

Root Causes of Biodiversity Loss in Vietnam Summary

Introduction

Biodiversity is threatened by rapid population growth and the compelling requirements of economic growth in most regions of the world; this threat is particularly pronounced in the tropics. Biodiversity is affected by a large number of processes and factors. A number of the direct or proximate processes with immediate impacts on biodiversity, such as deforestation, are driven by human activities: agricultural encroachment, fuelwood collection, hunting, logging, and others. Behind these direct or proximate causes of biodiversity loss are often underlying root causes fueled by social or economic factors at the protected area, provincial, national, and international scales. Intermediate and distant determinants of biodiversity loss, such as timber exports, international demand for endangered species, or planned migrations are rarely evaluated for their impact on a country's biodiversity. Until now, most studies on the protected areas of Vietnam, including the most pivotal works¹, provided little speculation about underlying root causes of biodiversity loss.

With a wide range of latitudes (stretching from 8°30N to 23°N), Vietnam's climate varies from humid tropical conditions in the southern lowlands to temperate conditions in the northern highlands. Consequently, the country enjoys a diversity of natural environments and a high level of biodiversity in its forests, waterways, and marine areas. Vietnam has been rated as the sixteenth most biologically diverse country in the world². Vietnam has an estimated 12,000 species of plants. About 33% of the flora of Northern Vietnam are endemic³ and, nationally, the percentage of endemism could be as high as 50%⁴. Vietnam also has a wealth of fauna varieties: 276 species of mammals, 828 species of birds, 180 species of reptiles, 80 species of amphibians, 472 species of freshwater fish, and many thousands of invertebrate species have been identified⁵. These groups show a high degree of local distinctiveness, with many endemic species of great scientific and economic significance. Of the 34 globally threatened birds identified as occurring in Vietnam, 10 are restricted range endemic forest species. Sixty fish species and four primate species are also endemic to Vietnam.

¹ Mackinnon et al. 1989; Ghazoul and Le Mong Chan 1994; World Bank 1994, 1995; WRI and IUCN 1995; Dang Huy HuVnh et al. 1996; Hill et al. 1996; Kemp and Dilger 1996; SIEBR 1996; Vo Quy 1997.

² World Conservation Monitoring Center 1992

³ Poss Tamas 1965

⁴ Thai Van Trung 1970

⁵ Dao Van Tien 1985; Dang Huy Huynh et al. 1991; Vo Quy 1997

Perhaps Vietnam's greatest claim to biodiversity notoriety is the discovery within the past few years of three new mammal species. The most recent discovery, the Truong Son Muntjac, was found during a survey of western Quang Nam Province during early 1997. Research in Vu Quang Nature Reserve, located on the Lao border, led to the discovery of the Saola and the Giant Muntjac. In addition, a new species of fish, two new bird species, and a new tortoise have been found in Vu Quang.

Biodiversity is rapidly declining throughout the country as a result of habitat loss. While marine fauna and flora are important, this study focused on terrestrial biodiversity loss, given the relatively larger impact of man on Vietnam's forests. Forests have been reduced alarmingly. Originally, the entire country was covered in forest, but over the past few decades the forests of Vietnam have suffered serious depletion. Between 1943 and 1991, forest cover decreased from 67% to 29% of Vietnam's total area. At least 12.6 million ha of forest, including 8.0 million ha in Southern Vietnam, have been lost. The northern mountains experienced the greatest decline, with forest cover dropping from 95% to 17% in only 48 years. Consequently, a frightening total of 13 million ha or 40% of the country is currently classified as unproductive, barren land. The remaining forests are degraded, poorly stocked, and badly fragmented. Apart from habitat loss, many species are endangered or have been lost as a result of massive over-use. Collection of rare medicinal plants and rare timbers, and over-hunting and collecting for the wildlife trade have had a significant impact. Many species are confined to small geographical ranges and occur at low individual densities, which render them highly vulnerable as the forests are cut into smaller patches and eventually completely cleared.

During this century, the Sumatran rhinoceros, sika deer, Eld's deer, kouprey, wild buffalo, Edwards' pheasant, and probably the Malayan tapir have already become locally extinct. Without urgent conservation action, the following fauna species are facing certain extinction in Vietnam: banting, Javan rhinoceros, tiger, Asian elephant, and the saola. Among the resident forest birds most prone to extinction are large waterbirds and Galliformes, including the white-shouldered ibis, imperial pheasant, Vietnamese pheasant, green peafowl, and orange-necked partridge. Many valuable plants are becoming scarce and some are in danger of extinction. Of endemic species, 28% of the mammals, 10% of the birds, and 21% of the amphibians and reptiles endemic to Vietnam are currently listed as endangered species. The total of threatened species is high for a single country, reflecting the seriousness of the threats to wild habitats in Vietnam⁶.

This study looks at three sites in Vietnam: the Ba Be National Park, the Na Hang Nature Reserve, and the Yok Don National Park. Yok Don and the Ba Be/Na Hang areas are ideal for studying root causes as they represent two distinct but prevalent biome types in Vietnam. Ba Be

⁶ Vo Qui 1985, 1987, 1997; Dang Huy Huynh et al. 1991; Nguyen Van Sang, Truong Van La 1991; MOSTE 1992; World Bank 1995

and Na Hang are nearly identical in biodiversity composition given their proximity. Yet they provide a useful comparison since the Ba Be/Na Hang area is located at the junction of three provincial administrations. The difficulties of cross-provincial coordination and planning in Vietnam creates an interesting dynamic for the study of socioeconomic root causes.

Ba Be National Park and Na Hang Nature Reserve are two protected areas located in the mountainous northern region of Vietnam where ethnic minority groups practicing traditional agricultural practices outnumber the lowland Kinh Vietnamese. The forests are best described as limestone forest or tropical semi-evergreen forest. Biodiversity losses are driven by population pressures, seasonal agriculture being practiced on sloping lands, breakdown of the traditional land tenure systems as the government presses for sedentarization, and forest fragmentation.

Yok Don National Park lies in a completely different biogeographical zone, with lowland dry dipterocarp forests which are a good habitat for bovids and other large grazing animals such as elephants. The forests are good for timber production, and the national park is almost completely surrounded by state forest enterprises. The original inhabitants of Yok Don, mostly Ede, Lao, and Mnong ethnic groups, practiced traditional agriculture, hunting, and collection of forest products. The government has encouraged these groups to settle into permanent villages but they still make extensive use of nearby forests. The government sees Dak Lak Province, the location of Yok Don, as a "new frontier." The forest areas are extensive, and much of the flat plateau area is good for cash crops such as coffee and cashew nuts. Incentives are provided to ethnic Vietnamese, mostly recent immigrants, to start plantations of cash crops.

Site Descriptions

Ba Be National Park

Ba Be National Park is situated in the Ba Be District of Bac Kan Province, about 250 km north of Hanoi, in northern Vietnam. It was established as a Natural Preserve Zone in 1977 and became a National Park in 1992. The commune of Nam Mau lies within the park, and Na Hang lies to the west. The park has a total area of about 7,131 ha. The protected zone of the park is about 4,000 ha; the northern buffer zone is about 1,100 ha; and the southern one about 1,900 ha.

Ba Be Lake lies at the center of the park. Around the lake are steep mountains, ranging from 500m to 1,098m in height. Much of the park has steep slopes and is still largely forested. The only flat land (less than 10% of park area) occurs on the river plains and flood plains around the lake. All this area has been converted to agriculture. On steep slopes, soil is shallow and trees have not been able to grow to any great height. In some very steep areas and on the tops of peaks, there is little or no soil. In flatter areas, soil has been able to accumulate and supports quite different fauna and flora. The watershed of Ba Be is made up of three basins. During the

rainy season, the inflow to the lake from these major rivers exceeds the outflow, causing the water level to rise as much as 2.8m. When water levels rise, local rice fields are flooded.

There are two main forest types: tropical moist evergreen forest and tropical evergreen limestone forest. Although much of this forest is disturbed to some extent, it still plays an important role in supporting fauna and landscape protection. Wildlife is present in all areas, and regenerating forests are showing encouraging signs of recovery. Ba Be is a very important site for bats and birds. The rarity of most species indicates the complexity of the local ecosystems. Among the species encountered, four are listed for strict protection by the government. Three species of medical plants were found which are threatened with extinction due to human exploitation. The estimated forest area lost annually is 100,000 ha, of which about 50% may be due to shifting cultivation⁷. The analysis of this study, based on observations and data collected in the park, suggests rather lower deforestation rates from shifting cultivation. However, it is likely that the natural resources of Ba Be are being depleted at an increasing rate by illegal logging, cutting, shifting cultivation, and tourism. In a 16-month period, 1996-1997, 81 ha of primary forest were cut and burned for shifting cultivation.

Na Hang Nature Reserve

The Na Hang Nature Reserve is located in Na Hang district, Tuyen Quang province, about 300 km from Hanoi. The reserve is comprised of the five communes and bordered to the north and east by three more communes. The reserve covers 41,930 ha. The core zone is 27,520 ha; the buffer zone is 14,410 ha. It is situated between the Nang and Gam river watersheds. The Nang river connects with Ba Be lake and plays a role in regulating the water level in the lake. Hills and mountains cover most of Na Hang district. The highest mountain, Thuong Yen, is 1,398 meters. The region has two distinct seasons. The dry season lasts from October to March, with cold winds from the north, and the rainy season from April to September. Annual rainfall is 1,792 mm. The Na Hang Nature Reserve was created in 1994. Since the reserve is still new, the management and infrastructure are poor. The staff of the reserve, responsible for management activities, is only 8 people.

There are three main types of forest in the Na Hang area. Tropical moist evergreen closed forest consists of the *Lauraceae*, *Fabaceae*, and *Meliaceae*. These families commonly grow in the valleys of Gam river. Tropical monsoon closed and semi-deciduous forest consists of *Fabaceae*, *Lauraceae*, and *Fagaceae*. Most of the forest of this type was destroyed, and has been replaced by secondary forest of bamboo and other species. Limestone tropical forest contains *Burretio dendronhsienmu* and *Garrcinia fragracoides* in the unexploited areas. This

⁷ Ministry of Forestry's statistics 1993

forest type regenerates with difficulty. Where the forest has been badly degraded, only shrubs and bushes remain. Terrestrial vertebrate diversity in Na Hang is high. One species of interest is the endemic Tonkin Snub-Nosed monkey. It is now found only in the Na Hang/Ba Be region, and the population is estimated at less than 200 individuals. Other threatened mammals found in Na Hang reserve include 9 species of primates, the Asiatic black bear, sun bear, clouded leopard, and tiger.

The human population in the Reserve is 10,590, and population density is 25 persons per km². The current population growth rate is high, at about 2.4% per year. Most of the local population has lived in the area for a long time. There are four major ethnic groups living in the reserve, including Tay (56%) and Dao (22 %). Most Tay people live at relatively low altitudes, in the valley and flat areas. They generally practice paddy rice cultivation, or shifting cultivation when rice paddies are not available.

Due to destruction of forest and extensive hunting in Tuyen Quang province over the long term, habitats for wildlife, especially endangered species, have been restricted to the Na Hang Nature Reserve. Many mammals, once distributed widely in the province, can be found only in the reserve⁸. In 1943, nearly all of the province was covered by the forest but, by 1975, forest cover was only 28%, and by 1992 only 17%. The decrease in forest in this region was caused by the rapidly growing population's demand for forest products and agricultural land.

Yok Don National Park

Yok Don National Park is situated in Krong Na Commune, in the Buon Don District of Dak Lak province. It is in the center of the Srepok river basin, which forms the right branch of the lower Mekong basin. The park's core area is 58,200 ha. The buffer zone overlaps with three communes, Krong Na and two newly established communes, Ea-Huar and Ea-Wel. The western boundary of Yok Don lies along the Cambodian border. The northern and eastern boundary follows the Srepok River. Yok Don was declared a Reserve in 1986, and became a National Park in 1991.

Yok Don includes many kinds of terrain. The average elevation is 100m to 500m. It is divided into the following subzones: subzone of complete preservation for wet deciduous dipterocarp forest on the left bank of the Daken river (31,000 ha); subzone for ecological regeneration on the right bank of the Daken river (23,000 ha); and subzone for experimental management and animal reproduction on the left bank of the Srepok river (5,100 ha). The vegetation of Yok Don can be classified as: dry dipterocarp forest (57%); riverine evergreen forest (8%); hill evergreen forest (12%); mixed deciduous forests (13%); and grassland area (13%). Top soil is deep, and the vegetal cover has a high biomass. Of the park land, 56,182 ha is

⁸ Dang Huy Huynh 1996

forested. Yok Don has a tropical monsoon climate, with a well defined dry season from October to April. Mean annual rainfall is 1,540mm.

Yok Don is the only park in Vietnam protecting dry dipterocarp forest. One important feature of the vegetative cover is the grass under the forest canopy. A total of 61 species of grass serve as food for animals, perhaps the most important being those available in the dry season and other times when food is scarce. A total of 62 mammal species, 196 bird species, 40 reptile species, and 13 amphibian species have been recorded in the park. Notable mammals include large ungulates: kouprey, banterg, gour, feral/wild buffalo, Eld's deer, hog deer, and elephant. Carnivores include: tiger, leopard, golden cat, leopard cat, sun bear, and black bear. At least 455 plant species have been recorded. Many of the tree species have value as timber or for turpentine resin. The park also has a rich flora of orchids of horticultural value. Yok Don National Park may contain the most numerous species of rare, valuable animals at the highest density in Vietnam.

There are no villages or state enterprises in the core area of Yok Don National Park. The population in the 3 communes of the buffer zone is 7,704. Population density is 8 persons per km². There are 10 ethnic minorities in Krong Na, 5 in Ea-Huar, and 10 in Ea-Wel. Ede, M'ngong, Giarai, and Lao are all native minorities of Yok Don and comprise 71% of the population. Other ethnic groups are generally migrants from other provinces, particularly from North Vietnam. Isolation from inhabited areas facilitates management and control of the Park. However, between 1978 and 1991, 9,000 ha of natural forest were lost yearly, on average, in Dak Lak. Between 1991 and 1996, on average, 3,000 to 3,500 ha were lost yearly.

Methodology

Attempting to determine the underlying motivations for actions which directly cause biodiversity loss is a complex process. This case study is an interdisciplinary work combining social and natural sciences: understanding the larger picture requires an interdisciplinary flexibility. The research team began the investigation by examining the mechanisms by which local populations are affecting biodiversity--the proximate causes of biodiversity loss-- at each of the three case study sites. The next step was to conduct further analysis, asking what motivates the local resource users to take such actions as hunting and expansion of agricultural land. After working up to national and international scales on the chain of causality, hypotheses were formulated about the root causes of biodiversity loss in Vietnam. A return journey down the chain of causality was taken to confirm those hypotheses, concluding with household interviews.

The collected data cover environmental and socioeconomic conditions, enforcement of government sectoral policies, local policies, and biodiversity resources. The data are both quantitative and qualitative. Quantitative data was collected on changes of land use, population,

agriculture production, and income sources. Qualitative data track changes in the resources and their degradation. Biodiversity loss often had to be inferred from surrogate or proxy measures, such as loss of forest cover or decreases in the population of indicator species.

Data was collected at four levels: commune, district, provincial, and central. At the commune level, data was collected from annual socioeconomic statistical reports; formal interviews with commune leaders using questionnaires; informal interviews with village elders; participatory rural appraisal in meetings of village people; and other anecdotal material. At the district level, data collected included annual reports of District's People Committees and Party's Committees; statistical data from the Agricultural and Rural Development Unit, Statistic Unit, Planning Unit, Population and Family Planning Unit, and Forest Protection Unit; as well as formal interviews and discussions with the district leaders. At the provincial level, data was collected from annual reports of the Provincial People Committees; formal interviews with provincial leaders; and statistical data from the provincial department. At the central or national level, data collected included legal documents related to policies, laws, and regulations from the Prime Minister's Office, ministries, and government departments; reports of research projects and national and international cooperative systems; and documents issued by international organizations. Formal interviews and invited reports were also solicited from VIPs involved, such as directors of research institutes and government departments.

Data on biodiversity was collected from publications and research project reports. This data was compiled from existing field surveys, which measured biodiversity primarily through ecological biodiversity surveys, focusing on species diversity, abundance, and distribution within habitats or ecosystems, and rapid/participatory biodiversity inventories using a variety of methods. GIS provided a useful tool for comparing the land use changes throughout the period.

Information management and storage systems in the provinces and districts are very poor. In general, the older the data, the more difficult it is to obtain. Some data was collected by informal means, including interviews with elders and former leaders. Other data is practically impossible to find, particularly maps. Furthermore, the data is often in various formats as it was collected or generated by different methods and for different purposes. The preciseness and accuracy of different types of data is difficult to evaluate. These problems all limited analysis of collected data.

Direct Causes of Biodiversity Loss

Forest degradation and loss is the most important contributor to the loss of biodiversity in Vietnam. Direct causes of habitat and biodiversity loss in Vietnam are summarized here. Specific local patterns of habitat destruction and biodiversity loss in the case study sites are examined in the following section.

Arable Land Expansion: Expansion of cultivated areas has resulted in the loss of more forest area than any other proximate cause. Shifting cultivation alone has transformed 13 million ha of previously forest-covered land to bare hills. Among the densely populated northern upland areas, the loss of natural forest was largely due to the expansion of annual crops such as hill rice. In the Central Highlands and along the South Central Coast, lands were opened for industrial crops such as coffee, tea, and rubber. The process starts with clear-cut logging. The cleared land, made accessible to farmers as a result of logging, is cultivated until soil fertility is exhausted. The land is then abandoned to extended periods of fallow, interrupted by occasional grazing, and fuelwood collection. These extensive activities, combined with a fire-prone regime, prevent forest regeneration. Soil erosion and weed invasion are part of the process of land degradation. Most of logging and subsequent agricultural production, especially in recent years, is on steep slopes which are highly susceptible to erosion once the protective vegetative cover has been removed. In this way, barren land is created.

Traditional Shifting Cultivation

Shifting cultivation is the traditional form of agricultural production for most of Vietnam's ethnic minorities. About 9 million people from 50 ethnic minorities practice shifting cultivation. There are two basic types: (1) itinerant or swidden cultivation; and (2) sedentary cultivation. There are about 120,000 households of itinerant cultivators, primarily from such ethnic minority groups as the H'Mong and Dao. Itinerant cultivators fully exhaust soil fertility and then abandon the land, without plans for further use. To find new lands to practice this "pioneer" shifting cultivation, people usually have to travel great distances. For example, over 200 households in Ba Be National Park have migrated from Cao Bang and Ha Giang provinces. In 1990, the cultivated holdings of itinerant cultivators were estimated at about 180,000 ha, primarily in the Central Highlands and the Northern Mountains. The sedentary shifting cultivators include most of the rural population outside of the Deltas, about 15 to 16 million people. They have fixed households but shift cultivation sites. Sedentary shifting cultivation is estimated to cover as much as one million ha every year.

In general, shifting cultivation is sustainable only when the population density is low. The threshold depends on factors such as the susceptibility of land to deterioration, previous farming history, and crop viability. Because of high population growth, shifting cultivation has become the main factor causing serious land degradation due to over-cultivation, and has been a primary cause of deforestation and formation of barren lands in Vietnam.

Logging: Between 1986 and 1991, State Forest Enterprises (SFEs) officially harvested 3.5 million m³ of wood annually; an additional 1 to 2 million m³ were logged illegally. Converting this volume to area equivalents, SFE logging accounted for the loss of perhaps 80,000 ha of forest per

year during this time period⁹. While all SFE logging of primary forests has since been halted, illegal logging by small operations is still prevalent. Rare hardwood species such as rosewood face extinction as people selectively harvest and hand-carry logs out of the forest.

Fuelwood Collection: Nationally, more than 90% of domestic energy consumption is fueled by biomass. Approximately 21 million tons of fuelwood are burned annually for household cooking and heating, preparation of pigfeed, and processing of agricultural products such as sugar cane. In most regions of the country, fuelwood collection is out-pacing the forest's regenerative capacity. Conversion of total weight of fuelwood exploitation to area equivalents shows that fuelwood collection accounts for six times as much forest loss as commercial logging¹⁰.

Hunting and Collection of Non-Timber Forest Products: A large degree of species loss in Vietnam is due to hunting and non-timber forest product collection, both for household use and sale. These products are an important source of income. Nearly 2,300 different plant species are affected. Fruit, flowers, bark, roots, stems, and resins are harvested for purposes ranging from food and medicine to construction and textile production. Fauna diversity has also suffered. Most forests, including those of protected areas, are nearly exhausted of wildlife due to hunting. An increasing volume of these products is now bartered and traded to neighboring countries, especially China and Thailand.

Fire: Of the 9 million ha of forest remaining in Vietnam, 56% is fire-prone in the dry season. On average, 25,000 ha of forest area are lost to fire each year; up to 100,000 ha are lost in particularly dry years¹¹. In the Central Highlands, where the natural cover is dry dipterocarp forest, annual fires gradually degrade the quality of forest by repeatedly eliminating the recruitment layer of saplings and some large trees. Before planting each crop, shifting cultivators use fire as a tool for clearing land, controlling weeds and insects, and producing ash for fertilizer. Since uncontrolled fires often burn 10-20 times the intended area, the result is not only the localized destruction of protective vegetative cover but also the extensive loss of soil organic matter and associated soil structure decline.

War: Often merely a consequence of war, environmental degradation was an important tactic during the Second Indochina War. In addition to the impact of 13 million tons of bomb

⁹ MOF 1991

¹⁰ World Bank 1992, 1995

¹¹ GOV 1994

ordinance, 72 million liters of defoliants and herbicides were responsible for the destruction of 4.5 million ha of forest between 1961 and 1975¹².

Local Context

Ba Be National Park

The population of Ba Be District was 37,312 in 1975 and doubled to 65,653 in 1995. Population growth is about 3.5% to 5% per year in some villages. The majority of the population is Tay, Dao, and H'Mong. The 9 villages in the core and buffer zones of the park have an approximate populace of 1,500, a lower population density than outside the park. There are also many villages surrounding the park. Most of Tay villages have been established in the area for along time, but the Dao and H'Mong have moved in recently (after 1979) in search of new agricultural lands. Shifting agriculture is the traditional land use of ethnic minorities in Ba Be district. In a number of places, Tay, Nung, and Kinh have adopted fixed cultivation, but traditional methods of farming are still used. Animals such as buffalo, cows, pigs, and goats are kept in every village on grazing land or fallow fields. Surplus crops or animals are sold at market.

The people of Ba Be are living at a subsistence level. Because agriculture often cannot meet all their needs, they have little alternative to exploitation of forest products. All minorities in the area of Ba Be use many forest products: timber and bamboo for construction of housing, animal stalls, and boats; fuelwood; palms for roofing material; rattans and other weaving materials; fruits, mushrooms, and bamboo shoots; and grazing for animals. Some products, especially bamboo shoots, birds, and snakes, are collected for sale in the market. Most Tay fish in the lake and rivers using traditional tackle, nets and traps, or the illegal practice of dynamite fishing. Although hunting within the park boundaries is prohibited, it is still very widespread.

Population growth is clearly one of the factors contributing to poverty. The number of landless and land-poor rural households is increasing. In the whole Ba Be district, 30% of the population suffers from food shortages all the year round, and 40% for 3 to 6 months of the year. As more people become dependent on the same agricultural resources, those resources are used more intensively. Inputs required are high and yields are declining from year to year. The migration of H'Mong and Dao people from Cao Bang and Tuyen Quang province and other parts of Bac Kan province to Ba Be has led to further forest clearing for shifting cultivation. Between 1992 and 1997, 102 households with 777 people migrated to Ba Be, of which 71 households with 564 people went to the core zone.

¹² World Bank 1994

Shifting cultivators remain poor in part because hill rice productivity is very low. However, the problem is compounded by their inability to speak Vietnamese, very high illiteracy rates, very high population growth rates, and their agricultural techniques. In north Vietnam, the area under natural forest cover in the areas where the ethnic groups practice shifting cultivation has been drastically decreased. In the northwest, where many H'Mong live, less than 13% of the land area is under natural forest cover and forest plantation; in the northeast, 15%. The cold, humid winter and very uneven temperatures and distribution of rainfall and humidity lead to low yields and frequent crop failures. In Ba Be, a total of 32,193 ha of forest land is classed as barren land due to shifting agriculture. Often the most feasible strategy for the minorities in upland of Ba Be is to eat less; eat less nutritious foods such as cassava; and gather food in the forest.

The Bac Kan provincial and Ba Be district institutions and agencies have implemented large programs for infrastructure development, water rice fields, forest rehabilitation, agroforestry models, fruit trees, special crops, and livestock breeding, as well as providing subsidies, occasional free rice, and loans. The government's current aim is to end forest clearing and burning for shifting cultivation. Although fixed cultivation and sedentarization programs have been implemented in Ba Be district for over 25 years, the results are still limited. These programs, which were implemented in combination with the establishment of cooperatives in Ba Be, were ineffective because of lack of analysis of the needs of the various ethnic groups and lack of coordination between agencies. Infrastructure is poor and the sustainability of land use alternatives is not ensured. Markets are not ensured and are unstable. Many people consider that they have the right to clear the forests to practice shifting cultivation.

There has been no investment in extension services on crop varieties or livestock husbandry. Productivity and yields are low. There is growing evidence that public funds were mainly invested in buildings and infrastructure for the government, rather than transfer of knowledge, assistance in increasing production, or protection of the environment. Management is poor, and the staff of cooperatives and forest protection troops have limited knowledge of land or forest management, policy implementation, or biological resources. Farmers have lost their faith in managers of cooperatives and forest protection units.

With the development of the private sector, people in Ba Be have opportunities to develop commodity production, but markets are not yet stable. Due to the harsh topography, and difficulties in transport and communication which hamper marketing of commodities, people continue practicing shifting cultivation, logging, and hunting for subsistence. In some communes, the people have even destroyed commercial product trees, since there are no markets for the products, and have returned to shifting cultivation. However, there is increased cultivation of cash crops, such as Chinese plum and tea, and forest exploitation for export earnings. Recently, with the opening of the Chinese market, a number of forest products, including tortoise, scaly ant-

eater, turtle, snake, squirrel, flying fox, monkey, and medicinal plants have found new export outlets. As a result, the number of forestry law violations in Ba Be increases every year.

Na Hang Nature Reserve

In the Na Hang district, the main proximate causes of deforestation are agricultural expansion and shifting cultivation for food security, forest product consumption, wildlife collection and poaching, and the war. Agricultural production is the major source of food and income for probably 90% of households living inside the reserve. Many households raise poultry and pigs. People also keep a small number of cows and water buffalo. Cultivated land is very scarce and people frequently have to clear new land for swidden fields. Agricultural practices vary among ethnic minorities, but the main activities of shifting cultivation are similar. Various crops are cultivated, such as dry rice, cassava, and maize. After several years of cultivation, the land becomes eroded and the soil infertile. Plots are then left to fallow for 10 to 15 years.

Poverty and food shortages directly affect biodiversity loss in the district by forcing local people to clear forested land for agriculture. Poor households make up about 43% of the population living inside the reserve¹³. Food crops for local consumption account for over 90% of agricultural land in the district. According to people in Na Hang, the food shortages of the late 1970s and early 1980s caused serious forest destruction. Over the last decades, agricultural lands have increased significantly to meet the food needs of the growing population.

Food production has been increased mostly by agricultural expansion, particularly by creation of more hill fields. Average food production per capita rose from 183 kg in 1981 to 284 kg in 1986. This amount of food is insufficient for the district. Particularly between 1986 and 1992, agricultural production was so low that people had to rely on food from other natural resources. Since 1992, with intensive cultivation and new rice and maize species, the district has been able to produce more food. Average food per capita rose to 344 kg by 1996, reaching the average food product per capita in Vietnam. Pressure on the forest as an additional source of income has been significantly decreased. However, this situation may be reversed due to rapid increase in population.

Forest resources are harvested by local people for food, shelter, traditional medicines, oils, fuel, beverages, tools, and cash income. The extraction of products such as fuelwood by rural communities, perhaps once within the carrying capacity of surrounding forests, has now crossed

¹³ Tuyen Quang Department of Statistics

the limits of sustainability. In Na Hang district, wood provides 50% of cooking fuel. If the present population of Na Hang district is about 60,000, annual fuelwood consumption is probably 30,000 m³ per year. Commercial wood exploitation was very high in the 1960s. In the following years, forest production fell steadily while the range of products expanded. By 1990, forest-based production in Tuyen Quang was quite low because of over-exploitation of the resources. For the Na Hang district, for the 20 years from 1973 to 1993, the SFEs officially exploited 80,000 m³ of logs, in addition to extensive extraction of bamboo. Illegal logging is probably much more serious, but has become less common since 1992, perhaps because of improvements in local food production.

Various other forest resources are legally collected, but only in small quantities, including bamboo shoot and ear fungus, used as food; palm leaves used for construction; and the bark of *gio* tree, used as medicine. Limits on collection are intended to protect the forest from extensive disturbance. Wildlife hunting and collection are traditional local practices. Traditional targets were pig, tiger, leopard, bear, deer, monkey, varran, fresh water turtle, and tortoises. Because of extensive hunting of these animals over a long period of time, their numbers are decreasing dramatically. With the new market orientation of the economy, pressures on wildlife are rapidly increasing. The extensive wildlife trade with China encourages poaching, hunting, and collecting of a much wider range of wildlife species.

The population living inside the reserve is the main pressure on local biodiversity. The population in the reserve has been increasing rapidly for many years. Over just the last eight years, the population increased by 1.4 times. Population growth affects biodiversity directly through increased resource consumption and, indirectly, by fueling the processes of poverty and migration. Over a period of 50 years, the movement of migrants to and from Tuyen Quang, and in particular to and from Na Hang district, has contributed significantly to population growth. Many factors forced people from other regions to migrate to Tuyen Quang. In the 1960s, the government implemented a campaign of land colonization and established a new economic zone to achieve economic development of the mountainous region. It was accompanied by policies to set up state-owned forestry and agriculture enterprises, and agricultural cooperatives in the mountains. This campaign encouraged approximately one million people to migrate from the Red River Delta to the Northern Midlands and Highlands. Bombing during the Second Indochina War forced the evacuation of many people from the Red River Delta to the mountains; Tuyen Quang province willingly received tens of thousands of people in this period. In 1979, border conflicts with China forced many H' Mong, Dao, and Nung minorities to evacuate from border areas to Tuyen Quang. With the food shortages in the late 1970s and early 1980s, large areas of forest were cleared for swidden fields. In the 1990s, because the district still has some relatively fertile lands under forest cover, people from land-poor neighboring provinces have migrated to Na Hang. The commune Da Vi, bordering the Reserve, has been a hot spot for spontaneous migration to Tuyen Quang.

In the Na Hang district, forests were intensively cleared in two periods, both closely linked with policies of the cooperatization movement. Between 1975 and 1983, when the cooperatization movement was seriously curtailed, living conditions became very bad and people were forced to clear the forest for agricultural land and to exploit forest resources as an additional source of income. Between 1989 and 1993, food-self-sufficiency policies were issued that engaged people from all sectors in clearing the forest in order to expand food crops.

Local authorities in the Na Hang district carried out work under the government's fixed cultivation and sedentarization program for about 29 years, but the number of shifting cultivators was not much reduced. There are several possible reasons: First, the living conditions of these former shifting cultivators did not improve much, so they went back to traditional agricultural practices. Second, the construction of infrastructure for the new settlements was insufficient. Third, the program was sometimes forced on people by the authorities, regardless of their wishes and knowledge, so people were reluctant to participate.

Since 1992, Tuyen Quang has been among the first provinces in Vietnam to enforce a policy of closing natural forests. In 1997, Na Hang district created a new organization to prevent deforestation and wildlife hunting. This is a group consisting of staff from the Na Hang Forest Protection Unit, the police, army, and local authorities. Also in 1997, the People's Committee of Tuyen Quang province officially recognized the urgency of strengthening measures for forest protection and development. However, for the Na Hang Reserve, poor management and facilities, including human resources and material infrastructure, in combination with the large population living inside the reserve, make it extremely difficult to preserve biological resources.

Yok Don

People have lived in Yok Don for a long time, following traditional agricultural practices, collecting forest products, and hunting. In 1975, the population of Dak Lak Province was 36,000. It is now 1.6 million. Natural growth contributes 3% yearly to population growth, the rest is a result of planned and spontaneous in-migration from the North. Spontaneous migration was particularly strong in the mid-1990s. With high population growth, demands on land for cultivation, food, wood, and construction materials has been increased.

Shifting cultivation is the traditional land use practiced not only by local ethnic minorities but also by migrants from the North. Local infrastructure is very poor and living standards are low. The obligations and rights of local ethnic minorities and migrants are unequal, creating a growing gap between rich and poor. The poor become more dependent on forest products, such as hunting, logging, and clearing forest to earn a living. Agriculture is the main source of income for all villages within the buffer zone. 90% of workers are in agriculture. Rice is the main crop,

and productivity is low at 273 kg to 459 kg per capita per year. In general, each village is able to grow enough rice to feed themselves for only some months of the year. Many families raise poultry and pigs, and a small number of cows, water buffalo, and elephants. Cattle and elephants are raised mainly for farming and transport. The government has had a policy since 1984 of encouraging ethnic groups to settle down in permanent villages. However, they continue to collect vegetables, wild animals, and other products for food from nearby forests.

The main commercial crops are coffee and rubber. Ethnic immigrants maintain plantations of these and other perennial crops. The yield of those crops is rather high, enabling some families to become rich. There are three SFEs which exploit about 11,200 m³ timber per year in total. Timber exploitation occurred intensively from 1990 to 1993 for export to the South and to the former Soviet Union and the Czech Republic. Some forestry enterprises paid no attention to reforestation. Forest quality and quantity has decreased significantly as a result. Border trade, particularly trade with China since 1992, has led to over-exploitation of natural resources in Dak Lak province and Buon Don district, including timber, non-timber forest products, and animals. In Ea-Tul, even domestic elephants have been illegally shot for their tusks. The Yok Don area has great tourism potential. One major attraction of the area are the Ban Don elephants, many which are kept by private households and can be rented to tourists.

Hunting was traditionally done with cross bows from the backs of elephants. Since the war there has been an abundance of automatic weapons in the area, and hunting is now far more lethal for wildlife. In the dry season, hunters set fires in the park; animals are later attracted by the new grass shoots, which facilitates hunting. Ede people catch wild animals and elephants for domestication. In addition, fires are started by resin collectors who use fire to start the resin flowing from dipterocarp trees. Every year within borders of the National Park, 10 tons of *Strychnos nux-vomica* L. seeds, 10 tons of *Kaempferia galanga* L., 5 tons of honey, 50 tons of *shorea vulgaris pierre*, 20 tons of *Dipterocarp alatus roxb*, and 1 ton of dried bamboo shoots are collected.

The central plan for socioeconomic development of Tay Nguyen plateau in general and Dak Lak province in particular led to forest clearing for coffee, rubber, tea, cashew, and pepper plantations, as well as hydro-electric stations. The agricultural cooperatization movement began in Dak Lak province in 1976, but was in operation for only five years before it was dissolved. Policies for the economic and cultural development of Tay Nguyen after liberation, with planned migration from the North, have resulted in a population increase. A total of nine planned migrations from Thai Binh province to the buffer zone of Yok Don National Park were carried out from 1978 to 1995. Each newly established household gets a permit from the local people's committee to cut 10 m³ of wood for house-building. People often use the permit to cut over the allowed amount.

Based on a government decision to reorganize SFEs, Dak Lak province has reorganized forestry management by separating the forest industry from the forest planting sector. Although the basis of this decision was logical, there have been big gaps in the implementation. Some enterprises, individuals, and officers took advantage of these gaps to exploit forest resources and capital through smuggling, illegal transport, and price manipulation. A program under which forestry land is allocated to farm households for protection and reforestation, known as the 327 program, has been implemented in Dak Lak since 1985. But for a long time, the forestry department and local authorities have made mistakes in policy implementation and organization of forestry management. As a result, people did not take part actively in forest protection.

Direct Causes of Biodiversity Loss				
	<u><i>Ba Be</i></u>	<u><i>Na Hang</i></u>	<u><i>Yok Don</i></u>	
Agriculture expansion				
Annual crops	+++	++	++	
Cash crops	-	-	+++	
Logging				
Legal	+	++	+++	
Illegal	+++	++	+++	
Fuel-wood consumption				
	+++	+++	+++	
Non-timber product collection				
	++	++	+	
Fire damage				
	+	+	+++	
Hunting				
	+++	+++	+++	
War damage				
	-	-	++	
Weak	+ Medium	++ Strong	+++ Very Strong	

National and International Context

To effectively decipher the root causes of biodiversity loss, a country's national socioeconomic context must be clearly understood. Thus, this section provides a brief presentation of Vietnam's socioeconomic history since 1945. This half century can be divided into four distinct periods:

1945-1954: Establishment of Democratic Republic of Vietnam and the First Indochina War: In 1945, Vietnam's economy was overwhelmingly agriculture-based, employing over 90% of the labor force and generating over 60% of national income. Agriculture was plagued by obsolete cultivation techniques and low productivity. Additionally, land distribution was skewed, as 2% of the country's population controlled 51% of the country's land. In rural areas, 60% of farming households were landless and worked as tenants for landlords. Beginning with Ho Chi Minh's declaration of national independence, this decade was fraught with hardship as the country

struggled to end nearly a century of French occupation. In July 1954, this First Indochina war ended, as the North was liberated from French occupation.

1954-1960: Building the foundations of socialism and the struggle for reunification: The signature of the Geneva Accords resulted in the temporary separation of Vietnam into two zones divided at the 17th parallel. During the following 20-year period, two separate economies developed. In the South, the Saigon administration set up a free market economy which received considerable support from foreign countries, primarily the United States. In the North, the major development steps were: further improvement of democratic revolution, economic reforms, and build-up of the initial physical and technical foundation for socialism. Throughout this period, the struggle for national unification was regarded as the foremost priority.

In 1954, the North's economy was facing the severe aftermath of the First Indochina War. The first three-year plan (1955-1957) aimed at economic rehabilitation, completing the land reform, and creating a solid foundation to bring the North to socialism. By 1957, the land reform was complete, with rural agricultural areas in the preliminary stages of cooperatization. The second three-year plan aimed at turning the multi-sector economy into a socialist one based on state and collective ownership. Collectivization of land and other means of production was completed by 1960. The second stage of agricultural production cooperatization was also developed. The seeds of weakness leading to eventual collapse of these cooperatives were sown from their inception. Major problems included the fact that the speed of agricultural cooperatization out-paced the establishment of a supporting framework; poor and landless farmers with little production experience were selected for leadership positions, while rich and experienced older farmers were prohibited from leadership positions; and, a contradiction existed between the proclaimed liberation of the labor force and the constraints of highly collectivized production unit. The establishment of these cooperatives (known as APCs) led to labor and land depredation in rural areas. Due to blind optimism, these mistakes and contradictions in establishing the cooperatives were ignored, leading eventually to their collapse in the 1980s.

1961-1975: The Second Indochina War: The Communist Party's first five-year plan (1960-1965), calling for completion of socialist reform in the North, was interrupted by the Second Indochina War in 1964. This war of reunification lasted until 1975. The North's economic construction and development efforts were redirected toward the war, but agricultural cooperatization still held an important position.

During this period, a campaign was carried out to improve cooperative management and cultivation technology. Enlargements of APCs from hamlet to commune and even an inter-commune scale were conducted hastily. Embezzlement and mismanagement of cooperatives' assets occurred everywhere. Investigation showed that between 20% and 30% of APC capital and fixed assets were lost and approximately three-quarters of all machines were

damaged, resulting in a 50% increase in production costs by 1975. Massive upgrading of APCs and collectivization of farmer's land and other production means, particularly in mountain regions, where preconditions were not mature, deepened the inherent contradictions of APC model. Difficulties caused by the war plus problems with the APC model brought agriculture and the economy in general in the North into a recessionary crisis. Food production failed to meet domestic demand and the state had to import increasing amounts of cereal grains.

1976-1985: Reconstruction of a unified nation: After formal reunification of the North and South in 1976, harmonization of the South's economy to that of the North became an immediate priority. The 1976-1980 five-year plan reemphasized the traditional socialist model and large-scale socialist production. Consequently, numerous state and local enterprises were established. For instance, 50 forest enterprises were established in Dak Lak Province alone. Meanwhile, the agricultural cooperatization movement was in turmoil. Despite growing evidence of problems, further collectivization was carried out. By 1979, the Communist Party recognized emerging weaknesses in the economy and consequently decentralized economic decision-making: state enterprises were placed on a self-accounting and self-financing basis; the private sector, until then officially non-existent, was sanctioned by the government; and responsibility for managing agricultural production was transferred from the cooperatives to the individual farming families, creating a contract-output system.

Under the new agricultural system, land was allotted by the cooperative to the farm which, under the contract, was responsible to provide a predetermined output to the cooperative. Any surplus produced over the contracted output would remain with the family, for its own consumption and/or sale. The cooperative, however, remained the owner of the land and of major capital equipment. It also remained responsible for the provision of agricultural inputs and service, the collection of taxes and fees, and the sale of the contract output at a price fixed by the government. The introduction of the contract-output system initially had a significant positive impact on the growth of paddy production. Rice distribution to consumers, however, still remained the sole responsibility of the government, under a rationing system and at subsidized prices, well below those in "parallel" retail markets. This heavy subsidization led to an increase in the budget deficit and, coupled with simultaneous increases in wages and money supply, to accelerating inflation, reaching as high as 774% in 1986. Once again, agricultural output slowed.

1986-present: *Doi Moi*, an Economic Renovation: Under the pressure of an increasingly serious economic crisis and in the context of new economic thinking, the Sixth Congress of Vietnam Communist Party, held in 1986, made the pivotal decision to initiate *doi moi*, a national economic renovation consisting of the following key tenants:

- Adjust the investment and production structure, with shift in emphasis to such priority objectives as food and foodstuffs, consumer goods and goods for export;
- Adopt a multi-sectoral economic policy for the long term;

- Replace the bureaucratic central-planning mechanism by a management mechanism better suited to a market economy;
- Expand and upgrade foreign economic cooperation.

The first five years of *doi moi*, 1986-1990, saw the transition to a new management mechanism. By the second five-year period, 1991-95, the change had a significant impact on economic performance. Average annual GDP growth soared to 7% and export earnings increased 30% yearly between 1989 and 1992. Inflation was reduced from 400% in 1988 to 4.5% in 1996.

Of direct pertinence to biodiversity loss, *doi moi* reforms facilitated phenomenal agricultural growth. Communist Party decisions in 1988 defined the renovation of the agricultural management mechanism, designating the farming household as an autonomous economic unit, and allowed farmers to retain up to 40% of contracted output. Most importantly, a new land law was adopted by the national assembly in 1993 allowing farmers to transfer, exchange, lease, mortgage, and inherit land use rights. The tenure period was extended to 20 years for annual cropland, and to 50 years for perennial cropland, to be renewed as long as the allocated lands are lawfully used. The law provides the necessary incentive for farmers to make long-term investments. Thus, land use rights in Vietnam are now little different from private land rights in modern market economies, even though state ownership of land is maintained. This has encouraged farmers to invest more labor and capital into production on their land. As a direct consequence of these renovations, food production increased from 18 million tons in 1987 to over 24 million tons in 1992.

Root Causes of Biodiversity Loss

The causes of biodiversity loss discussed below are closely interlinked and the relationships among them are complex. Moreover, they tend to reinforce each other. Intensity of the impact of these causes is a different across the studied areas. The research determined the following to be the most critical root causes of biodiversity loss in Vietnam at the national and international levels:

War: During the 45-year period from 1945 to 1990, Vietnam was a battleground for two major wars and two border conflicts. Both the First and Second Indochina Wars had a large direct impact on biodiversity loss. This warfare also acted as an indirect cause of biodiversity loss in Vietnam. War increased the amount of land cleared for agriculture. To feed the rapidly growing population and grow foodstuffs to feed the armies, large new areas of forest were cleared for agricultural expansion. The areas cleared were larger than would normally be needed because so much food was lost to air attacks on the supply columns, aerial spraying of crops, and bombing of dikes and irrigation channels.

War also affects biodiversity by causing large migrations of people. For instance, during the Northern border war with China (1979-1980), many households of ethnic minorities migrated away from the border provinces of to the uncultivated forest lands of Tuyen Quang (Na Hang), Bac Kan (Ba Be), and Thai Nguyen provinces. After the war ended, most of these households remained illegally in these provinces, carrying out shifting cultivation in upland areas. This in-migration of war refugees significantly increased the population density in Ba Be, Na Hang, and surrounding areas. After these initial pioneers migrated at the height of the fighting, many relatives followed in the next few years, increasing the size and impact of the new settlements.

Moreover, at the end of the Second Indochina War in 1975, which was fought mainly in the Central Highlands, many automatic guns remained in the hands of local villagers. This greatly increased the efficiency with which hunting of large mammals was carried out. Fauna populations have since declined rapidly in the Central Highlands, primarily due to the increased lethality of weapons.

Demographic Change: Demographic change in Vietnam is a main root cause of biodiversity loss. A growing national population demands more resources from an unchanging amount of land, thus forcing expansion of arable land to meet increasing food demand. Vietnam is the second most populous nation in Southeast Asia and the twelfth in the world, creating great pressures on limited land resources. The population has recently grown quickly: from 35 million in 1945 to 75 million in 1995, with predictions of 158 million by the year 2050. Consequently, the average arable area per capita is sharply reduced. From 1940 to 1990, a period of just 50 years, the average arable area per capita fell 50%, from 0.26 ha 0.12 ha¹⁴.

The population of Vietnam is not equally distributed among different areas of the country. Delta regions cover only one-quarter of total area but are home to three-quarters of the population. In 1995, the country-wide average population density was 223 persons per km², but the density in the Red River Delta was 1,142 persons per km². The population density in the Northern mountainous and upland regions was only 122 persons per km², and in the Central Highlands just 56 persons per km².¹⁵ In mountainous areas, where ethnic minorities predominate, the natural population growth rate is usually higher than in lowland regions. For example, in Na Hang Nature Reserve, the population increased from 1,987 in 1950 to 10,590 in 1997, with annual growth rates of 2.8% to 3.6%. The rate in Ba Be National Park is even higher, at 3.5% to 5% per year.

¹⁴ Khong Dien 1995

¹⁵ Khong Dien 1996

The dramatic difference in population densities between the highlands and the more densely populated lowlands continues to lead some analysts to believe that "the distribution of population and human resources has not been in line with that of natural resources"¹⁶. However, it can be argued that the uplands are already relatively more overpopulated than the lowlands. The irrigated wet rice agro-ecosystems of the Red River Delta are among the most robust and sustainable systems known in the world. They have been able to support extremely high human densities for centuries. Calculated in terms of agricultural productivity, population densities are as high or higher in the mountains than in the deltas¹⁷. In general, mountain agro-ecosystems, except in those limited areas where irrigated terraces can be constructed, have a much lower carrying capacity and respond to intensification with rapid declines or even total collapse of productivity. This is especially true under traditional systems of swidden agriculture. Growth in population densities, combined with deforestation and environmental degradation, has created a crisis in upland agriculture. Unfavorable shifts in the people-to-land ratio has forced a dramatic shortening of the fallow cycle so that fields that formerly were cropped for one year and then fallowed for 20 are now cropped for two or three years and then fallowed for no more than four years. This has occurred in most parts of the Northern mountain region, resulting in greatly reduced yields and permanent environmental degradation.

Planned and Spontaneous Migrations: Migration, both legal and illegal, has been an important cause of population growth in the Central Highland region. Starting in the 1960s, the government encouraged approximately one million people to migrate from the Red River Delta to the Northern midlands and highlands. The migration movement was on such a large scale that it fundamentally altered the demographic balance of the uplands. In the nearly 30 years between 1960 and 1989, the Kinh population (ethnic Vietnamese) in the midlands and highlands increased at astronomic rates, rising from 640,000 in 1960 to almost 2.6 million in 1989¹⁸.

After reunification in 1975, and until 1989, all migration was sponsored by the government. Of the 2.4 million people who were officially resettled between 1981 and 1990, about 75% moved within their own provinces. Of the 0.6 million people who moved outside their provinces (1981-1989), 75% moved from the North to the South, primarily from the Red River Delta and the North Central Coastal Region to the low-density Central Highlands. In addition to the planned migrations, many households followed relatives or friends to the relocation areas illegally. Thus, between 1976 and 1988, 3.6 million people migrated to establish "new economic zones". The case of the Krong Na commune, in the buffer zone of Yok Don National Park, is

¹⁶ Vo Quy Nhan 1992

¹⁷ Vu Tu Lap and Taillard 1994

¹⁸ Be Viet Dang 1993

illustrative. In 1975, Krong Na's population was 2,742 people of 8 ethnic minorities. The population increased quickly, reaching 7,706 in 1995, including 17 ethnic minorities.

Attempts at Sedentarization: After 30 years of the government's fixed cultivation and sedentarization program (FCSP), 65% (1.9 million persons) of the original resettlement target (2.9 million) have adopted permanent settlement. Of these, 30% (nearly 600,000) may be considered to be "successful" in that they are sedentarized and cultivating permanent cash crops with relatively stable income and little need for government support. Some 40% (about 800,000) may be considered to be marginally successful in that government support for production activities is still needed. The remainder have proved to be unsustainable even with government support. They continue to destroy the forest and practice slash-and-burn agriculture. The unsustainable ones are generally in the Northern Midlands and mountain region, while the successful ones are in the basal soil areas of the Central Highlands, where production conditions are more favorable¹⁹. Although FCSP has been implemented for 30 years, people are still poor, and shifting cultivation is still popular, especially new clearing.

Poverty and Inequality: Vietnam remains one of the poorest countries in the world. With nearly 80% of its population living in rural areas, Vietnam is dependent on its agricultural and natural resources. Poverty varies greatly throughout the country, with the Northern Uplands and the Central Highlands remaining the poorest regions. In each of the protected areas studied, 90% of the population depends on agricultural production; their livelihood depends completely on agricultural land and geological and climate conditions.

Poverty in Vietnam is rooted in a number of factors. For the mountainous areas, the most important factors are: very poor material and technical infrastructure; a seriously damaged environment; a poorly developed economy; rapid population increase; unemployment; and poor education and training²⁰. As a rule, poor people are either landless or have been pushed to areas of low agricultural potential, including steep slopes and infertile lands, where high population densities or poor land use practices lead to further impoverishment and declining social well-being. Poverty prevents people from taking a long-term economic or environmental view. Poor farmers extract what they can from the environment to support themselves, and have little time or resources left to invest in resource conservation or management. Marginal resources, which are often all that are available to the poor, are used intensively. Moreover, poor farmers often lack the resources or skills needed for restorative or protective works. These communities are often faced with a shortage of agricultural land. As a result, arable land is more intensively exploited and forests are cleared more aggressively for agriculture production. Degradation due to excessive or inappropriate use creates a dangerous cycle in which poverty exacerbates itself.

¹⁹ Do Dinh Sam 1992; Be Viet Dang 1996

²⁰ Chu Huu Qui 1995

Macroeconomic Policies and Structures: Dividing Vietnam's recent macroeconomic history into pre-*doi moi* and *doi moi*, this section attempts to determine the importance of *doi moi* macroeconomic renovation to the country's biodiversity loss. The main question is: how have economic policy changes altered resource use patterns in Vietnam? Until 1975, the Vietnam economy was a war economy. The nature and demands of the war economy played an important role in shaping the exploitation of natural resources, especially forest resources. After reunification in 1976, Vietnam began to turn to peaceful economic development, based on state planning. Although peace and independence had been gained, the country's economy suffered many difficulties and entered a period of serious inflation and economic crisis in the mid-1980s.

No one doubts that *doi moi* has brought a new prosperous face to the Vietnam's economy. Nevertheless, current studies in environment have shown an alarming degradation of the country's natural resources and environment in general, and of land and forest ecosystems in particular, over the past few years. This research project has perceived a direct link between some *doi moi* policies and accelerated biodiversity loss in Vietnam. These problems are discussed below.

Cash Crop Export Promotion: Export promotion of agricultural products of high value, one of the primary goals of *doi moi*, has been a significant cause of biodiversity loss since 1986. Thanks to liberalization of the domestic market, decentralization and simplification of controls on exports and imports, and an increase in the exchange rate to market level, the export of agricultural products has increased dramatically over the past ten years. Profits from export of agricultural products have encouraged both state and private investors to expand plantations of export crops. As a consequence, forests are cleared and the biodiversity of forest ecosystems is threatened. Most development of cash crops is occurring in the Central Highlands. Much of the new agricultural land in Dak Lak, opened up from tropical forests, is planted with high-value export crops such as coffee, rubber, cashew, and fruit crops. Intensive and uncontrolled clearing of forest to obtain land for export crops in Dak Lak is a visible cause of biodiversity loss.

Export of Agricultural Products after <i>Doi Moi</i> (US\$ millions)			
	1985	1990	1995
Total export value of agricultural products	397	1,149	2,703
Agriculture	274	783	2,005
Forestry	40	126	98
Fisheries	82	239	600

Source: Cao Duc Phat 1997

Lack of Market Accessibility and Information: As domestic prices for primary export products fluctuate with international market prices, lack of information on prices and potential markets affects farmers' income as well as national foreign exchange income. For instance, the farm-gate price for coffee in Dak Lak was less than \$1 /kg for the first five months of this year. In June, 1997, the price reached \$1.5 /kg, but most of the harvest had already been sold²¹. The income from coffee sold at the lower price was hardly sufficient to cover farmers' costs. An unstable market for both domestically consumed and export products has driven local people into remaining forests to look for alternative income sources, before other cultivated crops or the next harvest season can provide them with badly needed income.

Timber Export Promotion: Intensive logging by SFEs, in order to meet both domestic demand for industrialization and export targets set by the government, resulted in a large loss of forest after reunification. Yet, this period of timber exploitation pales in comparison to the years immediately after the introduction of *doi moi*. Exploitation of timber was emphasized at the beginning of *doi moi* for the sake of earning hard currency. The total export volume of roundwood for the pre-*doi moi* period (1976-1980) was 11,700 m³. It increased to 277,100 m³ for the period 1986-1990²². By 1990, the value of exports of forest products was US\$ 126.5 million. This puts trade in forest products in third place after agricultural and light industry products. Moreover, these figures are underestimates because considerable difference exists between officially reported volumes of wood exported and the real volumes exported. In 1995, due to the government's export ban on raw logs, the export value of forest products declined to about US\$ 98 million²³. This policy has put greater emphasis on exporting processed timber products in order to retain a greater share of the added value from these resources and to preserve remaining forests.

Timber Export Boom after 1986						
Item:	Export volume:					
	1986	1988	1990	1991	1993	1995
Roundwood (m ³)	22,000	17,000	124,000	240,000	23,200	
Floorwood (m ³)	69,000	54,000	43,000	36,000	40,700	4,000

Source: General Statistical Office 1996

²¹ Vietnam Economic Times 74 Sept. 13, 1997

²² MOF 1991

²³ Cao Duc Phat 1997

Regional Demand for Non-Timber Forest Products: Export booms have not been limited to coffee and logs. Export of wildlife has also increased significantly, especially after the reopening the Chinese border in the early 1990s. While *doi moi* does not explicitly promote the export of wildlife, the associated trade liberalization has facilitated growth of this illicit activity. Vietnam also serves as a conduit for wildlife from Laos and Cambodia being transported to China and elsewhere. The Forest Protection Department has determined that Dak Lak Province has the greatest activity of wildlife hunting and trade in the country.

Other Public Policies:

Land Use Policies: Land use policies play a decisive role in socioeconomic development and livelihoods, particularly in agricultural countries such as Vietnam. Since about 80% of the population are peasants, the success or failure of land use policies and the cooperatization movement had strong impacts on the economic condition of the whole country. After liberation in 1954, collectivization of agricultural land began. As discussed above, inefficiency of the APCs led to an agricultural crisis. As the productivity of APCs declined, many farmers took to the forests to set up private plots, hunt, and collect non-timber forest products to supplement their dwindling income. For example, in the Ba Be district, during the 1965-1970 period, wildlife was very abundant. Today, the buffer zones are savannahs or completely barren hills. In Na Hang district, forests were intensively cleared in two periods: (1) 1975-1983, when APC productivity dropped as in other locations in the North; and (2) 1989-1992, when food self-sufficiency policies were implemented. Under these policies, everyone, including administrators and factory workers, had to work in clearing forest land for expansion of food crops.

From the early of 1960s to 1990, the government sponsored population redistribution programs with following objectives: (a) to match human resources with agricultural resources; (b) to develop the agricultural sector of the economy; (c) to create opportunities for employment in the agricultural sector; and (d) to strengthen national defense. Among the programs in support of the government's resettlement policy, the one with the largest implication for forest degradation and soil erosion was the government's fixed cultivation and sedentarization program (FCSP). The main objective of the program, which began 1968, was to stabilize the agricultural land use of ethnic minorities, such as the H'Mong and Dao who have a long tradition of shifting cultivation, and encourage socioeconomic development for about three million shifting cultivators. 445 projects have been established in 34 provinces under this program.

After 1991, when the state farm concept fell out of favor, two programs played key roles in the provision of capital for agricultural and rural development: 1) the 327 Program which is a source of investment credit for individual farmers that also provided funding for forest protection activities; and 2) rural credit systems extended by the Vietnam Bank for Agriculture to rural public institutions and individual farmers. The issue of investment credit for poor farmer

households is receiving great attention from the Vietnamese Government and foreign organizations. Nevertheless, the effectiveness of the government's effort to grant credit to poor households in remote areas is poor. Surveys in the buffer zone of Yok Don National Park found that the low amount of borrowing allowed and the poor terms of credit do not meet households' capital demands nor allow them to make investments to improve the sustainability of cultivation.

Forestry Policy: Among the most important policies related to biodiversity loss are forestry policies. Forest lands are managed by the Ministry of Agriculture and Rural Development²⁴. Following liberation in 1954, forest enterprises were established in almost all mountainous districts with the following tasks: managing, protecting, exploiting, and developing forest resources. By 1991, there were 412 forest enterprises. Dak Lak province alone has 50 forestry enterprises including 30 managed by the state. One of the main tasks of forest enterprises is to exploit forest products, mainly wood, necessary for reconstruction of the country and export. As result, legal logging has caused degradation of about 70,000 ha of forest per year, and an absolute loss of about 30,000 ha per year²⁵.

Government Conservation Efforts: The government of Vietnam has carried out efforts aiming at conserving nature since 1960. Vietnam's first protected area was established in 1962. More recently, the government has enacted a substantial body of domestic legislation aimed at the protection of biodiversity. One of Vietnam's largest achievements in biodiversity conservation has been the establishment of a protected area system that is representative of most of the major habitat types in the country. The protected area system now includes 10 National Parks (252,290 ha) and 61 Nature Reserves (1,692,351 ha)²⁶.

To date, Management Boards have been established in each of the National Parks and 35 of the Nature Reserves. Besides serving management and organizational functions, these Management Boards also carry out scientific research in protected areas. Forest Protection Units and Forest Protection and Management Stations have been also set up in some major National Parks and Nature Reserves. For many reasons, such as weak management, poor cooperation among government sectors, weak law enforcement, and lack of facilities, infrastructure, and investment, forests have been degraded both quantitatively and qualitatively²⁷. Shifting cultivation and forest clearance for agriculture, as well as poaching of wood and animals are still occurring. The most difficult challenge to Vietnam's protected areas arises from the presence of settlements

²⁴ Formerly the Ministry of Forestry

²⁵ World Bank 1995

²⁶ FPD 1997

²⁷ MARD 1996

of local people near or within the protected areas. There are some 250,000 people living inside protected forests. As a result, many important ecosystems and endangered species are not adequately protected.²⁸

Effectiveness of Policy Implementation in Vietnam: In the long period prior to *doi moi*, from 1954 until 1986, Vietnam's society developed under a central planning mechanism. As a rule, key policies of the national three- and five-year plans were issued by the Party Congresses, and the plans were put into practice through a series of government policies and regulations. Policies have been implemented by an administrative system subdivided into provinces or municipalities, districts, and communes. At all levels of this governmental structure, there is a parallel hierarchy within the Communist Party organization concerned with the policy-making and implementation effected by the government. After a state policy is issued by the national government, administrative systems at all levels (ministries, provinces and districts, and then communes) translate the policy into reality by designing particular measures to implement the policy in ways appropriate to local circumstances. The same policy, therefore, may produce very different effects in different localities depending on many factors including capacity, responsibility, knowledge, and quality of the leaders. Additionally, at the local level, provincial and district Peoples' Committees, entities of the parallel Party hierarchy, can issue their own policies or regulations to better implement the government's policies.

A socioeconomic development policy may have an adverse impact on the environment, or on biodiversity in particular. This is due to one or more of the following problems with policy design and implementation:

1. *Limited knowledge of policy-makers.* An issued policy may be either inappropriate in practice or lacking suitable conditions to achieve successful implementation. An example is a policy promoting the development of certain cash crops in mountainous areas. Due to lack of necessary processing facilities or transportation, sale of surplus crops was often poorly timed. This clear lack of communication, needed to horizontally and vertically synchronize policies, is repeatedly harmful to farmers.

2. *Mistakes or shortcomings in the process of policy implementation at different administrative levels.* Many irresponsible leaders have taken advantage of policy gaps either to advance themselves in the administrative system or to engage in corruption and smuggling. Violation of state laws and corruption have threatened to distort numerous economic activities. Personality power politics, individuals vying for personal promotion within a department or ministry, often result in irrational decision-making for the sake of personal gain.

²⁸ Vo Quy 1997

Root Causes of Biodiversity Loss			
	<i>Ba Be</i>	<i>Na Hang</i>	<i>Yok Don</i>
War demands	+++	+++	-
Demographic change			
Natural growth	+++	+++	+
Migration	+	+	+++
Poverty	+++	+++	+++
Policies on:			
Export			
- Legal	-	+	+++
- Illegal	++	+	+++
Land tenure	+++	+++	-
Forestry (state sector)	+	++	+++
Policy & law enforcement	+++	+	++
Traditional shifting cultivation	+++	++	+

3. *An unclear division of the managing responsibilities of different administrative apparatuses.* One entity may be controlled by several management organizations while others do not belong to any management line. Unclear delineation of management authority within a national park is a strong example. National park management is principally under the direct management of the Ministry of Agriculture and Rural Development located in Hanoi. Yet the communities within a park, both in core zones and buffer zones, are under the local district administrative system. Hence, even if a park's Management Board has enacted a policy to stop new migrants settling in the park, local authorities can still allow registration of new migrants.

4. *Inaccurate reports.* In order to appease superiors and managers, progress reports are often colored to hide many alarming but true figures, situations, and phenomena. As a result, policy-makers are not properly informed of the actual situation and develop inappropriate or insufficient policies.

Conclusions

Biodiversity loss is occurring throughout the country, particularly in mountainous regions. In all three protected areas studied, biodiversity is rapidly declining and forests have been reduced alarmingly by human activities. Among the three protected areas, there are clear differences in temporal scale as well as in quantity and quality of the proximate and root causes of biodiversity loss. In the North Indochina subtropical forests of the Ba Be National Park and the Na Hang Nature Reserve, biodiversity loss happened substantially prior to the *doi moi* renovation. The socioeconomic root causes of biodiversity loss in these mountainous areas of Northern Vietnam consist primarily of high natural population growth rates, traditional agricultural and hunting

practices, and the inefficiency of the APCs, all causes which had their impact on biodiversity before the mid-1980s. In the Central Indochina dry tropical forest of the Yok Don National Park, biodiversity loss occurred most intensely during the *doi moi* renovation, with the exception of the effects of hunting by automatic guns left over from the Second Indochina War. Economic development of the late 1980s brought planned migrations, arable land expansion for cash crop export earnings, and drastic logging.

There are important differences among Ba Be, Na Hang, and Yok Don related to socioeconomic conditions. In Ba Be and Na Hang in the 1960s, natural forests were still abundant. The largest biodiversity loss occurred in two periods of time: 1970-1983 and 1989-1992. The first peak of biodiversity loss was partly due to a disintegration of the cooperative movement. The second peak occurred as a result of the government's policy on food self-sufficiency. Both these peaks of forest degradation were due to food shortages and poverty. Poverty promoted population growth on one hand, and environmental degradation on the other. Forests were extensively exploited first for food security, then for expansion of agricultural production. Illegal migration due to the northern border war (1979-1980) contributed to population growth in the Ba Be area. Population growth in turn increased poverty and environmental degradation, including the formation of huge areas of barren hills and decreases in wildlife populations. Loss of wildlife has been compounded by illegal hunting.

Although Na Hang Nature Reserve and Ba Be National Park are close to each other, there are differences between the two areas, first in administrative management apparatus and second in conservation. In Tuyen Quang province, where Na Hang is located, the administrative system is active and flexible. They have understood the significance of environmental protection. They, therefore, not only implement state policies strictly, but also have promulgated regulations to protect and develop forests. Forestry protection units are active and effective. Authorities have been introducing new agricultural techniques to raise the local standard of living. The 327 program has been widely implemented and violations of forest protection laws are recognized in time. Thanks to all this, forests have been protected rather well.

In Ba Be, the situation is different because of frequent reorganization of the administrative system. Ba Be district was originally a district of Bac Kan province, then became a district of Bac Thai province in 1964, then a district of Ca Bang province in 1978 and now again a district of Bac Kan province in 1997. This has seriously affected the functioning of the administrative system. Consequently, the current situation of both administrative activities and conservation work in Ba Be is worse than that in Na Hang. There is some conflict between the Ba Be National Park Directorate and Ba Be District authorities in management of the park. Violations of the forest protection law still occur, including illegal logging, hunting, collecting non-timber forest products, and clearing forest land for agriculture. Results of the 327 program are rather limited.

In Yok Don area, the situation is rather different. In early 1970s, the population was rather small. Indigenous people followed traditional agricultural practices, collected products from forests, and hunted. Under the government policy to encourage ethnic people to settle down in permanent villages, initiated in the early 1980s, they made extensive use of non-timber forest products for subsistence. However, the impact of these indigenous people on the forest, natural resources, and environment was not significant. After national reunification, and especially since 1980, many changes occurred in the Yok Don area resulting in heavy forest degradation and deforestation. Logging by many state and local forest enterprises for domestic needs and for export, as well as illegal logging by state enterprises and smugglers, contributed to deforestation. The forest protection troop is under-staffed and under-financed, and thus is unable to control poaching of forest products. Government-sponsored and spontaneous migrants from other provinces, especially from the Red River Delta and the Northern Highlands, have contributed to the high population growth of the area. Population growth, in turn, has led to over-exploitation of natural resources for food security. Illegal hunting by automatic weapons and illegal wildlife trade with China, Thailand, and Singapore are causing wildlife loss in the area. Recent arable land expansion for cash and export crops, cashew, pepper, fruit plants, and especially coffee and rubber, adds to deforestation.

Under the *doi moi* renovation, the Government of Vietnam enacted a series of resolutions, policies and strategies for conservation of environment and biodiversity. However, for many reasons, biodiversity of the country in general and of protected areas in particular, is still being degraded in both quantitative and qualitative terms. For biodiversity conservation to be effective, it should be linked to sustainable development. Thus, it is essential to address the root causes of biodiversity loss by integrating conservation into economic development plans. Conservation efforts must combine upgraded protected area management with concrete strategies to provide livelihood opportunities for communities living adjacent to or in enclaves within the protected areas.

Recommendations

Knowledge of the proximate and root causes of biodiversity loss in Vietnam reveals which aspects of policy and administration are in need of improvement to slow the degradation of Vietnam's terrestrial ecosystems. Realistic and achievable recommendations for change are made here.

First, recommendations are presented for administrators who can effect change at the level of the protected, including protected area management and district and provincial level authorities. Specific recommendations are made for each of three protected areas examined by this project. Second, more general recommendations are made for the audience of national-level long-term planners who work on a much larger scale. Appropriately, it is at this level that the

potential solutions to the *root* causes emerge. Finally, some brief recommendations are made for addressing the international pressures which lead to biodiversity loss within Vietnam.

Proximate and Intermediate Scales

These recommendations are applicable to the protected area, district, and provincial scales:

- Halt any further in-migration of people into protected areas;
- Relocate households settled inside protected areas to outside areas in order to reduce human population densities to sustainable levels. Households should be moved outside the protected area boundaries but not to other areas of remaining high biodiversity;
- Reform sedentarization programs to increase their effectiveness. Provide fixed cultivation and sedentarization assistance to households living in areas of remaining high biodiversity;
- Improve policy coordination among protected area, district, and provincial authorities. Make attempts to eliminate jurisdictional ambiguities and overlap through open and regular fora with participation of district and provincial People's Committees, district and provincial department heads, and protected area management;
- Firmly enforce laws prohibiting forest exploitation. To do so, the capacity of Forest Protection Units must be increased substantially. Enforcement needs to occur not only at the forest level, but also at the market level in district and provincial collection centers;
- Clearly demarcate protected area boundaries and zones;
- Design tourist revenue redistribution systems that benefit the protection of biodiversity;
- Utilize an integrated conservation and development approach when addressing needs of households in the buffer zones of protected areas. Improve the living standard of local people living near the forest by introducing alternative means of income generation and upgrading infrastructure;
- Integrate education on family planning and environmental awareness with traditional customs to increase efficacy.

Ba Be National Park

- Clearly demarcate the boundaries of the National Park and its different zones. The communities living within the park boundaries need a clear idea of where and which exploitative activities are allowed before stricter enforcement can ensue;
- Immediately move a majority of all households currently living in the core zone either to the buffer zone or some other area able to absorb them. Their destructive impact on the little primary forest remaining cannot be addressed with development or aid activities. The population density of the core zone, currently far beyond carrying capacity, must be lessened through assisted relocation.

- Address the controversial migration of H'Mong people between Bac Kan and Tuyen Quang Provinces with inter-provincial meetings. The division of authority and obligations to address the impacts of the shifting cultivators living in the provincial border region must be effectively delegated between these two provinces that have a common interest in the resolution of the situation;
- Strengthen the capacity of the Forest Protection Units to prevent any new in-migration or further forest clearance for agricultural expansion.

Na Hang Nature Reserve

- Limit the population living inside the reserve by disallowing any further in-migration;
- Address the controversial migration of H'Mong people between Bac Kan and Tuyen Quang Provinces with inter-provincial meetings. The division of authority and obligations to address the impacts of the shifting cultivators living in the provincial border region must be effectively delegated between these two provinces that have a common interest in the resolution of the situation;
- Strengthen the organization and capacity of the Nature Reserve Management Board.

Yok Don National Park

- Prevent any further migration to the areas surrounding the park. Reconsider current provincial plans for planned migrations into the relatively uncultivated but potentially fertile areas north of the Park, and seek alternative relocation sites for planned migrations;
- Enlarge the current boundaries of the National Park to encompass adjacent areas not yet settled and cultivated;
- Strengthen the Forest Protection Unit to address high hunting pressures.

National Scale

These recommendations have been kept as realistic as possible given the difficulty of incorporating environmental considerations into national-level policy-making:

- Revise the protected area system of Vietnam to introduce more clearly delineated jurisdictional authority over the land, resources, and people located within the boundaries of protected areas;
- Collaborate and cooperate across ministries and departments to make policy that is horizontally integrated. Develop appropriate government mechanisms to facilitate effective collaboration and information sharing. Policies should be a product of interdisciplinary review and impact assessment;

- Designate land use categories in national-level planning. Demarcate where arable land expansion will and will not occur for cash crops;
- Harmonize regulations and enforcement for natural resources throughout the country;
- Consider the future impact of households moved to previously uncultivated areas when conducting planned migrations. Opening new frontiers is no longer a desirable alternative;
- The Forest Protection Department should be vested with stronger authority and greater institutional capacity. Improve the working facilities and pay, professionalism, and relationships with villagers;
- Shift investment focus to mountainous areas that have been thus far neglected in renovation. Prioritize assistance in agro-forestry production;
- Build sufficient flexibility into policies so that they can be tailored for each region, area, and minority;
- Assist provinces in halting free migration. Government-sponsored migration and fixed cultivation and sedentarization programs should be well-designed, well-financed, and implemented carefully, especially the selection of relocation sites.

International Level

- Initiate a dialogue with bordering countries on limiting the cross-border trade of endangered species. Strengthen CITES enforcement in cooperation with bordering countries;
- Maintain new legislation banning the export of any raw logs, timber, or processed wood products. Introduce an exception to the ban for wood products from sustainably managed forests;
- Welcome new technologies for processing agricultural products more effectively.

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