Ferro-manganese in Nghe Tinh

In the Truong Son mountain range lateritic iron, pyrite, lead and zinc have been found in Quang Binh and iron in Quang Tri. The southern half of Vietnam is much less rich in minerals but there is gold at Bong Mieu, coal at Nong Son, copper at Duc Bo and zinc at Dien Ban. In addition, there are small deposits of graphite, antimony, iron, wolfram, titanium, molybdenum and kaolin. There are extensive peat deposits in Minh Hai and oil and gas in the Mekong delta and on the continental shelf of Nam Bo. There is a bauxite in Tay Nguyen. Most of these known deposits remain unexploited, awaiting for the investments and fuel needed for the industrial development of the country.

Human Population

The human population of Vietnam constitutes paradoxically the country's most valuable renewable resource as well as the greatest threat to its environment. The total population in Vietnam was already 58 million in 1983. This gives a mean density of close to 200 persons per square kilometre, one of the highest densities for any agricultural country in the world. This population pressure places an impossible strain on the environmental capacity of the country. Figure 9 shows how the population is distributed over the 32 provinces.

As a result of this problem of over population, the government is pursuing a birth control programme. The programme is showing good results in urban areas but difficulties arise in the midland and mountain areas where peasants still have very large families and human growth is still possible at the expense of the forests through the practice of shifting cultivation. Such practices cannot be sustained, however, and the renewability of these vital water

Fig. 10 Shrinking Agricultural Land per capita in Vietnam

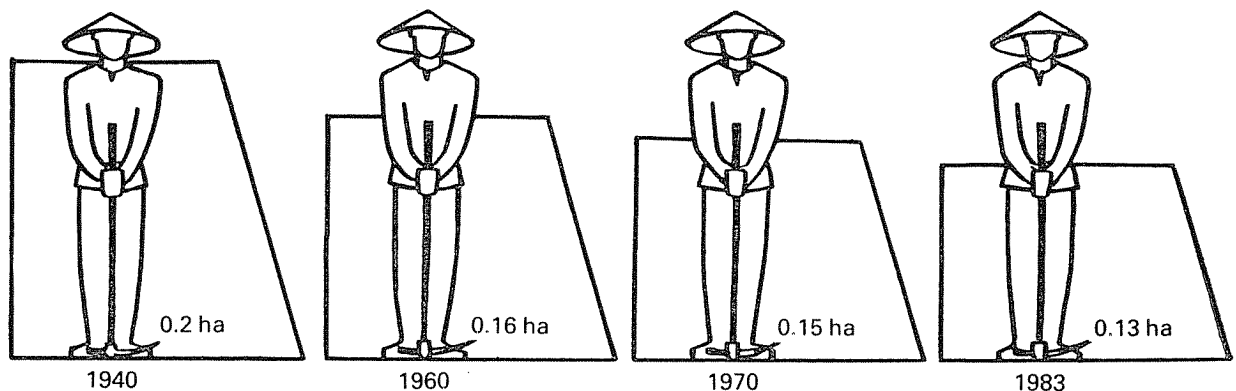
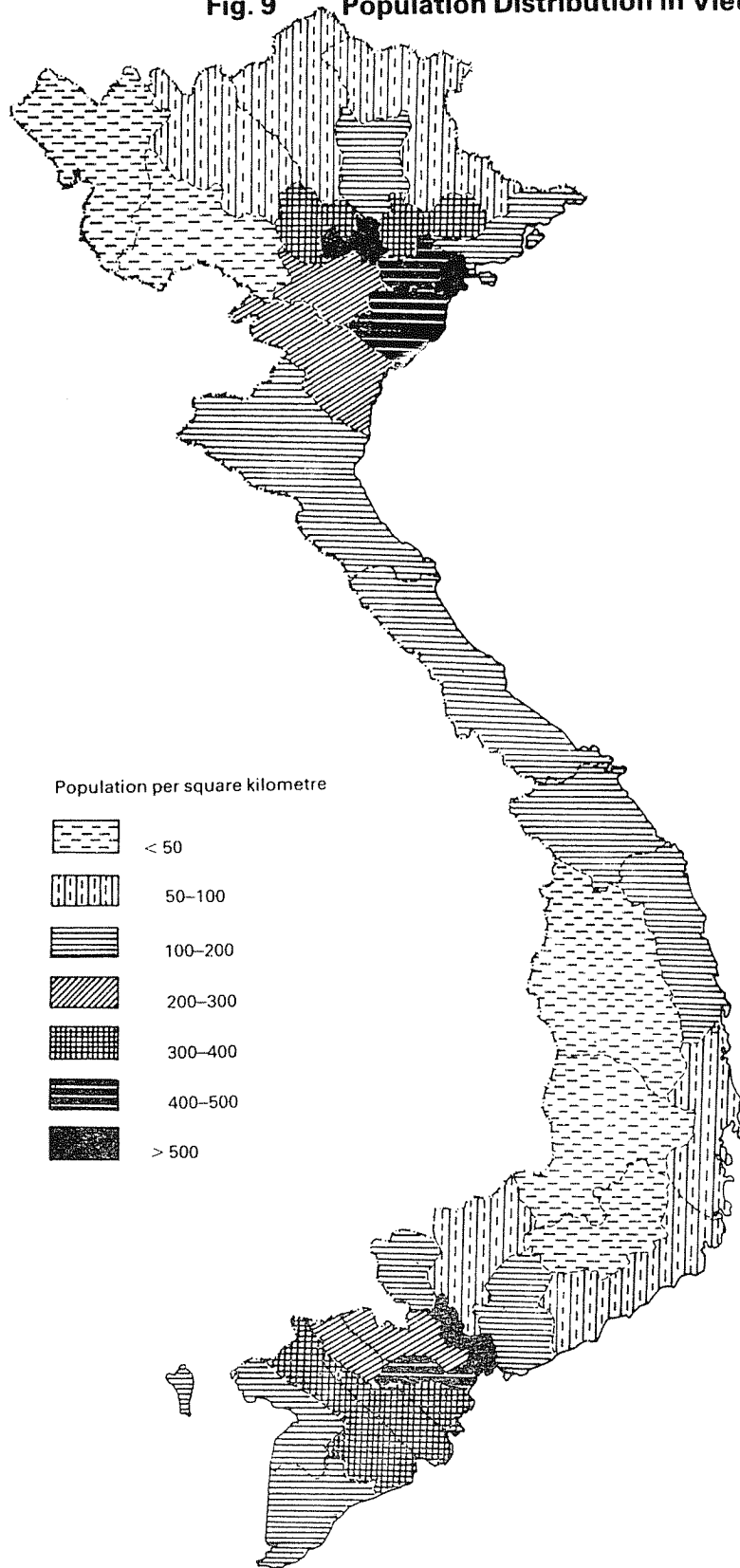


Fig. 9 Population Distribution in Vietnam



catchments is being destroyed. Greater effort is clearly needed to control population growth in the whole country but especially in the midlands if a population crisis is to be averted. This is made difficult because of poor communications in the midlands.

Workforce

A large percentage of the population of Vietnam comprises farmers working in agricultural cooperatives. They are by nature cheerful, hard-working, skillful and intelligent workers. They are also fiercely nationalistic, independent and hardened by almost 30 years of warfare.

The industrial sector in Vietnam is still relatively small, but Vietnam has for a long time invested heavily in education and now has a large number of highly trained scientists and technicians in many fields. In this respect, it has a clear advantage over most other developing countries.

Vietnam has a strong and dedicated army, which in addition to maintaining national security, undertakes extensive public work in agriculture and industry in constructing roads, bridges, canals and other communications.

Cultural Aspects

The population predominantly speaks Vietnamese. Most Vietnamese are Kinh people, but there are also some ethnic minorities, mostly in the hill areas who speak their own languages. These minority groups show language affinities with other hill people of Indo-China (especially Laos) and Burma. This variety adds colour to the rich culture and proud history of the Vietnamese people, with their wealth of art, songs, dances, traditional styles of dress, houses and customs, literature and historical sites. Both Buddhist and Catholic religions, are still widely followed throughout the country and the Government allows complete freedom of religious preferences.

Standard of Living

The average per capita earnings in Vietnam are difficult to calculate because of the complex dual economy that exists. An official state economy and a free market economy run side by side but with widely differing exchange levels. The official UN estimate is 300 per year, which makes Vietnam one of the world's poorest nations. However, as a result of the socialist system, severe pockets of poverty do not exist. The people are well dressed, cheerful and adequately fed. There is little sign of malnutrition and health standards are higher than in most developing countries.

Education

The standards of education in Vietnam are rather high. Every village has its own primary school for children aged 6-14 years and most villages are within reach of a secondary school for 15-17 year olds. All children receive primary education and between 30-40 per cent of them also get secondary education. There are 94 universities or centres of higher learning (including technical colleges) which train a total of about 30,000 students a year. Approximately 500 students a year go abroad for further training, primarily to the Soviet Union and German Democratic Republic (GDR).

THE DEVELOPMENT CONTEXT OF VIETNAM

After a long period of violent war for national liberation and unity, Vietnam is now concentrating on national reconstruction. It is striving to control the basic productive processes so as to transform the economy from small-scale to large-scale production. This is to be carried out under a socialist pattern of society over a period of twenty years. 'Persistently and energetically strive to move Vietnam from being a poor economic country to a socialist state with a modern agriculture and industrial economy, advanced culture and science, up-to-date machinery, steady in defence, civilised and happy in life' (Decision No. 4 of the Communist Party of Vietnam).

In order to achieve this aim, all the people working in the social and economic sectors must work very hard to implement the general economic objectives during the first period of transition from capitalism to socialism. The objectives are the following :

- To satisfy the basic and urgent needs of the population by gradually stabilising and improving, step by step, the material and cultural life of the people. The first task is to bring about stability in the area of food production, education, medical aid, housing, child welfare and other vital consumer requirements.
- To continue to construct the material and technological basis of socialism with the aim of advancing agricultural production both for local consumption and export, and at the same time, to increase the production and technological equipment for other economic sectors and to eventually pave the way for the large-scale development of heavy industry.

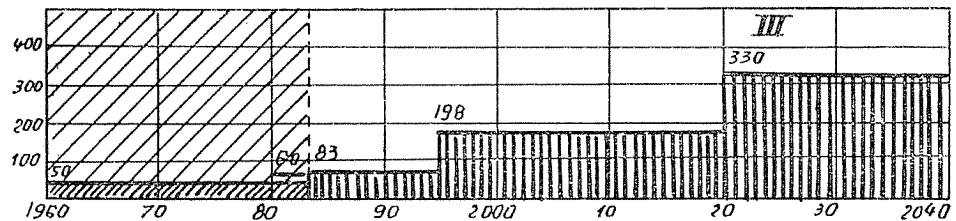
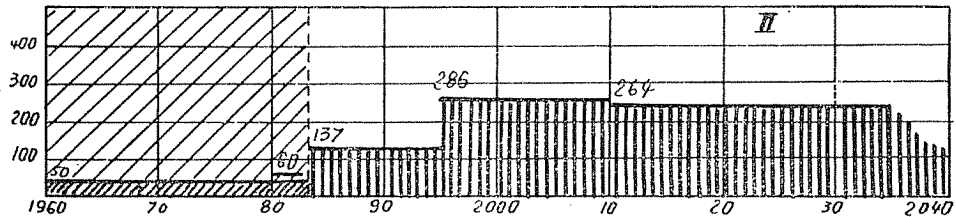
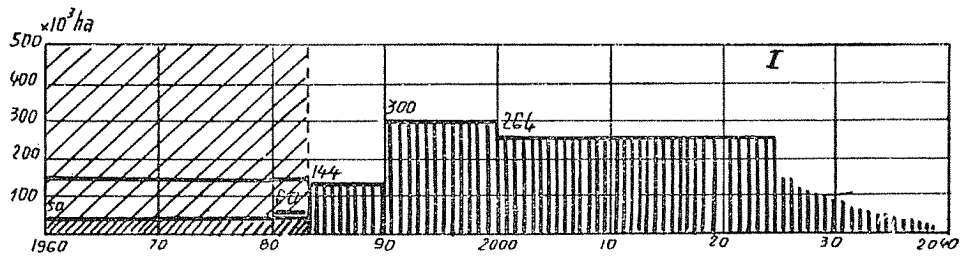
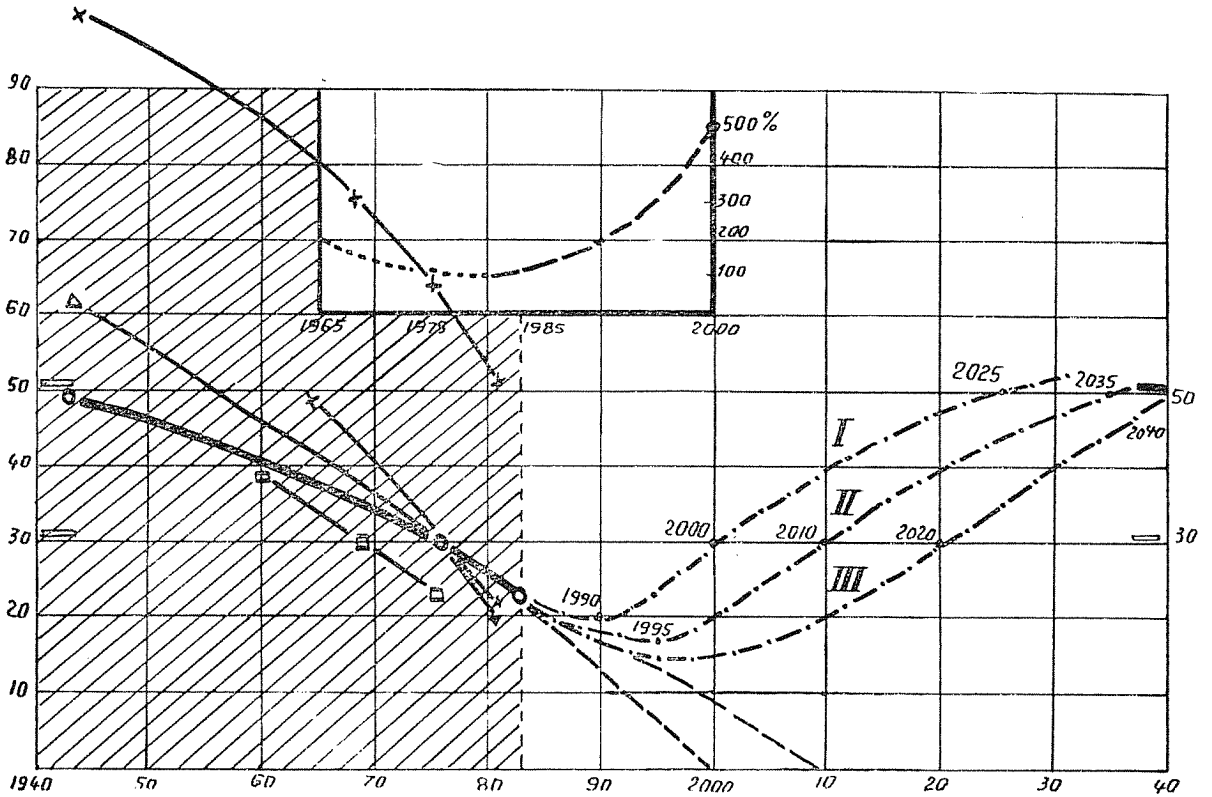
Naturally in order to attain the aforementioned general objectives it is necessary to make full use of all economic sectors and of all resources especially manpower and land (even forest and sea). Vietnam is setting up important industrial undertakings, such as hydro-electric plants at Hoa binh and Tri an, a thermo electric plant at Pha Lai, cement works for paper mills, etc. The country must increase the exploitation of coal and other minerals, develop light industry, the transport, construction sectors, etc. and boost agricultural, forestry and fishery production.

The needs for development in different areas is very great but the existing resources of the country are limited. That is why, for the development of long-term benefits, it is necessary to use our resources wisely. The decision made by the political bureau of the party on scientific and technological policies has emphasised that the environment and ecosystems need protection, the ecosystems that were destroyed during the war or by over-exploitation without proper management must be restored and further degradation of land must be resisted. The decision of the Party Congress No. 4 also pointed out that we "attach much importance to all problems: reforestation, exploitation and protection of forest cover, all the hills and dunes with trees during two or three years of the five year plans". . . "Launch a movement of all the people for the reforestation and protection of the forest especially hydrological forests for river catchments. Stop the destruction of woodland, supply the mountain areas with living provisions and put in motion a programme for settled agriculture to make permanent rather than shifting homes." The government has also issued a number of rules and regulations for the conservation and rational use of natural resources. They are rules and laws relating to :

- forest protection;
- use and management of land;
- economic management of fish-rearing;
- exploitation and conservation of water resources;
- hygiene and health protection; and
- hunting of wild beasts and birds.

Although there has been great progress in the rational exploitation of natural resources, all these laws which have been passed have not been seriously implemented. The forests,

Fig. 11 Alternative Approaches to the Restoration of Vietnam's Forest Cover



The upper figure shows historical (%) forest loss for various regions 'X', 'Y' and national figures 'O'. The projected curves indicate what happens if

- Forest loss rate continues to increase -----
- Forest loss held at current rate - - - - -
- Immediate intense reforestation (I)
- Steady level of reforestation (II)
- Reforestation built up gradually (III)

All these schedules (I, II, III) are designed to reach 50% forest cover

land, the sea, wild beasts and minerals continue to be exploited without proper control or management and for that reason it has become necessary to review the existing rules and regulations and modify them so as to ensure better implementation.

CONSERVATION NEEDS IN RELATION TO DEVELOPMENT IN VIETNAM

Maintenance of Ecological Processes and Life-Support Systems

Forests

Well-managed forest lands provide many direct and indirect benefits to man.

- They provide a sustained yield of primary forest products (building and furniture timber) and secondary products (rattan, firewood, fruits, honey, medicinal plants and game meat).
- They perform vital hydrological functions. Through their own water uptake and transpiration they return much of the rainfall directly to the atmosphere causing climatic cooling and increased cloud cover. By increasing the penetration of water into the soil by the action of tree roots they slow down the rate of rain run-off and produce a 'sponge effect' which buffers the flow of water, reducing extremes of both floods and drought.
- By breaking the force of the rain, they reduce soil erosion. They protect both the structure and fertility of the soil and also purify the water and supply clean water to waterways, reduce the siltation of vital irrigation canals, dams and reservoirs.
- They are the principal storehouse of Vietnam's valuable range of genetic resources which continue to evolve and propagate *in situ* in these remaining forests which have a high potential for human use.
- They provide temporary gardens for shifting agriculturists who, provided that gardens are small (one ha) and are not reopened too soon (20 years), can obtain ecologically effective and temporarily productive agricultural land in some areas.

Vietnam is not getting the full benefit from its forests on account of a combination of such factors as uncontrolled over-harvesting of some resources and unplanned and wasteful use of others. Uncontrolled clearing of forest land for marginal agriculture is causing loss of forest resources often accompanied with massive wastage of wood from fire, increased instability of water flow, soil erosion, silting of water systems and deleterious effects on climate. Overhunting results in the loss of valuable genetic resources, reduced harvest of legitimate game meat and loss of the forest's natural regulatory factors, such as agents of pollination, seed dispersal, seedling success, etc.

The following actions and programmes are vital to the rational use of forest resources (Fig. 11):

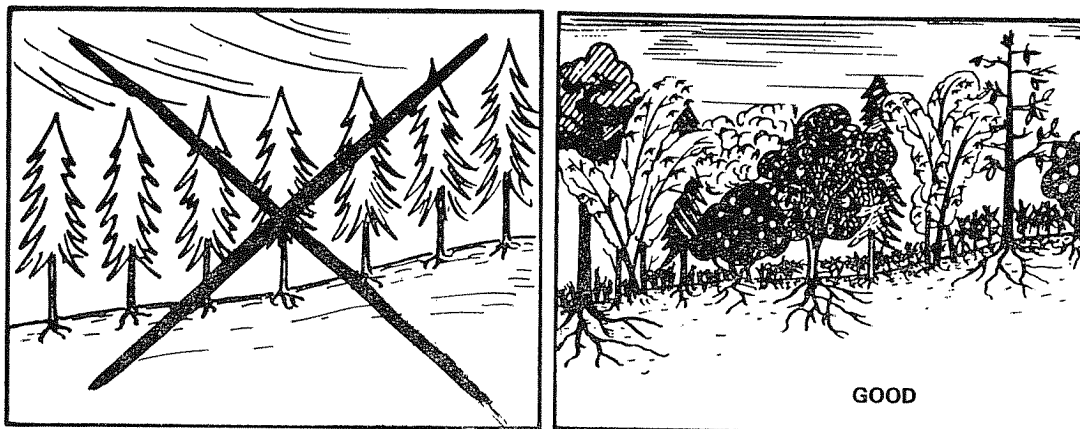
- Increasing the strength and effectiveness of forest protection by the establishment of several criteria for protected areas (hydrological reserves, national parks, nature reserves, cultural sites, recreation reserves); by better enforcement of regulations and laws; by better control of and response to forest fires and by better control of and prevention of plantation pests and diseases.

The 10,000 strong forestry police may not be enough to protect all necessary areas but they could be much more effective than at present when even priority areas are without protection. Greater cooperation will have to be forthcoming from the public, the police and the army in order to provide better protection.

- Massive increase in reforestation efforts. Current levels of reforestation are between 150 and 200 thousand ha per year with a success rate of only about 36 per cent. This is inadequate to counter the current loss of forest cover of about 2,00,000 ha. It is planned eventually to increase the forest area to about 16 million ha. This will require increasing the annual planted areas more than five-fold to about one million ha per year.

- The failure of the programme is high because of the occurrence of fires and the damage caused by insects and pests. These losses could be reduced by planting more fire-resistant species and reducing monocultures. The mixed species plantations support a richer fauna of birds and other animals which help to control pests (Fig. 12). The planting of fruit trees also helps reduce the cutting down of young trees by fuel hungry local people, provided they are allowed to benefit from the fruit obtained.

Fig. 12 Advantages of Mixed Forests



Monocultures are disease-prone, fire-prone, have little protective undergrowth, take a long period of non-harvesting growth, are ecologically sterile and can cause lowering of the water table. Mixed plantations give higher humidity, help stabilise the water table, provide a more constant supply and wider range of harvestable products, and are less prone to diseases or fires. They support a richer biota and offer greater soil protection.

Better support from the general public could be achieved if forestry planners were to pay more attention to the needs of local people for forest products. The concept of 'buffer zones' needs to be developed.

Midlands

Ideally, the midlands areas should be a mosaic of land-use in which the tops of the hills are protected as hydrological reserves, the lower slopes are used for a variety of agro-forestry purposes, industrial plantations and perennial crops and the valley bottoms for supporting settlements and for food production—maize, upland rice, tapioca, fruits, etc. It is likely that the midlands will suffer a shortage of food but an excess of forests and tree products. This imbalance can be rectified by exchange with agricultural communities further down the water system where the reverse imbalance would exist.

The combination of steep slopes and the pressure to grow more annual crops for food render the midland system the most fragile of all life-support systems in Vietnam. The current use of this zone in Vietnam is far from adequate. Uncontrolled forest clearance, lack of contour terracing and excessive attempts to establish annual rather than perennial crops has led to serious degradation of this zone, including loss of topsoil, humus and soil fertility, deep gully erosion and loss of water sources during the dry season (Fig. 13 and Fig. 14). Not only does this result in almost total loss of local productivity but it has disastrous consequences on downstream agricultural and hydrological systems. The area of bare land and land invaded by the pernicious grass, *Imperata cylindrica* has increased very rapidly from an estimated 3 million ha in 1943 to 10.5 million in 1975 and 13.8 million ha in 1983. The most seriously affected areas are in the northwest and the Tay Nguyen region.

Fig. 13 Effects of Loss of Tree Cover from Hill Slopes

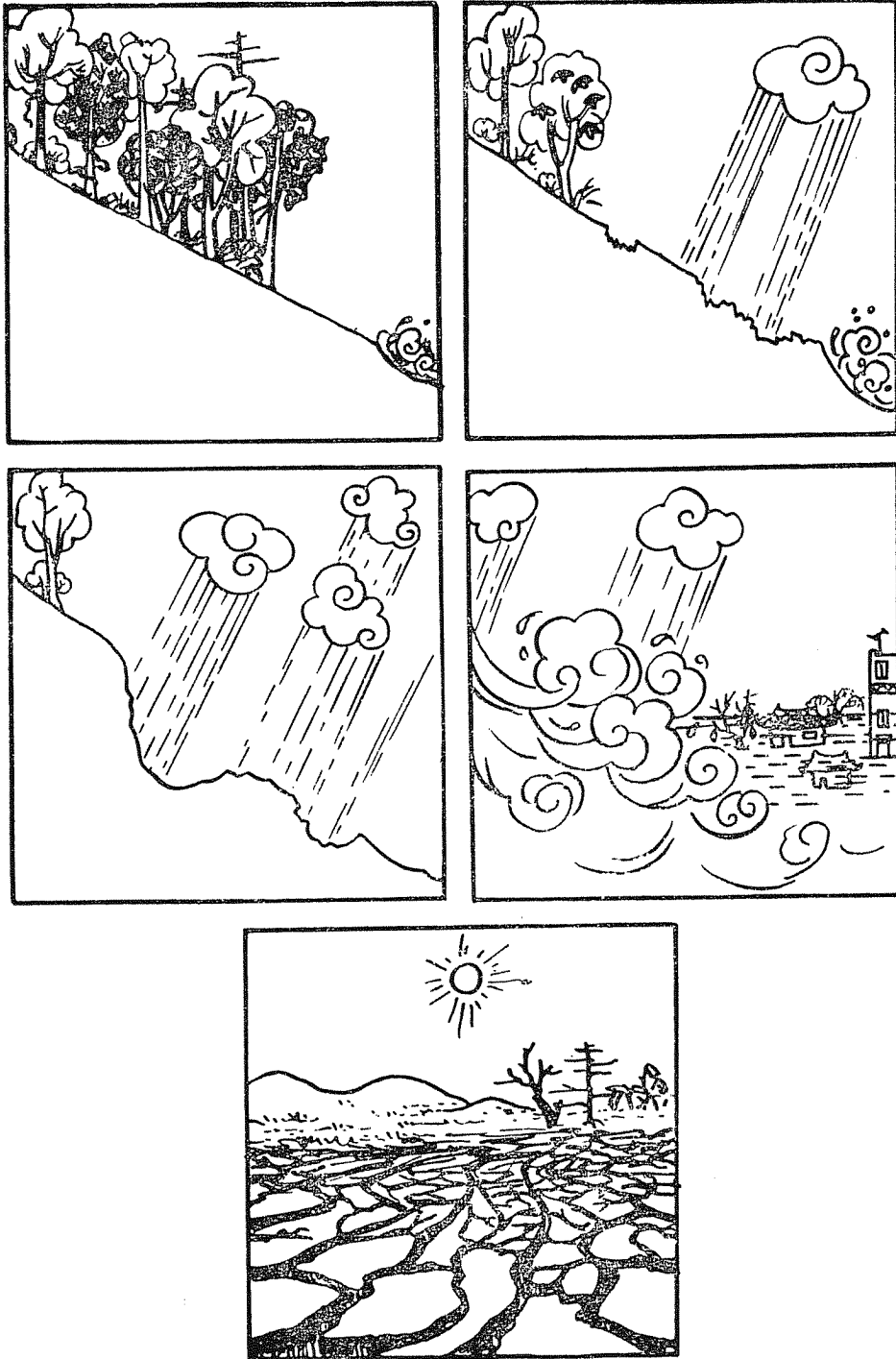
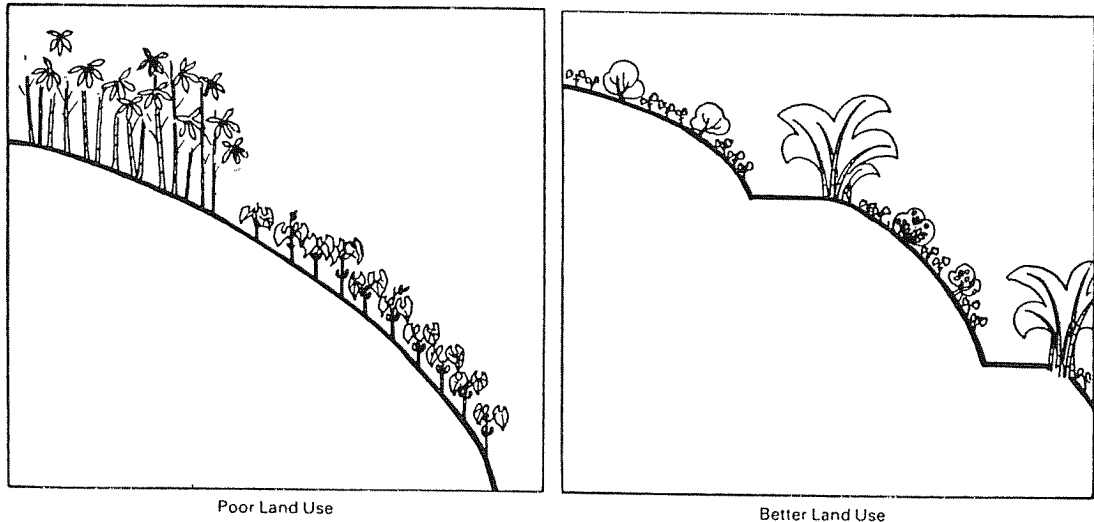


Fig. 14 Land Use



Cultivation of steep land is sustainable only if contour bunds (such as bamboo breaks) are constructed to reduce run off

People who are displaced because their production systems fail, tend to move further upward into the hills where they repeat the destructive cycle, doing even more damage. It is unfortunate that human population growth is greatest in the midland zone where, so long as some forests remain to be consumed, the pioneer spirit and the desire for a large family prevails.

The midlands life-support system urgently needs a number of priority actions. These are:

- Closure of protected forests from further destruction
- Resettlement of families presently cultivating too high up the steep slopes or inside protected areas
- Birth control programmes to reduce population growth
- Reforestation of non-productive barren lands
- Development of agro-forestry projects for village welfare
- Research towards improved design of agro-forestry lay-out and intercropping systems
- Research into various methods of regreening bare hills and reforesting in *Imperata* grasslands
- Greater efficiency in fire prevention and fire fighting
- Improved communications to facilitate better marketing of midland products in exchange for cropland grain.

Cropland

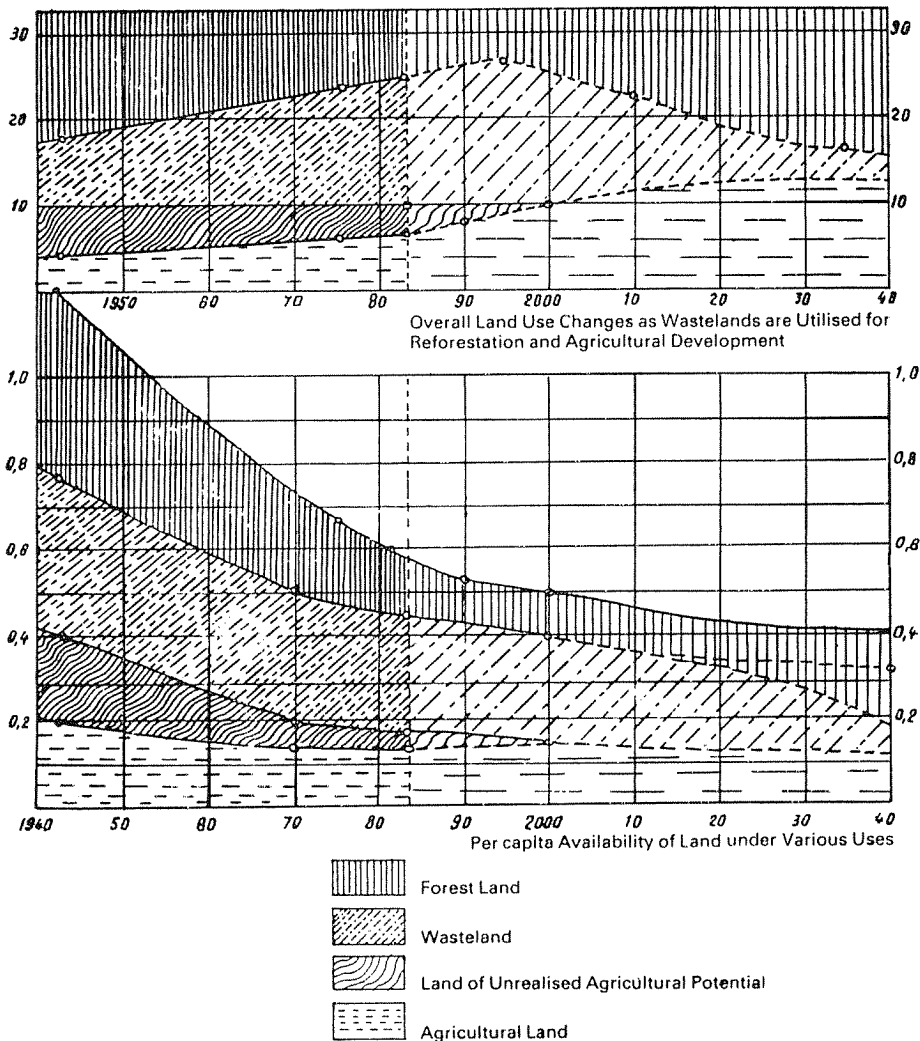
Vietnam's cropland system must provide sustenance to the human population living on croplands and grow enough to supply grain and vegetables to the urban and industrial sectors as well as supplement the diet of hill farmers in the midland zone. Efforts to increase production are causing cropland farmers to exceed the natural limits of the system and at the same time the cropland farm system is suffering from the adverse indirect effects of poor land management, such as flood damage, siltation with sand, increased incidence of storms and the salination of fields in the dry season. The increasing population makes demands for combustible fuel from land that could be more usefully devoted to growing rice. This results in the collection and burning of agricultural wastes (eg. rice stubble) which could otherwise be recycled into the soil where it is needed.

Efforts at increasing production through the application of insecticides and fertilizers are expensive and carry their own environmental dangers. To increase output there is a need to intensify agricultural production in croplands and also to extend such agriculture to increase the area of croplands. The potential for both is strictly limited. Agricultural production cannot be pushed continually upwards to meet new population demands. Population must be stabilised if it is to remain within the capacity of domestic agricultural production.

The following actions are urgently needed:

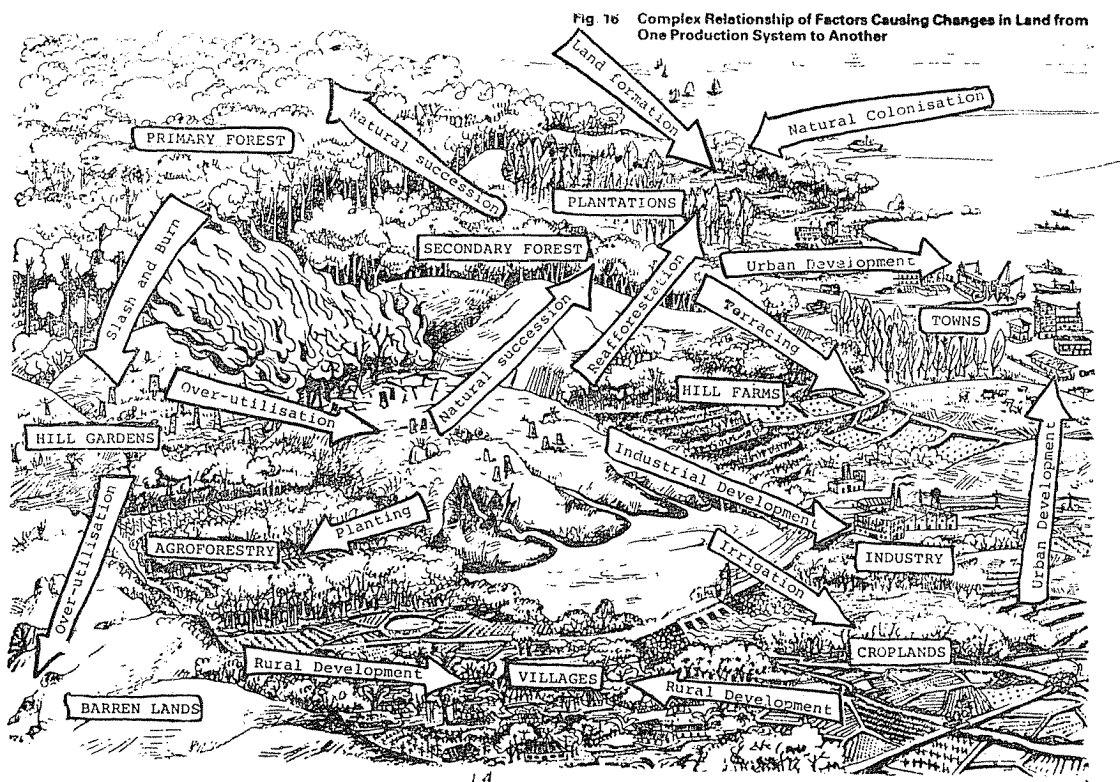
- All land with clear and marginal potential for permanent agriculture should be brought under production with necessary facilities, such as irrigation development, contouring, etc.

Fig. 15 Projected Land Use Changes



- New human settlements and industrial or other activities should be sited only on land of low agricultural use.
- Efficiency of existing irrigation networks should be improved so that maximum crops per year can be produced. Increased use of wind or other energy can help raise water to higher fields.
- Fuel plantations should not be grown on agricultural land but every square metre of available non-cropland should be used for fuel production for example land in villages, along dykes and alongside roads.

- Additional fuel needs should be met from midland forestry areas rather than relying on stubble and other agricultural wastes for fuel thus removing valuable nutrients and texture from the soil.
- Special research should be aimed at solving agricultural problems on acid sulphate soils.
- Agricultural research must continue to select more productive and vigorous strains of crops.
- Over reliance on single species or single varieties of crops is dangerous. In order to promote greater genetic vigour and as a defence against disease and crop failures, farmers must be encouraged to maintain a wide range of crops and crop varieties and develop intercropping techniques.
- Fuel needs could be reduced through the development of more efficient cooking stoves and by tapping alternate energy sources, such as solar cookers and bio-gas plants.
- Reliance on pesticides should be reduced. These are costly, cause serious environmental degradation and pollution, kill the natural pest control agents (birds, frogs, reptiles) and ultimately result in the propagation of pesticide-resistant pest varieties.
- Natural fertilizer techniques (eg. the use of *Azolla*) should be developed.
- To maintain adequate levels of soil fertility and to reduce dependence on petro-chemical fertilizers.
- Expensive mechanisation of farming should not be carried out solely to save human and animal energy of which Vietnam has an abundant supply.
- Upstream reforestation must be given high priority as a tool to attain increased agricultural production.
- Population control must be promoted to reduce the impossible stress under which the cropland support system must operate.



Freshwater

Water is essential for all life and the country's hydrological regime is dependent upon by all other life-support systems (Fig. 17). In particular, freshwater supply is needed to :

- Irrigate agricultural crops
- Provide drinking water for the human population and domestic animals
- Provide avenues for transport and communication
- Provide water for industrial needs
- Provide a sustained yield of fish and other edible products
- Provide hydro-energy

The current use of water resources is often inefficient. Many water sources have been allowed to dry up owing to mismanagement of the catchment areas. High levels of sedimentation reduce the efficiency of irrigation canals and shorten the lifespan of dams and irrigation reservoirs. Thac ba reservoir receives about 2.5 million tonnes of silt a year. Da nhim reservoir has recently dried up with not enough water in the dry season to produce electricity. The reservoirs of Cam son, others in Song Hieu, and the large 30 million cubic metre reservoir of Boc Nguyen in Ha Tinh province all dried up within 10 years of building. Water levels of many rivers and streams in Diliuh, Tay Nguyen, and Vinh Phu decreased visibly against their former levels and water table levels have dropped steeply in many areas. Most of the hydro-electric potential in the country remains unutilised. Investments that have been made so far are being wasted by poor management of the catchment areas.

Water pollution from biological wastes and toxic industrial discharge is a very serious problem in some areas. For instance, Hanoi city releases several thousand cubic metres of untreated sewage directly into lakes and ponds each day. In these waters there are organic and inorganic toxins, dangerous bacteria and parasites. Each day Ho Chi Minh city discharges some hundreds of thousands of cubic metres of sewage into the canal and river system. It is estimated that as population and industry develop over the next 15 years in these cities, the water demand will rise to 8 thousand million cubic metres per year and the amount of waste water will rise to 5-6 thousand million cubic metres per year.

The use of agricultural pesticides and herbicidal spraying by the US forces in the war of reunification have caused a serious drop, both qualitative and quantitative, in the productivity of freshwater fisheries. Overharvesting of fish and other aquatic foods—frogs, migratory water birds, etc.—have resulted in a serious fall of stocks.

The following actions are urgently needed:

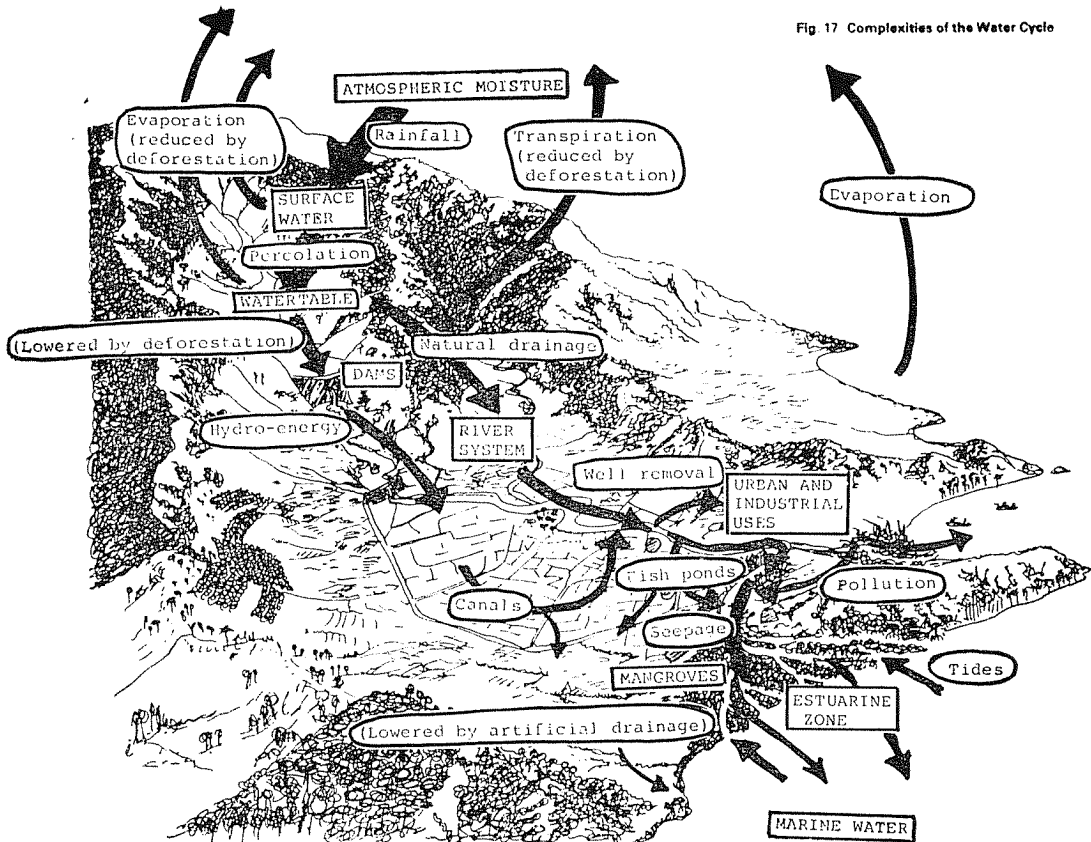
- Reforestation and strict protective measures of vital water catchment areas
- Strict enforcement of pollution controls on industrial plants
- Development of sewage treatment plants for major population centres
- Increased investment in hydro-electricity to reduce dependence on fuelwood and to take the pressure off forests
- Development of freshwater fishponds
- Application of harvest quotas for fish and other products, protection of breeding sites, etc.
- Restocking of some water bodies

Estuarines and Coasts

Estuaries along the coastline of Vietnam are formed by the mixing of sea waters and freshwaters discharged from the river systems, especially the strong Red River and Mekong river systems. Along estuaries and coastlines are located many large populated cities, sea ports and industries. (Haiphong, Vinh, Danang, Quynhon, Nha trang, Ho Chi Minh city, etc.).

These coastal regions play a very important role in various economic fields—in the exploita-

Fig. 17 Complexities of the Water Cycle



tion of biological resources and minerals, in transportation and in the expansion of new land for cultivation.

Estuaries and shallow sea waters are the spawning and breeding grounds of many species of marine organisms of commercial importance. In these regions are distributed rich coral reefs and mangrove forests where a wide range of fishes, shrimps, crabs, oysters, birds and terrestrial animals is concentrated.

Estuaries in Vietnam suffer changes by both natural and human activities. The main factors which have an impact on the estuaries are the following:

- Fishing is chiefly concentrated in the estuaries and shallow coastal waters—the main spawning and breeding grounds of many commercial species and home of the young and larvae.
- Methods of fishing are by hand but fishing tools used are over-destructive, namely, the use of fishnets of small mesh and the use of explosives. Because of these effects, catch per fishing unit does not increase, but is, in fact, decreasing. Fishing intensity is now rapidly increasing in comparison with what it was some years ago, but the total catch only increases slightly. Owing to over-fishing over several decades, many economic species of marine organisms have decreased or are now threatened. These include *Clupanodon thrissa* in the Tonkin Bay, *Dorosoma nasus* in Central Vietnam's sea. *Mytilus smaragdinus* in the lagoons of Central Vietnam, *Haliotis diversicolor* in Bach Long Vi island and *Panilurus sp.* in the coral reefs. The fish *Megalops cyprinoides* was abundant in the Nambo estuaries about 30 years ago but now seems to be absent.
- According to available statistics the surface of mangrove forest in estuaries is about 3,00,000 ha, including about 1,40,000 ha of *Melaleuca* forest. This area is now great-

ly reduced by napalm bombing and herbicide spraying by the US military during the war against Vietnam, and by the destruction of mangrove forests for other economic uses, such as expanding brackish fish ponds, cutting of firewood and building materials and the burning of *Melaleuca* forests for hunting purposes. Exploitation of coral reefs for making quicklime is a very wasteful use of these productive living resources, especially as extensive alternative sources of quicklime are available in the karst limestone hills of Vietnam.

- Loss of coastline tree cover increases the incidence of storm damage by tidal waves and typhoons in populated coastal areas and leads to sand blowing on to agricultural lands.
- Estuaries and shallow waters suffer pollution by waste water from the populous cities and industrial plants, by exploration for oil and gas on the continental shelf and by loading and unloading of goods, especially petroleum products in the sea ports. In addition, increased siltation from deforested upland areas is changing the nature of estuaries and coastal areas and killing aquatic life and coral reefs. In many estuarine regions people are also expanding the cultivation of new land by building dykes seaward. Many hydro-electric stations, reservoirs, dams, etc. are built on the upper streams and water courses. These activities affect the life of organisms and biological productivity of estuarine ecosystems by changing the flow of freshwater downstream. The balance of freshwater with salt water which determines the distribution of species in the coastal zones is thus affected.

Estuaries are important areas and are subject to profound changes from both natural and artificial factors, yet they have not been fully studied. Investigations of the Institute of Marine Researches concentrates only in the areas from 30-50 m isobaths out to the open ocean. To fill this gap in knowledge, a project, 'Rational Utilisation and Protection of Natural Resources of Estuarine Ecosystems in Vietnam' was begun in 1975 as one of the eight sub-programmes of Programme 52-02.

The following actions are urgently required:

- Vital spawning areas should be protected from fishing
- Other fishing controls, such as limits on mesh size, banning of explosives and poisons, etc. should be established.
- Fishermen should be encouraged to fish further out at sea. This requires larger boats and, therefore, the formation of larger fishing cooperatives.
- Mangrove reforestation projects must be continued.
- The mining of live coral for making lime and building materials should be banned.
- Pollution measures to control the discharge of organic and industrial wastes must be enforced.
- Planning permission must be necessary before seashore developments can be approved. Guidelines should be drawn up as to what types of development are to be excluded or limited.

Deep Sea

Vietnam's deep sea resources are underutilised and are hardly affected by the management of other resource systems. Nevertheless, the idea of the sea as a limitless resource for production and for the dumping of wastes must not continue. This system also has its limits and could be easily polluted and over-exploited unless utilisation is rationally planned and developed. The following actions are required:

- A ban on the dumping of oil from ship sumps or of radioactive wastes in Vietnamese waters.
- Adequate control to prevent oil leaks from marine oil exploration platforms.

- Adherence to the international conventions relating to the use of marine resources, for example, Law of the Sea, International Convention on Dumping of Wastes at Sea, International Whaling Convention, etc.
- Conducting more surveys into the fisheries potential of the deeper sea areas and plotting important areas of mineral upwelling.
- Direction of more fishery attention from the over-fished coastal waters to the under-fished deeper waters. This may mean cooperative investments in larger boats and different tackles.
- International assistance in planning a carefully developed fisheries industry may be required. UNDP/FAO could provide assistance.

Preservation of Genetic Diversity

The preservation of genetic diversity is both an insurance and an investment. It is necessary to conserve genes in order to sustain and improve agricultural, forestry and fishery production; to keep open future options for exploiting natural resources; to establish a buffer against harmful environmental change; to act as raw materials for much scientific and industrial innovation; and as a matter of moral principle.

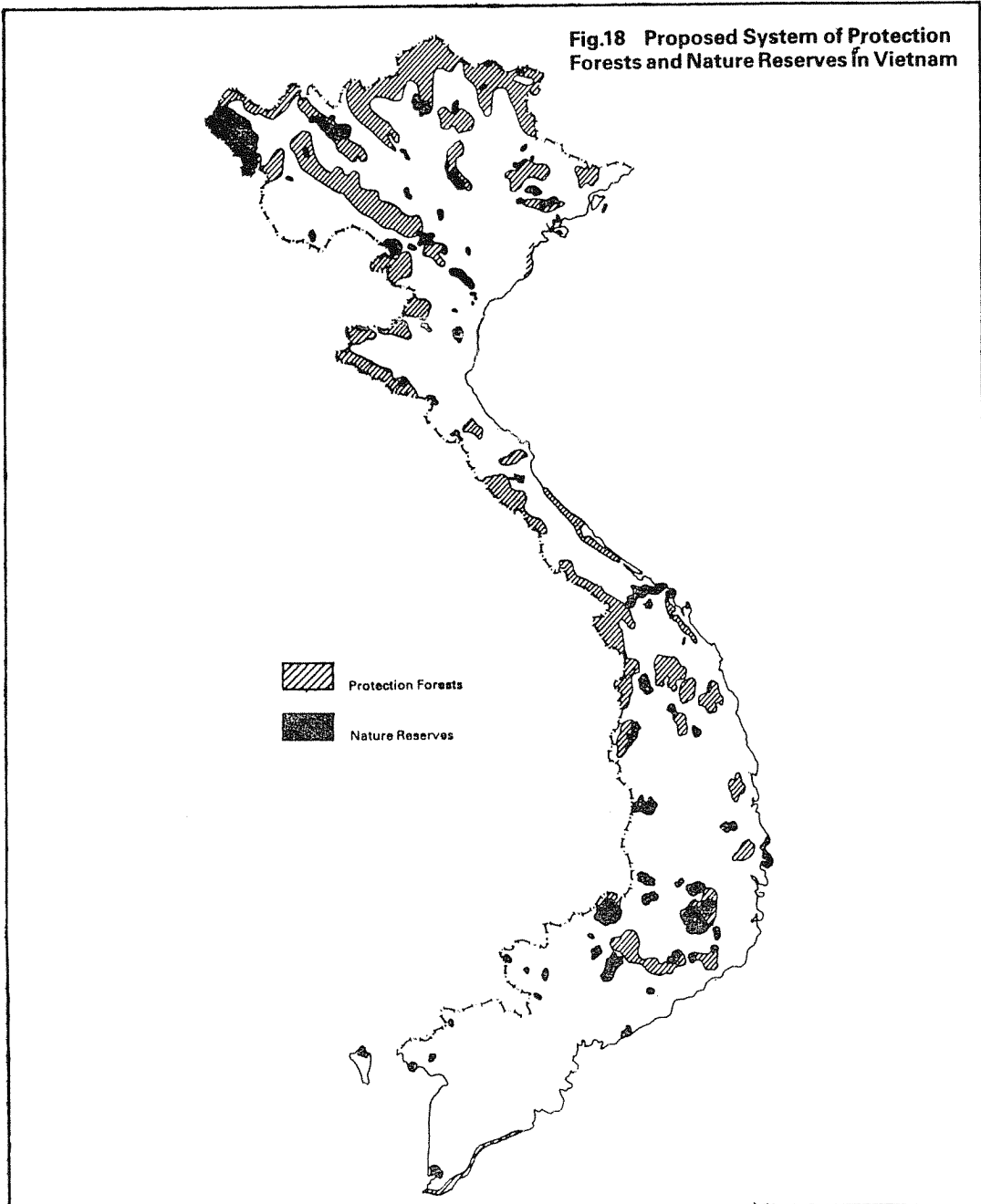
The preservation of genetic diversity involves diversity in both wild and domesticated species. It involves not only preserving species, but preserving the full range of genetic variation within species. This means the protection of viable gene pools or local populations over the full range of the species distribution. In tropical areas, the protection of wild species is of very high long-term value as almost all improvements in the use of lands unsuited to permanent agriculture will involve the development of more suitable agro-forestry combinations. The native forest species are already pre-adapted to local conditions of soil and climate. Selected combinations of wild species can be expected to provide a richer and structurally more complex land cover, provide better soil and water protection, suffer lower levels of disease and pest damage, and show greater overall productivity. They can also be managed to provide a wider range of locally useful materials than conventional monoculture plantations.

The current loss of genetic resources from Vietnam, however, is frightening. Not only are species being lost as their forest habitats are cleared, but many animal species are simply being hunted to the point of extinction. Unless there is a major reversal in current patterns of destruction and over-exploitation, it is clear that hundreds of species of mammals, birds and plants will become extinct in Vietnam within the next ten years, greatly reducing the future development options of the country. The following measures are urgently required:

Development of Protected Areas

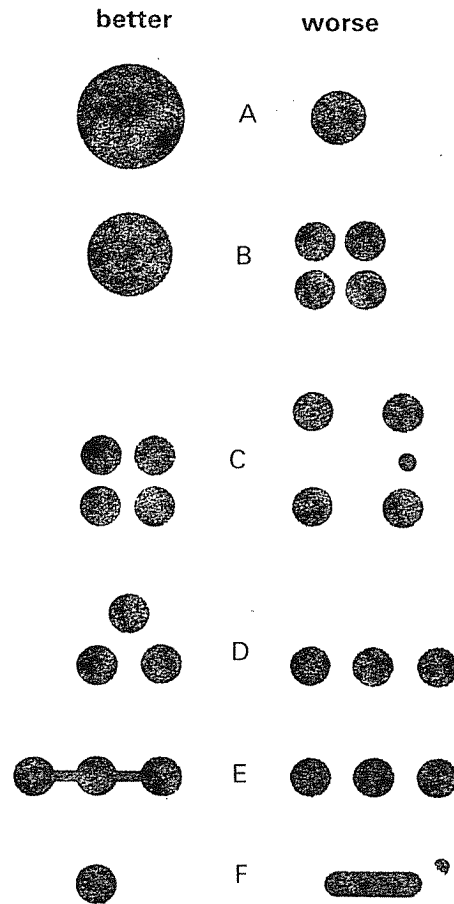
A system of national parks and nature reserves should be established and managed by the Ministry of Forestry. A start has already been made by declaring 14 areas as reserves and proposing another 73 (Fig. 18). These reserves should be selected to cover the full range of distinctive ecotypes of the country and should be large enough to contain viable populations of each species. In complex tropical ecosystems which have high species diversity but generally low individual densities this means areas of very large size (e.g. 1,00,000 ha). Smaller areas can be expected to lose many local species. However, where large areas are not available, the small size of some reserves can be countered by designing buffering layers of surrounding land use which are partially protective (eg. no hunting zones) and can act as migration corridors to maintain exchanges between neighbouring 'islands' of surviving natural habitat. The preliminary system would protect a total of 7,21,000 ha or 2 per cent of the country. (See Fig. 19 for some of these design principles). Priority for selection should

Fig.18 Proposed System of Protection Forests and Nature Reserves in Vietnam



also be given to areas containing a concentration of endemic species, rare species or habitats and those habitats that are most seriously threatened by the current pattern of land conversion. Management plans will need to be written for most of the protected areas and the development of new skills for the management of such areas will have to be encouraged among the staff of the Ministry of Forestry through an intensive training programme. Legislation for the establishment and management of these reserves will need revision and enactment. Knowledge of such new legislation will have to be disseminated among the regional judiciary and police authorities.

Fig. 19



Suggested geometric principles derived from island biogeographic studies for the design of nature reserves. In each of the six cases labelled A to F, species extinction rates will be lower for the reserve design on the left than for the reserve design on the right.

Source: Diamond, Jared M, 1975. *The Island Dilemma: Lessons of Modern Biogeographic Studies for the Design of Natural Reserves* Biological Conservation. 7:129-146

The experience of other countries has shown that protected areas fail in their objectives unless the needs of local people are given serious attention at the design and planning stage and unless various direct or indirect benefits are made available to the local people through the establishment and management of such reserves. This involves considerable skill in socio-economic evaluation and the development of sensitive extension services for the reserves.

Since the establishment of nature reserves is a rather new idea in Vietnam—a country where

there is little experience in this field—it is felt that international assistance in the initial stages of planning and training for the management of a few model reserves is needed.

Protected Species

Scientists associated with Programme 52-02 have already drawn up lists of endangered species. Official protection has been afforded to 54 species of mammals and 60 species of birds. It is planned to produce a Vietnam Red Data Book to give information on a wider range of species categorised as endangered, threatened, vulnerable or of indeterminate status.

These activities must be continued and the status of wild species should be constantly monitored so that revisions to the protected species lists can be made and other priority actions taken to save species that have become endangered. This continuous monitoring should give an indication of the environmental health in the country. A loss of constituent species is a clear sign that something is wrong. Unfortunately, there is at present almost no enforcement of the regulations regarding protected species. The legislation needs tightening up and the local judiciary and police alerted to its existence and importance.

Hunting Regulations

Properly controlled hunting could provide valuable protein to the people, a source of recreation for them, and also prove to be a profitable tourism and trophy industry. Instead there is no control and game species are being hunted out of existence.

The police should try to register and check all firearms in the country and confiscate all unofficial weapons. Regulations to control hunting should be brought into effect if any game is to survive the present decade in Vietnam. Such regulations should insist on hunting only under permit, with prescribed hunting areas, hunting seasons and size limits. Hunting permits should limit the holder to a maximum number of kills and all kills should be registered with the local controlling agency.

Under proper management, population densities could be built up to levels where quite a high sustainable kill would be possible. At present, however, game have been reduced to such low levels that few large animals remain to be shot and hunters are turning to squirrels, civets and other small animals as alternatives to the preferred deer, pigs, goats and monkeys. Most areas require a total ban on hunting for a few years to allow stocks to recover. Even reintroduction of species are needed in many areas.

Control of Trade

One way to reduce over-utilisation of genetic resources and to enforce protection laws is to apply much stricter control of trade. There is no control, for instance, on the export of tiger skins, although this is a protected species. An immediate step should be for Vietnam to become a member of CITES (Convention on the International Trade in Endangered Species of Wild Fauna and Flora). As such, Vietnam would be obliged by international commitment to introduce regulations to control the trade in a number of species listed on three different appendices of the convention, each requiring different types of documentation to permit export. This would be particularly relevant to control the heavy trade in ivory passing through Ho Chi Minh city.

Ex Situ Conservation

In addition to efforts to save valuable species *in situ* in the wild, there should be efforts to build up self-maintaining captive breeding stocks in zoos and botanical gardens; develop seed banks and other forms of *ex situ* conservation. Attempts should be made to rescue

and artificially propagate some of the rare relict tree species of Vietnam as well as some animal species. A good example is the rare bovid, the kouprey *Bos sauveli*, which is reduced to about 20 individuals in Vietnam (out of a world population of perhaps no more than 100). This species is known to have domestication potential and could be hybridised with domestic cattle. Such potential, and maybe even the species survival, can only be realised if a captive breeding centre is established.

Sustained Utilisation of Resources

The principles of sustained utilisation of renewable resources and the principle of maximum sustained yield are familiar to every farmer. He manages his chickens in just this way, knowing just how many of the laid eggs he must leave to hatch and how many of the resulting chickens he can eat or sell to maximise his production yet sustain his flock. These same principles must be applied to all renewable resources if maximum sustainable benefit is to be realised. The farmer manages his chickens well because he has a long-term interest and because he has exclusive ownership.

These principles are more difficult to apply to common or communal resources and more difficult to apply to resources with very long regeneration periods. Only when rather strict cooperative regulations and controls are applied can such good use of communal resources be realised. A much stronger sense of civil responsibility must be spread through the whole population to effect such control. In addition the individual or cooperative farmers and users of renewable resources must be given a longer-term interest in the particular resource base, otherwise short-term interests will always prevail.

For instance, a farmer or village of farmers who enjoy short-term use of a forested hill will get most benefit by cutting for use or sale all the wood, then cultivating the area for a few years whilst fertility lasts and finally leaving the area barren and eroded. If the users were given a more long-term interest they would profit more by removing forest products only within the renewable limits of the forest. They would convert the land from forestry to agricultural use only when they had the labour or investment available to incorporate adequate terracing, land contouring, irrigation or other infrastructure to ensure that agricultural production could also be sustained.

The solution of the problems of irrational use of renewable resources is complex and requires a combination of improved legislation, better land-use planning, increased understanding of the principles involved, better means of enforcing regulations, some land reforms, improved communications and marketing of goods, better control of population growth and larger financial investments :

- Improved legislation is needed to prohibit a number of wasteful and destructive practices, such as cutting forests and cultivating steep slopes, causing undue siltation or pollution, etc.
- Better land-use planning is needed to get the best possible return from each unit of land.
- Increased understanding of principles is needed so that the people are more likely to apply them.
- Better means of enforcing regulations are required to check a number of currently uncontrolled selfish and illegal practices.
- Land reforms are needed to give farmers and cooperatives a more long-term and personal interest in the resources that they utilise. For instance, in Vinh Phu province good results have been obtained in experiments whereby more of the state forest land has been given to cooperatives to manage and these areas have been given to individual families to use on a twenty year basis with the bulk of produce to be owned by the families themselves.

- Improved communications are needed so that each area can be used to grow what is most suitable for it, rather than whatever is unavailable in the market as is often now the case, resulting in the planting of annual food crops in areas better suited to the cultivation of perennial crops.
- Better control of population growth is needed to reduce the pressures on the whole system. On account of poverty and lack of food, farmers are driven to grow food where there ought to be tree cover.
- Larger financial investments are needed so that more marginal land can indeed be properly brought into agricultural use on a sustainable basis.

Maintenance of Environmental Quality for Human Life

The maintenance of major life-support systems, preservation of genetic resources and sustained utilisation of renewable resources all contribute directly to the material basis for human welfare. But the quality of human life is measured in terms of more than just material benefits. For human life to be satisfying, there must be a reasonable balance between different material needs. Major shortages in one area cannot be compensated for by surpluses in another area. A starving man needs food: he cannot get comfort from extra wood or money. Cooking requires fuel—it cannot be done with extra rice. All these basic material needs—food, water, shelter, clothes, fuel, employment and enough money to buy the minimal comforts of modern life—must be available. In addition to these, are a number of qualities less easy to quantify or evaluate but equally important to the satisfaction of basic human needs—clean air, space for living, positive social environment, good health, privacy when needed, satisfying spiritual, political or philosophical beliefs, facilities to enjoy recreation, attractive clean living environment, clean water, personal liberties, sense of belonging and opportunity for achievement.

Some of these needs relate to the social environment for living and this, in turn, depends upon the socio-political developments of the country. The current course of village-organised socialism in Vietnam is based on the traditional living patterns of the region and Marxist principles adapted to ensure greater fairness in the organisation of work and the distribution of the fruits of labour. These policies have been developed over thirty years and have been found to provide a healthy and suitable social basis for human life in this country.

The other needs relate to the use of natural resources. Nature has bountifully provided Vietnam with scenic beauty, living space, room for healthy outdoor recreation, clean air and water. It is man's uncontrolled destructive activities which lead to waste and pollute these resources on which the quality of life so much depends. These needs must be kept in mind when planning the country's development and the use of its natural resources. The following actions are regarded as essential:

- Preservation of adequate water sources for human needs and protection of these sources from pollution by toxins, diseases or parasites.
- Provision of social medical services including immunisation programmes, health clinics and hospitals in reach of the whole population.
- Establishment and enforcement of pollution controls and standards for discharge of industrial and motor vehicle emissions, for effluent and waste disposal, for sewage treatment and disposal, etc.
- Continuation and intensification of a population control programme until the population is stabilised to a socially acceptable density.
- Strong support for the programme to develop a system of national parks and recreation areas and all encouragement to promote healthy domestic recreation habits.
- Reforestation to secure adequate water sources.

Attainment of a Balanced State

All human societies, even in highly industrialised countries, are ultimately dependent on the support of their agricultural base. Vietnam cannot rely in the future on import of food for its people. Food will be in short supply in all the other countries of Asia and most of the countries of the world. Even gold cannot buy the food from the hands of a starving man. Vietnam must aim at achieving agricultural self-sufficiency.

It has been pointed out earlier, that the capacity of the land to produce food is limited. The best that can be hoped for is the maintenance of a sustained capacity to produce a maximum yield of food. If the standard of living is to be maintained when food production is constant, then population must also be stabilised. The following simple formula approximates the situation:

$$\text{Quality of life} = R \times e \times r / P$$

where

R = resource base,

e = efficiency of utilisation

r = level of renewability and

P = human population.

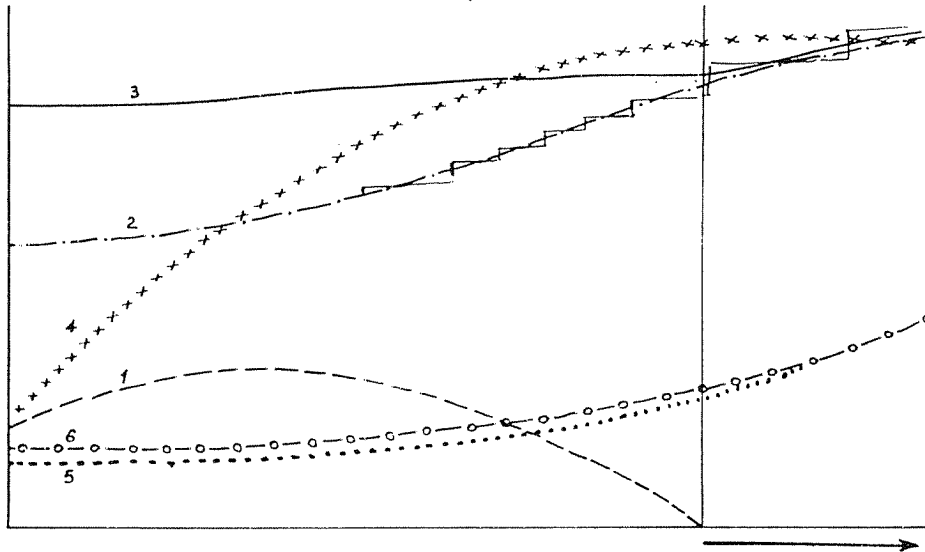
The National Conservation Strategy advocates the following measures to maintain the optimal quality of life:

- Population growth must be reduced to zero as soon as possible.
- The prime objective of research and development should be to improve the efficiency of utilisation of natural resources. This includes increasing production and reducing wastage; increasing the efficiency of the manufacturing industries and marketing; increasing the use of alternative energy sources (solar, wind, tidal, geothermal, nuclear, etc.), improving the quality of crops and domestic herds and applying improved techniques of agriculture, forestry, agro-forestry, fishery and animal husbandry; improving methods of disposal of wastes and pollutants and better management of health and hygiene.
- The rate of use of renewable resources must be determined by the relationship between efficiency of use and level of renewability for the resource in question. The principle of maximum sustained yield should be followed.
- Vietnam must maintain strong natural security so as to safeguard the need for territorial stability implicit in the concept of a steady state and the balance between population and the renewable productive capacity of the land. The people of Vietnam must always be willing to make whatever sacrifices are needed to guarantee their continued independence.

The rate of use of non-renewable resources offers the widest scope for manipulation of the quality of life in Vietnam. Rapid use of these resources can provide immediate improvement in living standards but may reduce the potential of living standards for future generations. These resources should not be squandered selfishly or wastefully on non-constructive, consumptive pleasures or to fuel further population growth. It is proposed that the benefit reaped from the exploitation of these resources be utilised in three ways. First, to pay for the immediate physical investments that are needed to raise the sustainable productivity of renewable resources, such as irrigation systems, land terracing, reforestation and further research. Second, to provide the investment needed to stimulate industrial growth. Third, to cushion the population during the transition from the current standard of living to that eventual position when the population has been stabilised (Fig. 20).

If the overall living standards are to be maintained at current levels or improved, the total increase in efficiency of use of renewable resources must be greater than the total increase

Fig. 20 Projected Resource Base Productivity under Different Patterns of Resource Use



1. Overall Productivity based on Use of Non-Renewable Resources
2. Overall Productivity based on Renewable Resources
3. Total Overall Productivity (1 + 2)
4. Population Growth
5. Per eapita Productivity from Renewable Resources (2 ÷ 4)
6. Total Productivity per capita (3 ÷ 4) i.e. Standard of Living

in population by the stabilisation date plus the current proportion contributed to living standards by the exploitation of non-renewable resources. It is likely that increase in efficiency will be stepwise (as technology improves) rather than gradual. In addition, the exhaustion dates of different non-renewable resources will tend to cause sudden falls in living standards. Controlled use of the wealth from non-renewable resources can smoothen the curve of living standards through this transition period, avoiding sharp changes which might threaten the social order.

INTERNATIONAL IMPLICATIONS

Conservation of renewable natural resources should not be conducted by countries in isolation. Conservation is a global imperative. The distribution of natural resources crosses international frontiers so that responsibilities for their management are shared. Even when an endemic resource is entirely confined to one nation, that country holds a global as well as a national responsibility for its protection.

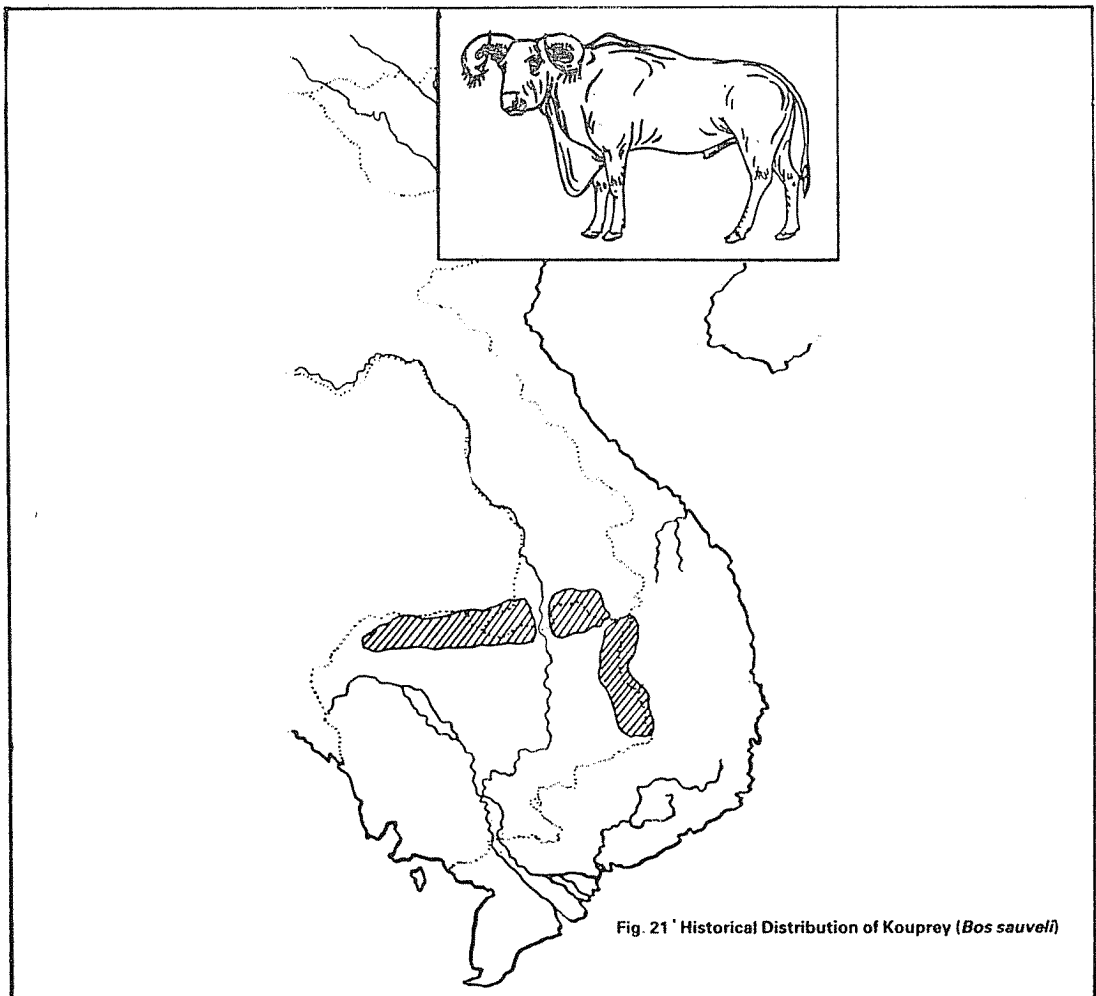
In some cases, one country may be responsible for the protection of a wild species from which it gains little benefit but upon which another country may be heavily dependent. Thus, Brazil contains the wild stocks and close relatives of the rubber tree *Hevea* sp. but has virtually little rubber industry itself. Even so, conservation of these wild species is vital to the economy of Malaysia and to a lesser extent, Vietnam. For these reasons, several international agencies have been established with worldwide operations to help conserve natural resources and assist in environmental planning. They must also seek ways to get those countries that use and depend on the natural resources of the developing countries to contribute to the cost of conserving those species in the wild. In the case of Vietnam, there are eight areas in which international implications must be kept in mind. These are:

Management and Utilisation of Migrant Species

Vietnam is the winter home of many northern bird species including species of potential food or trade value, such as ducks, waders, rails, storks, cranes and ibises. Management of such populations should be coordinated with the countries in which such species breed, for instance, to determine species status or for research through banding, etc. The International Convention on Migratory Species is a useful forum for coordinating such cooperation.

Management of Shared Transfrontier Resources

International cooperation is needed for effective management of shared transfrontier resources, such as mutually vital protected forests or individual species. For instance, the



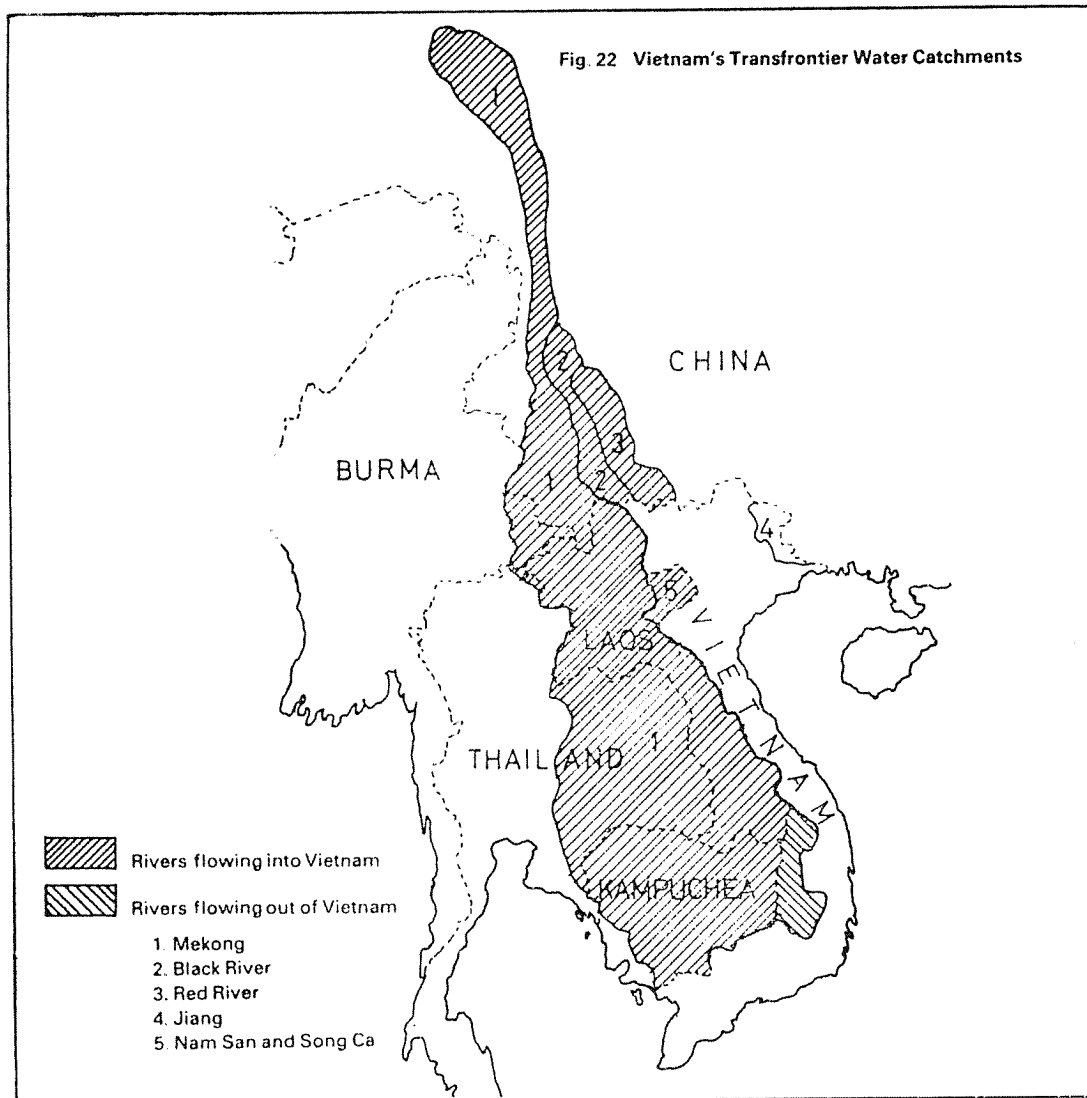
whole world population of Kouprey *Bos Sauveli* is distributed along the borderlands between Thailand, Kampuchea, Laos and Vietnam (See Fig. 21). Only an international effort can manage such a species including the establishment of transfrontier reserves and cooperation in catching poachers who dodge back and forth across national boundaries.

Management of Resources of International Concern

In cases where Vietnam is fulfilling an international responsibility by protecting resources of worldwide concern, such as qualitatively or quantitatively unique species or features or combinations of both, it can considerably benefit through the use of international programmes, such as the 'World Heritage Convention' of UNEP and the Man and Biosphere (MAB) programme of UNESCO.

Management of Transfrontier Watersheds

Most of Vietnam's rivers extend well beyond its national frontiers. Extensive deforestation of these upstream catchments has direct adverse consequences on Vietnam's agricultural



programme (See Fig. 22). Vietnam must get the cooperation of other countries to agree on common land-use policy and water management (e.g. pollution control, diversion or flow checks) and should assist such countries to achieve more rational use of these vital catchments. The Mixed Commission for the Mekong Project of which Vietnam is a member, is a good example of this type of cooperation.

Control and Organisation of International Trade

Considerable benefits can be achieved by entering into international agreements to control trade in natural resources. For instance, one of the most effective means to stop illegal trade is through participation in CITES. Vietnam should also establish bilateral agreements with its immediate neighbours and possibly with ASEAN who are developing their own trade agreement. In addition, a common marketing policy is vital if countries selling the same products to a monopoly buyer are not to be played off against each other in a price undercutting game.

Participation in International Cooperative Efforts

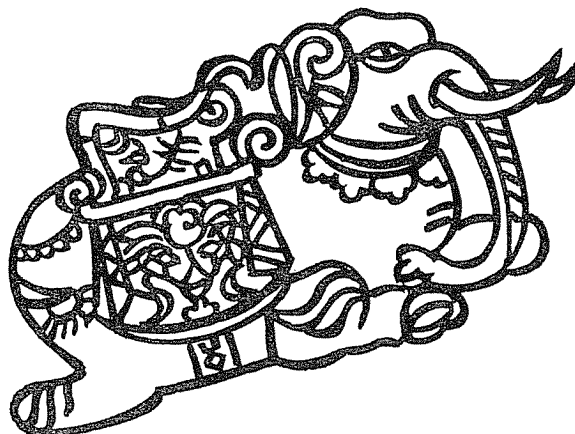
Vietnam could benefit through greater participation in international cooperative efforts, such as the UN Decade of Drinking Water and IUCN's Programmes to save 'Marine Resources', 'Tropical Rainforests,' 'Endangered Plants,' 'International Wetlands' and 'UNEP's Regional Seas Programme.'

Access to Foreign Aid and Technical Assistance

As a developing country with a low per capita income, Vietnam is entitled to considerable international aid and development assistance. Primary sources of aid which could be channelled into the environmental sectors include : several UN agencies, such as FAO, UNEP, UNESCO, ESCAP, UNICEF and WHO; direct assistance from friendly socialist countries (USSR, GDR and others); bilateral assistance from other friendly countries (Sweden, Netherlands, Norway, etc.); loans from international development banks (World Bank, Asian Development Bank); assistance from international aid organisations (WWF, IUCN, Earthscan, IEED, International Red Cross, USAID, OXFAM, etc.); exchange and technical cooperation with other developing countries (India, Cuba, Burma, etc.). Some countries which may not wish to enter into direct bilateral assistance arrangements with Vietnam may be willing to channel funds through international organisations. The Conservation for Development Centre (CDC) of IUCN is an agency which regularly fulfils this intermediary role. Assistance can take many forms—funds, equipment, training, technical assistance, information or loans. Vietnam should try to make more use of these possibilities.

Preservation of Cultural Heritage

International assistance and concern could be mobilised to help in the preservation of Vietnam's rich cultural heritage, both living (art, dance, folklore, language, tradition) and dead (archaeology, historical monuments). The various programmes of UNESCO are particularly relevant in this context.



THE OBSTACLES TO CONSERVATION

Although for a number of years, there has been tremendous awareness among governmental planners about the environmental problems facing Vietnam, and although a good deal of information has been gathered and research conducted, there has been little satisfactory improvement in the use of resources. This has been due to a number of obstacles that have severely handicapped our efforts, namely:

Lack of Environmental and Natural Resource Planning

Although the principles of rational use of resources have been included in sectoral policies and have been stated in party decisions and directives, these principles have not been clearly incorporated into the development process. The emphasis of development in all sectors has been on trying to meet the production goals laid down by the government. There is need for better integrated land-use planning. Long-term consequences must be taken into account when planning resource use and the principles of sustained yield must be observed in the future planning process.

Lack of Integration between Conservation and Development

Conservation has been seen as necessary and is advocated in policy documents but there have been no clear directives about how it is supposed to be applied. Too many sectors have failed to see the advantages of including conservation as an integral part of sound development. Development has been measured in terms of production levels achieved, with no attention being paid to costs in terms of resource depletion.

Lack of a Suitable Organisation

Vietnam has no environmental ministry and no coordinating body to pay due attention to environmental affairs. As a result, each sector has made its own plans for maximising production with no concern for the effects of such utilisation on other neighbouring or even distant sectors. Some sectors have paid due attention to their own depleting resources but have only shown concern in so far as it affects their own sector. Much better integration of plans must be achieved and this requires a new cross-sectoral coordinating agency.

Lack of Environmental Legislation

Although there are a number of sectoral laws and regulations and a number of directives from the party on environmental issues, these laws are hardly known let alone implemented. There is no overall law of the environment and no legal requirement to ensure that development is planned in a way that minimises or avoids doing damage to the environment or to other production systems.

Lack of Reliable Information

Vietnam, a long narrow country with many remote regions, has a poorly developed communications system. It is difficult to collect detailed information about the environmental conditions in many areas and to disseminate information to remote places. There are insufficient financial resources to check on the accuracy of existing information. Information on environmental conditions is not a luxury, but is a vital ingredient in sound

resource-use planning. Therefore, more effort must be put into the collection, storage, analysis and dissemination of relevant information.

Lack of Conservation Awareness

As a result of the difficulty of collecting environmental information from many parts of Vietnam and the inability to make such information generally available, there is an overall lack of public awareness on environmental problems confronting the country. Those scientists who are well aware of the environmental problems are not being adequately heard by either the public or government planners. One of the main functions of the NCS will be to tackle this lack of conservation awareness.

Shortages of Experienced Manpower and Investment

Although the government has been aware for some years that the problem of increasing wastelands is a matter of considerable concern, and that large-scale reforestation must be carried out, the country is not well equipped to tackle such an enormous task. This is not only because the country is poor and lacks the financial resources, but also for want of experienced manpower in the environmental field. While considerable training investments and land management changes will be difficult for Vietnam to finance, they are nevertheless vital to the restoration of a stable, productive environment for the future welfare of the country.

Population Growth

In spite of the fact that the Government realises that the population is too large and has therefore introduced a major birth control programme, population continues to rise rapidly. Producing food and fuel for this uncontrolled population puts severe pressures on the resource bases. Every small improvement in land use is quickly overtaken by additional people to support.

Lack of Cultural Taboos

The people of Vietnam are not restrained in their consumption of natural resources for food and other purposes by the dictates of religious, moral or traditional taboos. The great respect which previous generations showed for the balance of natural forces and all living things including the forest spirits, has been lost or forgotten as a result of the terrible social upheavals that took place during thirty years of war and because of the sheer demands of the growing population for more immediate production.

The National Conservation Strategy

GOAL

- To satisfy the basic material, spiritual and cultural needs of all the people of Vietnam, (both present and future generations) through the wise management of natural resources.
- To define and establish policies, plans, organisation and action, whereby the sustainability of natural resource use will be fully integrated with all aspects of the country's social and economic development. The essence of the strategy is to analyse trends as well as current issues so as to better anticipate problems and to plan accordingly.

Objectives

- Maintain essential ecological processes and life-support systems upon which human welfare is dependent.
- Maintain the country's wealth of genetic diversity of both domesticated and wild species which are of realised and potential benefit to mankind.
- Ensure the sustainable use of the country's natural resources by controlling levels and patterns of use within renewable limits.
- Maintain environmental quality, necessary for the well being of human existence.
- Achieve a stable state with a stable population in balance with natural sustainable productivity at a reasonable standard of living.

OPERATIONAL PRINCIPLES

- Keep options for future development as open and flexible as possible.
- Maintain a broad base of resource dependencies rather than relying too heavily on a few vulnerable resources.
- Keep development small scale in nature and locally oriented, in line with sound ecological principles and the social and cultural pattern of society.
- Minimise the wastage of resources in use.
- Mix curative with preventive solutions to environmental problems.
- Integrate conservation closely with development so that both are more cost effective.

- Undertake integrated land-use planning to achieve optimal balance between land-use potential and actual local needs.
- Coordinate planning and action between different development sectors.
- Build on existing institutions and procedures.
- ✱ — Involve maximum public participation and educate the public accordingly.
- Undertake adequate field trials before introducing any widespread application of new techniques.
- Maintain flexibility of approach rather than general regulations as local conditions in Vietnam are extremely variable.
- Approach the exploitation of resources cautiously; err on the safe side; achieve maximum sustainable yields gradually with full monitoring of the resource in question.
- Focus activity on specific projects as well as deal with broad policies.
- Establish priorities and phase action accordingly.
- Highlight successes and learn from both successes and mistakes through good documentation.
- Regularly review progress and be prepared to change direction when necessary.
- Inspire the people and the army of Vietnam to realise that the proper management of natural resources is the logical continuation of the war for liberation of those resources; the great and heroic sacrifices were not made so that the land could be wasted.

SUMMARY OF ISSUES AND CROSS-SECTORAL ACTIONS NEEDED

Table 3.1 indicates how much the activities in one production sector affect the productivity of other sectors. Some activities, such as deforestation and over-population, adversely affect almost all production sectors right across the board and clearly are areas for priority action. Only the deep sea resource production is relatively free of adverse affects from other sectors. If overall use of natural resources is to be efficient, planning must be done in an integrated and cross-sectoral manner.

Table 3.2 indicates the types of inter-ministerial and agency linkages that must be developed between different sectoral bodies to effect the smooth integration of plans and to settle inter-agency conflicts or any overlapping that may occur. In cases where regular co-ordination of activities is needed, it will necessitate establishing permanent official committees or other channels for coordination.

ORGANISATIONS INVOLVED IN THE NATIONAL CONSERVATION STRATEGY

National Board for Environmental Coordination

It is proposed that a new, high level body be created by the Government to coordinate environmental affairs. Since this body must coordinate and sometimes overrule the actions and plans of several other ministries, it must itself be higher than ministerial level. It is proposed that the body be called 'National Board of Environmental Coordination' to emphasise its primary function of coordinating activities and delegating responsibility for action. It is suggested that the Board work closely with the Prime Minister's office and be headed by a vice prime minister. It should have a fulltime permanent secretariat and should work closely with the State Commission for Planning.

The following terms of reference are proposed for such a Board:

- Review and revise the environmental legislation of Vietnam in conjunction with the Ministry of Justice as well as draft a new Law of the Environment.
- Produce sets of environmental standards for different sectors.
- Supervise the establishment of an environmental data centre to collect and analyse environmental information so as to monitor the state of the environment. This centre

Table 3.1 Effects on Different Types of Resource Productivity of Selected Human Activities showing Complexity of Interrelationships

Resource Base	Forests Resources Productivity	Midlands Resources Productivity	Croplands Resources Productivity	Freshwater Resources Productivity	Coastal Resources Productivity	Deep Sea Resources Productivity	Industrial Productivity
Activity							
Deforestation, Over-cutting	Short-term gain, long-term loss of resources	Increased bare lands	Some increase, much loss of production	Increased flood, droughts and siltation	Over-siltting, killing of corals	Little effect	Loss of fuel, Siltation of hydro-power reservoirs
Protection of forests	Increases resource base	Can be restored to use	Generally benefits	Strong benefits	Enrichment of resources	Little effect	Enhanced hydro-energy produced
Reforestation	Increased at high cost	Increases land productivity	Increases productivity	Improves supply and quality	Generally improved	Little effect	Enhanced hydro-energy produced
Over-hunting/Over-fishing	Short-term and long-term loss	Loss of natural pest controls	Loss of natural pest controls	Reduced food production	Reduced food production	Reduced stocks not yet reached	Little effect
Sustained use of forests	Balanced	Can be more easily balanced	Optimal balance obtained	Adequate water supply assured	Some siltation	Little effect	Optimal support to industry
Fire damage	Total loss of resources	Saves labour but causes irreparable damage	Causes burning of organic fertilisers	Increased siltation	Increased silt and loss of coral reefs	Little effect	Loss of fuel, siltation of dams
Population control	Reduces pressure on all resources	Reduces loss of productive capacity	Reduces demand for impossible productivity	Reduces pressure on supplies	Reduces the overfishing of stocks	Reduces demands on the resource base	Reduces pressure of demands
Resettlement	Alleviates problems in critical areas	Alleviates loss of resource base	Causes local increases in demand	Considerably improves supply	Some positive effects	Little effect	Can direct labour to areas of shortages
Education	Promotes more rational use	Promotes more rational use	Can reduce bad practices	Promotes more rational use	Promotes more rational use	Little effect	Increased skill and technology
Pollution	Forest losses from acid rain	Threat to fragile ecosystems	Some losses of production	Kills fisheries	Causes serious loss of stock	Oil pollution most dangerous	Slight negative effects
Use of insecticides	Indirect loss of faunal resources	Threat to fragile ecosystems	Short-term gain at high cost	Danger to fisheries	Danger to fisheries	Little effect	Little effect
Research	Benefits areas of productive management	Vital to find new land-use solutions	Can improve agricultural productivity	Finds new energy sources	More rational planning of resource use	More rational planning of resource use	Big increases in efficiency possible
Increased irrigation	Helps justify protection	Greatly helps production	Greatly helps production	Resource base altered	Mangrove zones may change	Little effect	Little effect
Extensified agriculture	Increases pressure on forest resources	Causes further loss of resource base	Increases pressure on limited	Heavier demands made on system	Negative effect on neighbouring systems	Little effect	Increased support for industry

TABLE 3.2 MATRIX OF INTER-AGENCY LINKAGES NEEDED FOR ENVIRONMENTAL COOPERATION

Active Agency	P M	NBPC	Agric.	C & T	Edu. *	Fin.	Food	F Affs	Forest	Interior	High Ed	Justice	Labour	L Indust	Aqu Prod	M & Coal	Power	Defence	P Health	Water Cons	Ext Rels	Planning	Sc & Tech	I of Sc	52-02
Active Agency																									
Prime Minister's Office	X	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Nat. Board of Env. Coord.	AR	X	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc	Dc
Min. of Agriculture	AR	ARC	X	C	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Com. & Transport	AR	ARC	C	X	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Education	AR	ARC	C	C	X	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Finance	AR	ARC	D	D	D	X	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Min. of Food	AR	ARC	C	C	C	R	X	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Foreign Affairs	AR	ARC	C	C	C	R	C	X	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Forestry	AR	ARC	C	C	C	R	C	C	X	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Forestry	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Interior	AR	cC	C	C	C	R	C	C	C	X	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Higher Education	AR	ARC	C	C	C	R	C	C	C	C	X	C	C	C	C	C	C	C	C	C	C	C	C	C	Dc
Min. of Justice	AR	ARC	C	C	C	R	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Labour	AR	ARC	C	C	C	R	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Light Industry	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	C	C
Min. of Aquatic Products	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C	C
Min. of Mines & Coal	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C
Min. of Mines & Coal	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C
Min. of Power	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
Min. of Defence	AR	c	C	C	C	R	C	C	C	C	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C
Min. of Public Health	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	C	C	C	X	C	C	C	C	C	C
Min. of Water Conservation	AR	ARC	C	C	C	R	C	C	C	C	C	C	C	C	C	C	C	C	C	X	C	C	C	C	C
Comm. of External Relations	AR	ARC	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	X	C	C	C	C
Planning Committee	AR	ARC	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	X	X	X	X	D
Comm. of Science & Technology	AR	AR	D	C	C	R	C	C	DC	C	C	C	C	C	C	C	C	C	C	C	D	X	X	X	D
Institute of Science	AR	AR	A	C	A	R	A	C	A	C	C	A	C	A	C	A	A	A	A	A	A	A	A	A	D
Committee 52-02	AR	AR	Ac	Ac	Ac	C	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Ac	Dc

Letters of matrix indicate relationship of active agency towards passive agency
 R = Report, A = Advise, D = Direct, c = Coordinate, C = Regular Coordination Link
 Several letters indicate multiple relationships.

- should work in conjunction with GEMS (Global Environmental Monitoring System of UNEP). (A start in this direction is being made by Hanoi University).
- Promote research aimed at solving environmental problems in the natural rural and urban environments. (This is already being tackled by the Committee for Rational Use of Natural Resources and Environmental Protection, Programme 52-02).
 - Act as an environmental watchdog with the power to veto specific development projects or bring matters relating to inter-ministerial conflicts on environmental issues to a higher authority for decisions.
 - Have the authority to order the conducting of environmental impact assessments of any development project that appears likely to have an adverse environmental impact.
 - Develop the training facilities to build up a cadre of environmental expertise in Vietnam.
 - Promote, coordinate and periodically review the National Conservation Strategy and its implementation.
 - Solicit and administer foreign aid projects in the environmental sector.
 - Promote greater environmental awareness among the people by education and propaganda.
 - Fulfil an environmental 'ombudsman' role, acting as the government spokesman on environmental affairs and answering all complaints or questions on environmental policy or concerns.
 - Liaise with the Department of Population Affairs to bring about a stable growth rate of population in Vietnam at the earliest possible date.

Ministries

The National Board of Environmental Coordination should coordinate the working of the various ministries and see that they implement the objectives of the National Conservation Strategy; the terms of reference of this strategy should be constitutionalised. The following guidelines are suggested for the concerned ministries.

Ministry of Agriculture

- Promote environmentally sound sustainable agricultural practices in harmony with the environment so that the fertility of soils is not reduced nor is there undue loss of soils from erosion.
- Conduct experiments and trials aimed at increasing per unit production and decreasing risks from pests and diseases.
- Coordinate with the Ministry of Forestry to ensure that forestry practices do not endanger agricultural productivity.
- Participate in environmental impact assessment studies to monitor the impact of other sectoral developments on neighbouring agricultural production systems.

Ministry of Transport and Communications

- Develop communication networks to facilitate better marketing and exchange of products between different production systems so that production in each area can be of the type most suited to its capacity for sustained productivity.
- Liaise with major production ministries in connection with their long-term needs for communications.

✕ *Ministry of Education*

- Facilitate the introduction of environmental teaching in school programmes.

- Develop teaching materials and teacher skills for the inclusion of environmental teaching in the curriculum.

Ministry of Food

- Cooperate closely with the Ministries of Agriculture, Communications and Transport, and Public Health to ensure that food shortages in some sectors, for example, forestry, industry and fishery can be met by adequate supplies of grain from other areas, such as croplands.

Ministry of Forestry

- Ensure the maintenance of vital hydrological and climatic functions through the management of adequate forest cover in important catchment areas. This will need considerable reforestation.
- Prevent the loss of soils by maintaining adequate forest cover on steep slopes and areas of fragile soils—sandbars, river banks, etc. This will involve considerable reforestation.
- Preserve the genetic diversity of the country by the establishment and management of an adequate and representative system of protected nature reserves and national parks.
- Provide opportunities for the enjoyment of natural areas as sources of recreation and tourist development by establishing a system of parks and recreation forests.
- Derive maximum benefit for the country through the development of forestry production which is consistent with the above four terms of reference and which can be sustained over the long term. Emphasis on forest production should be to first meet the forest production needs of the people; second, the needs of local industries; and third, the possibility of export.
- Coordinate plans closely with those ministries which are directly affected by forest policy, especially agriculture, water conservation and aquatic products.

Ministry of Interior

- Emphasise to the police force the importance of environmental protection and the enforcement of relevant laws and regulations.
- Get control of the licensing of firearms currently being misused for hunting purposes.

Ministry of Higher and Vocational Education

- Assist the National Board of Environmental Coordination by maintaining a committee to conduct research and trials into the rational use of natural resources and environmental protection, and a committee to conduct research and trials on the reparation of war damage to the environment.
- Prepare courses and environmental teaching materials for introduction in the school and university curricula.

Ministry of Justice

- Prepare a new Law of the Environment in cooperation with the National Board for Environmental Coordination.

Ministry of Labour

- Help in the control of population growth in coordination with the Ministry of Health

and under the direction of the Department of Population Planning in the State Commission for Planning.

Ministry of Light Industry

- Undertake environmental impact assessments on planned and on-going industrial plants and development projects in compliance with the new Law of the Environment.
- Develop suitable small-scale industries throughout the country, in harmony with the respective ecosystems and with due regard to the needs of the local people and the productive capacity of each region.

Ministry of Aquatic Products

- Promote the utilisation of deep sea resources through inventory and the promotion of marketing and processing facilities and the encouragement of those cooperatives using large boats.
- Prevent overutilisation of coastal resources through the introduction of controls, such as closed seasons, size limits, mesh size and protected areas.
- Identify and protect vital resource breeding areas and other critical habitats.
- Develop a capacity for marine conservation including the development of a cadre for the selection, planning and management of marine protected areas.
- Promote better use of recreational and touristic potential of marine areas.

Ministry of Mines and Coal

- Undertake environmental (EIAs) of all mining operations in accordance with the new Law of the Environment.
- Introduce regulations and controls to prevent pollution of air and water, or environmental damage to surrounding production systems.

Ministry of Power

- Undertake environmental impact assessments (EIAs) of all power plants in accordance with the new Law of the Environment.
- Coordinate planning with the Ministry of Forestry so that catchments vital for major hydro-electric dams are given adequate forest cover and protection.

Ministry of Defence

- Devote adequate attention to the protection of natural resources from illegal abuses and wasteful consumption during periods of peace.
- Provide practical assistance to other ministries in the protection of the environment, namely, forest protection, construction of contour bunds, land terracing, erosion checks, flood dykes, etc.
- Encourage, through the armed forces, a due respect for nature and the environment.

Ministry of Public Health

- Establish safe standards and controls to prevent pollution of air, water supplies and foodstuffs in cooperation with production ministries.
- Help in the control of population growth and develop safe methods for effecting population control in cooperation with the Ministry of Labour and under the direction of the Department of Population Planning in the State Committee for Planning.

Ministry of Water Conservation

- Ensure that adequate forest cover is maintained to protect water supplies and hydrological regimes by coordinated planning with the Ministry of Forestry.
- Ensure the quality of water supplies in cooperation with other ministries through the enforcement of environmental standards and controls.

Government Committees and Institutions

State Committee of Science and Technology

- Administer and coordinate scientific research programmes directed towards the maintenance of environmental quality in close coordination with the National Board of Environmental Coordination.

Institute of Science and Institute of Climatology and Hydrology

- Undertake and promote scientific research on the properties and potential of the country's natural resources in cooperation with other scientific departments and agencies.

Committee for Rational Use of Natural Resources and Environmental Protection

- Undertake research aimed at more rational use of natural resources, environmental protection and restoration and population control, under the direction of the Board of Environmental Coordination, with the cooperation of the Ministry of Higher and Vocational Education and the State Committee for Science and Technology.

State Committee for Planning

- Establish a permanent department for the planning of population affairs, with the specific purpose of tackling three main areas: first, control of population growth; second, resettlement of people living in protected forest areas or areas where their activities are causing unwarranted environmental damage; and third, planning the dispersal of the still growing population into areas of new industrial or agricultural development.

Non-Governmental Organisations

Three types of non-governmental organisations (NGOs) have a role to play in the implementation of the National Conservation Strategy.

There are, clubs and societies, youth movements and peoples' committees. A small number of clubs and societies exist in Vietnam which have a particular interest in the environment of the country. The most relevant of these is the Environmental Conservation Society. Among the more important youth movements are the Ho Chi Minh Generation Movement and the Vietnam Youth Movement. People's committees are organised at the village, district and provincial levels. Such committees are powerful channels through which sound environmental policies and activities can be promoted. The useful roles these non-governmental organisations can play in implementing the NCS are mentioned here:

Clubs and Societies

- Assist and augment government activities by acting as independent bodies to monitor environmental conditions, alert government to environmental problems, help to promote greater public awareness and participation in environmental care and restoration.

Youth Movements

- Take up the environmental cause, promote environmental awareness among the young people and initiate environmental activities at the ground level.

Peoples' Committees

- Represent the people, coordinate with the local government and help determine land-use and other policies at the respective levels. Provide leadership to the people in guiding and supervising agreed programmes, management and production.

POLICY MATTERS

Policy matters are decided upon by both the Government and by the party Politburo. Where a policy is decided upon, it should be reflected in the constitution, in the terms of reference, programmes of the respective ministries and in the legislation.

In view of the very serious and fast-worsening conditions of the environment of Vietnam and the direct relationship between overpopulation and reduced environmental quality, the following principles should be included in the national policy:

- Stabilise the population size as soon as possible by persuasive rather than coercive means.
- Create a new environmental ethos among the population of the country.
- Restore and replant deforested lands for the benefit of all productive sectors through the combined efforts of the people, the party and the Government.
- Increase the utilisation of renewable resources only as far as their sustainable limits permit.
- Use non-renewable resources in a responsible and constructive way to pay for the vital investments needed to increase agricultural and industrial development—these resources should not be squandered on encouraging further unwanted population growth nor on non-constructive, wasteful consumption.

PLANNING

The sectoral planning in the implementation of the National Conservation Strategy will be undertaken by many agencies but coordination in planning will be undertaken by the State Committee for Planning and more specifically by the National Board of Environmental Coordination. This Board should be supported by the secretariat for the National Conservation Strategy which should plan all aspects of preparing, launching, publicising, communicating, monitoring and reviewing the strategy and should coordinate the planning of other agencies involved in its implementation.

LEGISLATION AND ORGANISATION

The National Conservation Strategy identifies the organisational needs for the implementation of the rational environmental policies proposed. These organisational needs must be reflected in the revised Constitution and strengthened by legislation. Existing and newly drafted legislation relating to the environment must be revised and put together in the form of a new and comprehensive cross-sectoral Law of the Environment. This law should be drafted by the National Board of Environmental Coordination in conjunction with the Ministry of Justice. It should cover the whole spectrum of environmental issues and should contain legal hooks for appending subsidiary legislation and specific regulations so that amendments can be made to sectoral regulations without need for revision of the parent law. In particular, the

Law must have the power to order environmental impact assessments (EIAs) to be carried out on any planned development projects. This can be effected by requiring the clearance of all development projects by the National Board of Environmental Coordination which can then decide in each case whether an EIA is needed and what particular aspect it should cover. This is rather more flexible and useful than blanket regulations requiring standard EIAs across the board.

It is recommended that prior to drafting of a suitable law, a national expert be sent to the International Environmental Law Centre in Bonn, West Germany, to study the way in which different countries have coped with legislation on environmental matters.

Law enforcement will require good cooperation from the Ministry of Interior, local magistrates and the police. At present, law enforcement agencies show little interest in enforcing existing environmental regulations. It is necessary to have a law and to impress its importance and urgency on the enforcement agencies. This is all part of the need to generate better environmental awareness through all sectors of both government and the people.

EDUCATION, PUBLIC AWARENESS AND TRAINING

One of the special projects of the Committee for Rational Use of Natural Resources and Environmental Protection (Programme 52-02) is the promotion of better environmental understanding through education, public awareness and training.

Education

The project has had good success in getting environmental teaching accepted in educational programmes. Courses have been framed and are currently being tried out in two schools by the Institute of Educational Science in Hanoi. Three new technical subjects at the secondary school level have been included, namely, population education, professional education and environmental education. These courses should be ready for wider application by 1985. The suggestions that they should be included in the school curricula has already been accepted by the Ministry for Education. In addition, courses of 30 hours each in environmental conservation are now included at the university level in agriculture, economics, social sciences, medicine, biology and geography as well as in some of the teachers' training colleges. Additional work must be done in training teachers in these fields and in organising better courses and reading materials on the subject of environment in Vietnam. Major steps have already been taken to get environmental studies included in formal education programmes.

Public Awareness

The second major area for promoting better environmental awareness is through the mass media. A start has been made to present environmental films on television but these reach only a small percentage of the population and usually those least affected by environmental problems. Greater efforts are needed in this field so that television broadcasts reach a larger proportion of the population. Meanwhile, efforts should also be continued to disseminate information on environmental matters through the radio and the press—especially the national newspaper, *Nhan Dan*.

Public awareness should also be promoted through youth movements, societies and people's committees. A new conservation ethos must be presented to the people of Vietnam to replace the lost Buddhist and Confucian beliefs in the need to respect living things and the principles of the balancing of natural forces.

Training

A large cadre of environmental researchers, activists, teachers, etc. should be built up. This involves a lot of learning and training. The programme for such training should include:

- import and distribution of more international, scientific and technical books and journals on this subject, and facilities for their translation into Vietnamese.
- establishment of special institutes to develop environmental manpower.
- holding of special courses on environmental subjects in Vietnam and sending Vietnamese scientists overseas for more specialised training.

Vietnam should utilise as many opportunities as possible for technical exchanges, cooperative relationship, foreign aid programmes, etc. to include the necessary training components so that Vietnam is not only self-sufficient in most areas of environmental know-how but can provide leadership in this field to its Southeast Asian neighbours.

INFORMATION AND RESEARCH

The Committee for the Rational Use of Natural Resources and Environmental Protection (Programme 52-02) has already collected much useful information and conducted valuable research, but this is a continuing need. The activities of the committee should continue and should extend into new areas where information is still inadequate. In addition, there is a need for the collection of site-specific information to measure environmental impacts and analyse and monitor trends.

The structure of the committee enables it to remain flexible being chaired by the neutral Ministry of Higher and Vocational Education but having links with all relevant departments, agencies and institutes in the country and also good international contacts with experts in many environmental fields.

The committee at present has insufficient funds which makes it heavily dependent upon other interested ministries for funds to conduct research. It would be preferable to give the committee sufficient funds to let it have a free hand in selecting priorities for research. However, care must be taken to ensure that research is closely relevant to and applied to real environmental problems and practical solutions and is not too theoretical or purely scientific. The shortage of overseas publications and information should be rectified by developing channels for receiving scientific journals, books and other technical documents through various international agencies, such as UNEP, IUCN, etc.

NEED FOR INTERNATIONAL ARRANGEMENTS

As stressed earlier, Vietnam needs much greater international interaction than mere receipt of information. Vietnam needs to discuss the management of the Mekong river with its neighbours in Kampuchea, Laos and Thailand, and the management of the Red and Black rivers with China. The former is possible through the arrangements established by the Special Commission for the Mekong River Project in Bangkok. New agreements should be made with the Chinese as soon as relationships between the two countries permit.

It is unfortunate that a number of existing agreements, such as the bilateral ones with Norway, Denmark and the Netherlands are being weakened through international pressures. It is important to maintain good relations with these countries as well as establish new international arrangements wherever possible. For instance, the newly developing association with the International Union for the Conservation of Nature and Natural Resources (IUCN) could prove very useful in tackling some of our environmental problems. Other international agencies, such as International Planned Parenthood Federation (IPPF) could also be usefully invited to assist Vietnam. Valuable lessons can also be learned from the success of the Population and Community Development Association in Thailand.

It is also recommended that active efforts should be made to repair the poor and misrepresented image that Vietnam now holds in many neutral western countries. A great deal more sympathy and support could be gained if there were more opportunities to present Vietnam's case through documentary films and propaganda activity on the present serious state of environmental degradation.

SPECIFIC PROJECTS

In addition to preparing general policies and major action programmes, there is a need to undertake a number of subsidiary research projects, experiments and models and training programmes, etc. It is proposed to include the following projects initially in the National Conservation Strategy. Undoubtedly, other project needs will also arise.

Projects to be included in the National Conservation Strategy

<i>No.</i>	<i>Title</i>	<i>Scope</i>	<i>Agencies</i>
1.	Rational use of natural resources	Continuing activities of Programme 52-02.	Ministry of Higher Education and State Commission for Science and Technology 52-02 and IUCN
2.	Promotion of NCS	Promotion, publicity and maintenance of NCS, including publication in book and film form, review and revision	52-02 and IUCN NBEC
3.	Midland agroforestry and mixed planting trials	Design and trial of better mixed cropping and mixed forestry in midland areas	Local Government 52-02 and SIDA
✕ 4.	Development of an Environmental Monitoring Centre	Provision of library, computer and training facilities	University of Hanoi and IUCN
5.	Environmental impact assessments (EIAs)	Training exercise on a selected development project, followed by a discussion and seminar	52-02 and IUCN
6.	Urban environment monitoring centre	Centre to monitor environmental conditions in Ho Chi Minh city	State Commission for Science and Technology and UNDP
✕ 7.	University cooperation project (Holland)	Various cooperative research and training projects	Ministry of Higher Education and Dutch Universities
8.	Marine resources inventory and planning	Training project in underwater survey and planning of resource use and conservation	Ministry of Aquatic Production and IUCN
✕ 9.	National parks training and planning	Training project in national parks planning and management, including efforts to save the Kouprey	Ministry of Forest and IUCN
10.	Development of new crops and domestic animals	Trials at introducing new species, such as sago and banteng	Ministry of Agriculture 52-02 and IUCN
11.	Reforestation trials	Trials at monoculture and mixed forests	Ministry of Forest and FAO/PAM
✕ 12.	Environmental cadre training	Building up training in all areas of environment	Various agencies
13.	Development of fuel saving	Trials in the development of domestic fuel saving eg. economic stoves, solar energy, biogas plants, etc.	Technical Cooperation between 52-02 and Government of India.
14.	Comparative study of environmental law	Fellowship to study in Environmental Law Centre, Bonn, West Germany	52-02 and IUCN

PUBLIC PARTICIPATION

The tasks of restoring the environmental well-being of Vietnam, replanting millions of hectares with forests, stabilising the birth rate, introducing more efficient and ecologically sound forms of agriculture, reshaping the land, changing the water flow are too numerous

for the Government alone to tackle. These activities are undertaken freely and willingly by the people, not through compulsion. The people should fully understand the importance of common environmental problems facing the country and should assume responsibility for taking remedial action. The Government can provide the information, the methods, the tools and guidance but the people must actively participate in the programme for environmental action. Environmental information or awareness can be spread to the public through all available channels. The know-how can be developed by the country's scientists and technicians and passed on to the public through people's committees and other channels.

The Government should provide the wherewithal for action—tools, seeds, contraceptives or whatever else is required for the job at hand. But the greatest challenge is to motivate people and offer them incentives to contribute their time and energy to this important task. Appealing to the national and social conscience may have good initial success, but maintaining a sound environmental policy is a long-term objective. The enthusiasm of the public must be sustained long after the mutual interest and novelty of such work has faded. Such enthusiasm can only be maintained if tangible incentives are provided and if the public is allowed to derive direct benefits from the efforts put in.

The ways in which the public can be given incentives include:

- Giving communities and individuals greater direct benefits from their improved production. This can be done by increasing the area of individual and cooperative land holdings and giving people more choice in the uses to which they can put such land.
- Giving communities and individuals a long-term interest in the land they use by ensuring some guarantee of continuity and inheritance of land use.
- Mixing short-term crops with long-term crops, for example, including some fast-growing bamboos, firewood and fruit-bearing species in forest plantations of longer maturing crops, such as timber, so that workers get quicker returns for their labour.
- Making various socio-economic adjustments so that it no longer pays to have large families. In most rural areas parents gain materially from having large families and exploiting the extra labour of their children to increase family production. It needs only a small change to move from a situation in which extra children are a benefit to where extra children are a burden. Smaller families are better under present circumstances and should be encouraged. This can be achieved by making parents pay some contribution towards purchasing books and clothes for children as well as for the schooling of their children, fees for the registration of births or have reduced rice allowances for having too many children.
- Easily or freely available services of contraception, vasectomy and abortion will also ensure a better response from the public to the birth control campaign.

INTERNAL RESPONSIBILITIES

The implementation of the NCS requires the involvement of many different agencies. The terms and reference of most agencies have been outlined in the previous section. It is the job of each agency to make its own arrangements to meet their responsibilities. There would be a need for an increase in staff, special equipment, or training facilities. These items must be properly planned and budgetted for in the routine and special development plans of the respective departments.

Only two new agencies are proposed under the NCS. The first is a special body within the State Committee for Planning with the role of coordinating national population planning efforts. This body could be quite small (about six persons) and can be accommodated in the existing structure of the committee. The second is the National Board of Environmental Coordination (NBEC) which will be larger. It should have the following personnel:

- Vice Prime Minister, (plus an assistant)
- Board Chairman, (plus 2 assistants)
- Vice Chairman for Land-use Planning, (plus 3 staff)

- Vice Chairman for Environmental Impact Assessment (plus 3 staff)
- Vice Chairman for Environmental Law (plus 3 staff)
- Vice Chairman for Resource Utilisation (plus 3 staff)
- Forestry Liaison Officer (plus an assistant)
- Agricultural Liaison Officer (plus an assistant)
- Population Control Liaison Officer (plus an assistant)
- International Cooperation Liaison Officer (plus an assistant)
- Water Resources Liaison Officer (plus an assistant)
- Aquatic Products Liaison Officer (plus an assistant)
- Industry Liaison Officer (plus an assistant)

In addition, the NBEC should eventually include the NCS secretariat which consists of an NCS secretary with about four assistants. The department would also need about four drivers, which would make a total staff strength of 45 persons. Office space will be needed for the staff. A house would be adequate and can probably be found in Hanoi without special premises having to be built. The office will need to be furnished with office equipment, typewriters, files, stationary, mapping equipment, etc. and will need about four vehicles.

Budgets for such an office, staff recruitment and special training will be needed. The budget must be prepared and approved well in advance of the establishment of the Board.

EXTERNAL AGENCY INVOLVEMENT

The Socialist Republic of Vietnam should become a State member of the IUCN and should endeavour to ratify the following international conventions as soon as possible:

- Convention on International Trade in Endangered Species of Flora and Fauna (CITES)
- International Wetlands Convention (Ramsar)
- International Whaling Convention (IWC)
- World Heritage Convention (under UNESCO)
- International Convention on Migratory Species

The National Board of Environmental Cooperation should be the State agency responsible for all these conventions. However, in the interim period before the Board is established the Committee for Rational Use of Natural Resources and Environmental Protection (52-02) should join the IUCN as a non-state member to initiate Vietnam's involvement in and reap benefits from such programmes. Vietnam should request such UN agencies as the FAO, UNDP for further assistance to help develop projects in areas of reforestation, protection of nature reserves, national park development, training programmes and population control.

Other relationships that can be used to benefit the development of better use of resources can be realised through the universities cooperation programme with the Netherlands and through the bilateral aid programme of the Swedish International Development Agency (SIDA). Technical exchange could be usefully developed with India, a country which shares many similar environmental problems with Vietnam and has developed a fair amount of experience in several fields, especially in the design of economical stoves, reforestation and public involvement in environmental restoration.

Vietnam's socialist friends in the Soviet Union, GDR, Hungary, Poland, etc. can assist Vietnam by supplying technical equipment and providing training in a number of relevant branches of science and technology, taxonomy, biology, ecology, soil science, forestry, nuclear physics, environmental assessment and so on. Through the use of remote sensing of sputnik satellite photos from the Soviet Union valuable monitoring of environmental conditions as well as the loss and regrowth of forest cover can be carried on. One of the functions of the proposed National Board of Environmental Coordination would be to pursue and develop these various international relationships to get maximum benefit from the assistance available.

Implementation

SCHEDULES FOR ACTION

The implementation of the National Conservation strategy is a multi-faceted and complex operation which requires good forward planning and integration. The schedules below present only the major projects and programmes that must be undertaken together with a tentative time schedule for their execution. Many of the activities are themselves so complex that they need careful preparation and planning which must take place well in advance of the proposed activity. This is essential so that the necessary budgets, manpower, training and equipment needed for execution can be made ready on time.

The lead agencies listed against the various activities are responsible for planning, costing and obtaining the necessary budgets for implementing these activities. The schedules also include the overall coordinating agencies that must support, supervise and coordinate the various integrating plans as they are developed.

1. ESTABLISHMENT OF A NATIONAL BOARD OF ENVIRONMENTAL COORDINATION (NBEC)

<i>Activity</i>	<i>Lead Agency</i>	<i>Coordination</i>	<i>Timing</i>
Decision by Government and Politburo	Prime Minister	Politburo	by June 1985
Preparation of terms of reference	Prime Minister	Politburo	by Dec 1985
Inclusion in new Constitution	Prime Minister	Politburo	by Dec 1985
Identification of Vice Prime Minister and full-time secretariat	Prime Minister	Politburo	by Dec 1985
Identification of suitable officers	NBEC	Prime Minister	by Jan 1986 ✕
Installation	NBEC		by Jan 1986
Staff recruitment	NBEC	Committee of Planning	by Dec 1986
National Symposium on Population and Resources	NBEC		by Sep 1986
National Symposium on Land-use and Planning Allocation	NBEC		by Nov 1986
Review of Existing Legislation and Regulations	Respective ministers	NBEC	by Dec 1986
Draft of new Law of the Environment	Minister of Justice	NBEC	by Apr 1987

<i>Activity</i>	<i>Lead Agency</i>	<i>Coordination</i>	<i>Timing</i>
Discussion of new law with all ministries	Respective ministers	NBEC	by Jul 1987
New law passed by government	Prime Minister	Politburo	by Dec 1987
Establishment of official inter-ministerial linkages	NBEC	Committee of Planning	by Dec 1987
Research into rational use of natural resources (52-02)	Ministry of Higher Education	NBEC	Continuous

2. PREPARATION AND IMPLEMENTATION OF NATIONAL CONSERVATION STRATEGY (NCS)

Completion of draft of NCS	Ministry of Higher Education (52-02)	Communication Science and Technology	by Jan 1985
Approval of draft NCS	Prime Minister	Politburo	by Apr 1985
Publication of the National Conservation Strategy	52-02	Communication, Science and Technology	by Jun 1985
Public launch of the NCS through media	Ministry of Information	Communication, Science and Technology	by June 1985
Making of a film on the environment	Minister of Education	Communication, Science and Technology	by Jun 1985
School exhibitions	52-02	Communication, Science and Technology	by Jun 1985
Propaganda and promotion campaign	52-02	Communication, Science and Technology	by Jun 1985
Formation of an NCS secretariat	Communication, Science and Technology	NBEC	by Jan 1986
Review of the NCS	NCS Secretariat	NBEC	by Jun 1986
Maintenance programme for the NCS	NCS Secretariat	NBEC	July 1986 onwards

3. FORESTRY SECTOR

Review legislation and regulations	Ministry of Forestry	NBEC	by Dec 1986
Submit draft of revised sections of law	Ministry of Forestry	NBEC	by Dec 1986
Review protected species lists	Ministry of Forestry	NBEC	by Dec 1986
Develop training school for guards	52-02 and Ministry of Forestry	NBEC	Start in Jan 1987
Complete a forest land-use master plan	52-02 and Ministry of Forestry	NBEC	by Dec 1985
Establish system of parks and protection forests	52-02 and Ministry of Forestry	NBEC	by Jul 1986
Develop model national park (Cuc-Phuong)	52-02 and Ministry of Forestry	NBEC	Jan 1986-Dec 1988
Trails in mixed reforestation	52-02 and Ministry of Forestry	NBEC	continuous
Preparation of detailed plan for reforestation	52-02 and Ministry of Forestry	NBEC	by Dec 1985
Preparation of local nurseries	Ministry of Forestry	NBEC	by July 1986
Rearing of seedlings in nurseries	Ministry of Forestry	NBEC	by Dec 1986
Launching of massive national planting programme	Ministry of Forestry	NBEC	from Tet 1987
Control of hunting and firearms	Police/Forestry	Ministry of Forestry	by Dec 1986
<i>Ex situ</i> conservation projects	Ministry of Forestry	NBEC	1986 onwards
Mangrove reforestation programme	Ministry of Forestry	NBEC	continuous

4. AGRICULTURAL SECTOR ACTIVITY

Agroforestry trials	Ministry of Agriculture	Communication, Science and Technology.	continuous
Mixed intercropping trials	Ministry of Agriculture	Communication, Science and Technology	continuous
Control of the use of pesticides	Ministry of Agriculture	NBEC	continuous
Research into acid sulphate soils	Ministry of Agriculture	Communication, Science and Technology	continuous
Land developments	Ministry of Agriculture	Committee of Planning	continuous
Resettlement programme	Ministry of Agriculture/Forestry	Committee of Planning NBEC	1986 onwards

5. AQUATIC PRODUCTION SECTOR

Training in underwater survey methods	Ministry of Aquatic Production	NBEC	Jan.-Jun 1986
Survey and inventory of marine resources	Ministry of Aquatic Production	Communication, Science and Technology	continuous
Review of fisheries regulations and controls	Ministry of Aquatic Production	NBEC	by Dec 1986
Review of marine pollution regulations	Ministry of Aquatic Production	NBEC	by Dec 1986
Declaration of protected marine areas in critical locations	Ministry of Aquatic Production	NBEC	by July 1987
Introduction of incentives for larger fishing cooperatives	Ministry of Aquatic Production	NBEC	by Jan 1987

6. INDUSTRIAL SECTOR

<i>Activity</i>	<i>Lead Agency</i>	<i>Coordination</i>	<i>Timing</i>
Review of pollution regulations	Communication, Science and Technology	NBEC	by Dec 1986
Development of legislation for EIA	Communication, Science and Technology	NBEC	by Dec 1986
Development of full sewage treatment plants for major cities	Local governments	NBEC	by Dec 1990

7. PUBLIC WELFARE SECTOR

Draft agrarian reforms	NBEC	Prime Minister	by Jul 1986
Pass agrarian reforms	Prime Minister	Politburo	by Dec 1986
Introduction of environmental teaching in school syllabus	Ministry of Education	NBEC	by Jan 1986
Introduction of environmental training in universities	Ministry of Higher Education	NBEC	by Jan 1986
Introduction of environmental aspects in people's movements	People's Committees	NBEC	by Dec 1986
Birth control programme	Various	NBEC, Communication, planning	continuous

8. INTERNATIONAL COOPERATION PROGRAMME

<i>Project/Activity</i>	<i>Domestic Agency</i>	<i>International Agencies</i>	<i>Timing</i>
International conventions	NBEC	Various	1986
IUCN common membership	52-02	IUCN	Jun 1985
IUCN state membership	NBEC	IUCN	Jan 1986
National parks planning and training	52-02, Ministry of Forestry	IUCN	Start Sep 1986
Kouprey protection project	52-02, Ministry of Forestry	IUCN	Start Jul 1985
International kouprey symposium	52-02	IUCN	Oct. 1985
Marine conservation training and planning	52-02, Ministry of Aquatic Production	IUCN	Jan-Jun 1986
Environmental impact assessment (EIA) training	52-02, Communication, Science and Technology	IUCN	Jul- Sep 1985
EIA international symposium	52-02, Communication, Science and Technology	IUCN	Sep 1985
Environmental law studies	52-02	IUCN	1985
Mixed forestry plantation planning	52-02, Ministry of Forestry	SIDA	1985 onwards
Netherlands Universities Cooperation (VH)	Ministry of Higher Education	Dutch Universities	continuous
Environmental manpower training	NBEC	Many sources	continuous
Development of model national park	Ministry of Forestry	UNDP/FAO	1986-87
Reforestation trials	Ministry of Forestry	UNDP/PAM	1985-86
Coordination of assistance projects	52-02	IUCN	continuous
Animal ecology in tropical forest ecosystems	52-02	Animal Ecol. and Morph. Inst. (Moscow)	continuous
Technical cooperation programme (fuel saving)	52-02	Government of India	1985 onwards

Monitoring and Maintaining the NCS

MONITORING

The success of the implementation of the National Conservation Strategy can be evaluated in a number of ways. It is important that a process of review is established with sufficient feedback to the NCS so as to enable revisions of the strategy or changes in the direction of the strategy wherever necessary.

In order to measure the effects of particular actions, policies or courses of management on biological systems, it is necessary to identify trends, monitor these over time and see if changes in trends can be correlated to the actions concerned. This means making repeated measurements or taking samples in comparable fashion over regular units of time. The use of control areas where the particular actions or policies are not applied helps to give stronger confirmation to observed correlations.

The following types of measurements are useful :

- species composition, diversity, biomass and production
- pest densities
- soil depth, humus content, nitrogen content
- area of different production systems
- product condition and quality
- productivity per unit area and per unit effort
- water flow and quality
- sedimentation rates
- air quality sampling
- noise pollution levels in residential areas
- land reflectivity (Albedo)
- incidence of meaningful events—storms, floods, droughts

Some of these measurements must be made in the field, others can be done from remote sensing data. The data collected must be accurately recorded, reported, stored and held available for recovery or analysis. A bureau of statistics or environmental data centre is needed. While planning, it is advisable to make detailed time-tables of activity and expected achievements so that realised achievement can be gauged and evaluated more easily against such targets and projections (eg. trees planted, hectares reforested, seedling survival, tons harvested, laws in effect, etc). The identification of success indicators is a useful component of plans and operation designs.

Monitoring of public awareness and education programmes can be carried out by simple statistics of how many people have been contacted, given courses, examinations passed, etc. But the question, —“Is the message getting through?” and “Are we putting over the message in the right way?”—can often be best answered by conducting public opinion surveys or soliciting direct feedback through questionnaires.

These numerous indicators of success or failure in the implementation of the NCS must be taken note of at regular periodic NCS reviews or symposia so that decisions can be made to incorporate changes or new elements into the NCS. The emphasis should be on pin-pointing the bottlenecks and pressure points that are causing delays or failures and identifying priorities for action. In allocating priorities, a balance must be sought between the urgency of the problem or the desirability of the objectives with the practical aspects of ease of funding, availability of necessary expertise and the likelihood of success.

It is recommended that for the first two years of implementing the NCS, an annual review meeting should be held for re-evaluation. After that, such meetings need be held only every second year and eventually may be required less frequently.

MAINTAINING THE NCS

It is recommended that a permanent NCS secretariat be established to supervise the maintenance and running of the NCS. Eventually, this secretariat should be part of the National Board of Environmental Coordination but in the meanwhile until such a board has been established, the function of the NCS secretariat should be continued by the Committee for Rational Use of Natural Resources and Environmental Protection (52-02).

The maintenance of the NCS involves several measures :

- Periodic reviews and revisions of the NCS
- Monitoring the progress and success of the NCS
- Publications and communications strategy to launch and publicise the NCS and the principles of the NCS. A prime objective of this is to gain greater public participation.
- Follow-up action on the various recommendations for implementing the NCS, particularly further development of areas in the NCS requiring more detailed planning and study
- Coordination of sectoral and regional sub-strategies to translate more easily the recommendations of the NCS into action at the ground level

LAUNCHING OF THE NCS

The NCS is intended to catch the attention of the whole country and alert people about the serious and real dangers of environmental degradation, the consequences of which have not been clearly realised. Unless appropriate actions, as outlined in the NCS, are taken immediately, Vietnam is heading for an internal population and environmental crisis far more dangerous than the external threats to the country for which it is much more alert and better prepared.

To attract government and public attention, the NCS should be launched in a well planned and concerted manner with maximum publicity. The launch should be an event. This could involve public announcements by senior national leaders, a children's procession or display of environmental paintings, television, radio and newspaper coverage, special audio-visual presentations on television and so on. In addition, a number of follow-up activities must keep people constantly aware. Regular features on environment in the newspaper, *Nhan Dan*, etc., extracts from the NCS should be included in language courses at schools. NCS study camps should be established by the National Youth Organisation and the Ho Chi Minh Generation Movement. The idea is to jolt people's ideas and understanding of environmental affairs in the country and start a new conservation ethos among the people of Vietnam.

ELICITING PUBLIC PARTICIPATION

The implementation of the NCS cannot be forced by the government or party. There are not enough officers nor enough controls to set about the colossal job of stopping population growth, changing irrational land-use practices, replanting the fifty thousand million trees (nearly one thousand per person) needed to restore the hydrology of the country. These measures can only be undertaken through a massive nationwide people's movement. Triggering off such a movement requires informing the public of the urgency of the problem, helping them understand the principles of wise land-use and resource management, winning their approval and support, mobilising their manpower in terms of time and location and giving the people the tools and guidance to help themselves and their country through willing labour.

Such large-scale mobilisation requires great planning and preparation. One such element outlined in the NCS would be the start of an annual Tet tree planting programme to begin in 1987. Other programmes will also need to be developed through respective ministries and local people's committees. People's action should be planned with great concern for the welfare and enjoyment of the participants. To get really good public support for the programme requires making the work fun, and socially rewarding. In addition to making the public participate in government planned activities, it is good to encourage spontaneous public action and establish societies, clubs, action groups, etc. India is a good model for such public action.

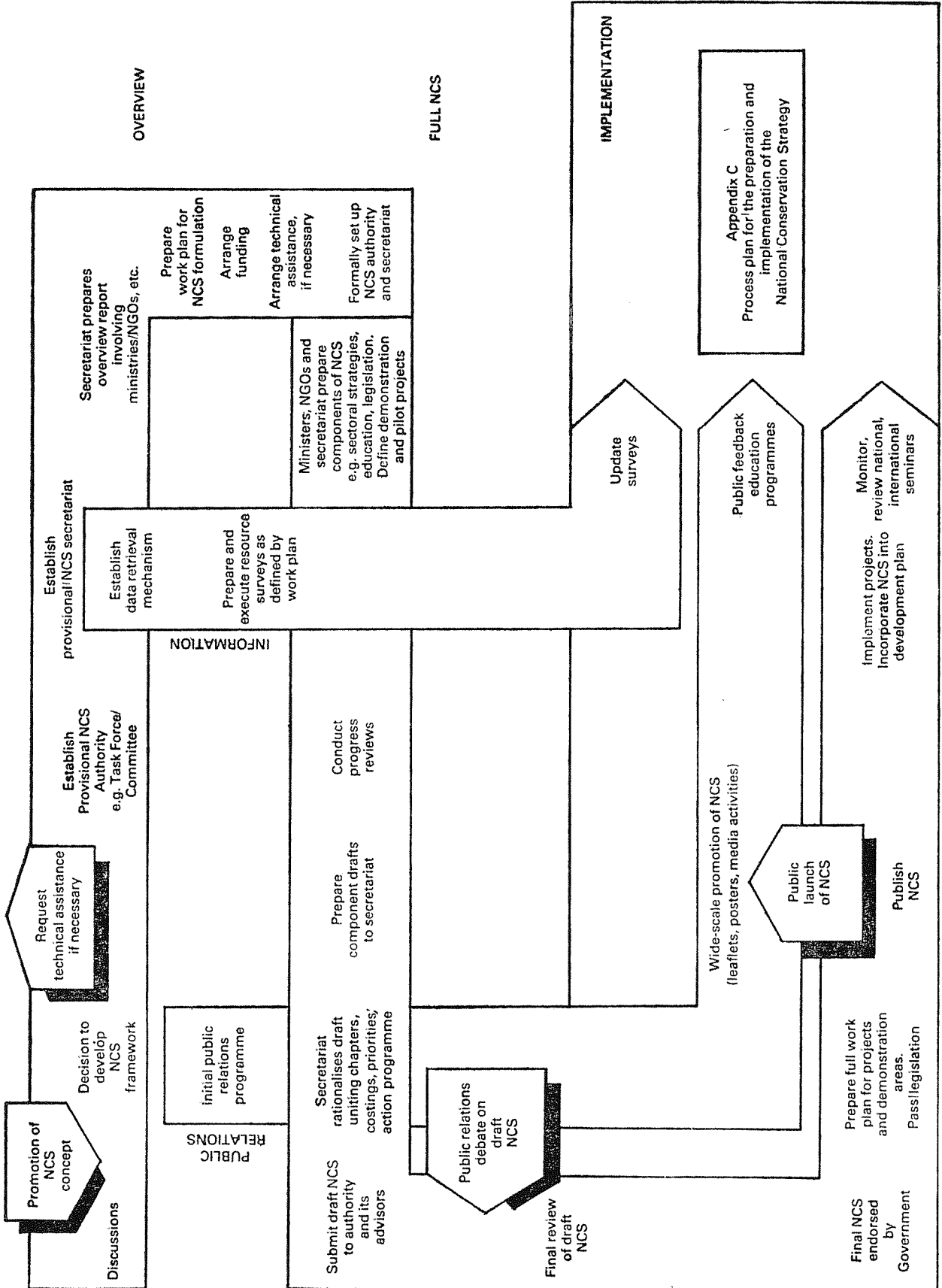
APPENDIX A

Abbreviations used in the Text

ASEAN	Association of South East Asian Nations
CDC	Conservation for Development Centre of IUCN
CITES	Convention on International Trade in Endangered Species of Flora and Fauna
EIA	Environmental Impact Assessment
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organisation
GEMS	Global Environmental Monitoring Service
GDR	German Democratic Republic
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Convention
OXFAM	Oxford Famine Relief Fund
NBEC	National Board of Environmental Coordination
NCS	National Conservation Strategy
NGO	Non-Governmental Organisation
PAM	Programme Agricolaire Mondiale
SIDA	Swedish International Development Agency
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNICEF	United Nations International Children's Fund
USA	United States of America
USSR	Union of Soviet Socialist Republics
VH	Vietnam/Holland
VREP	Vietnam Resources and Environment Programme
WCS	World Conservation Strategy
WHO	World Health Organisation
WWF	World Wildlife Fund
IPPF	International Planned Parenthood Federation

Members of the National Conservation Strategy Secretariat

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Mr. Hoang Thang	Secretary (VREP)
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INTERNATIONAL UNION FOR CONSERVATION
OF NATURE AND NATURAL RESOURCES

International Union for Conservation of Nature and Natural Resources

IUCN is an international non-governmental organisation with extensive membership of states, government agencies and non-governmental organisations. Its purpose is to ensure, as far as it is capable, that the process of socio-economic development throughout the world is sustainable and that man's use of the biosphere is managed for the overall sustainable benefit of mankind.

IUCN was founded in 1948 as a result of concern throughout the international scientific community of the extent to which economic development and the growth of the human population were causing significant adverse and often irreversible effects on the environment. The link between conservation and development has been a recurrent theme within IUCN over the last third of a century although in recent years the theme has assumed ever-increasing importance. The World Conservation Strategy (prepared by IUCN with assistance from UNEP and WWF, in collaboration with FAO and UNESCO and launched in 1980) stressed the critical importance of sustainable development throughout the world today.

IUCN's project activities are structured within a 'Conservation Programme for Sustainable Development', a three-year working programme which provides the basic framework within which IUCN's activities, including field and support projects are planned and executed. The IUCN Project Management Division is currently looking after 250 field projects, most of which are funded by the World Wildlife Fund.

The Conservation Programme for Sustainable Development comprises sub-programmes, six of which are closely linked to the work of the IUCN Commissions. These Commissions comprise bodies of volunteer professionals who make major contributions to the programme and constitute a global network of over 1500 experts working in the various fields of environment and conservation. The Commissions are :

- Environmental Planning
- Policy, Law and Administration
- Environmental Education
- Ecology
- National Parks and Protected Areas
- Species Survival

The Conservation for Development Centre (CDC) was established by the IUCN in April 1981 to address the problems highlighted in the World Conservation Strategy. Its name stresses the essential linkage between socio-economic development and natural resource management, a linkage which is important for all people but especially the poorest. It is concerned with the planning and management of national resource use for optimum sustainable yield.

The CDC comprises a small core staff to coordinate activities backed by the other components of IUCN, and by an extensive world-wide network of experts/consultants.

The Centre operates in three district modes :

- It provides advice and assistance to development/assistance agencies (bilateral and multilateral) on their projects;
- It responds to requests for assistance from governments, faced with resource conservation problems in their own countries (mainly developing countries); and
- It initiates and manages projects throughout the world, designed to address priority problems concerned with management of living resource, as identified by IUCN.

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