

## APPENDIX 3.

### I. NATURAL RESOURCES SECTOR ANALYSIS - VIE

#### A. The National context

1. Vietnam covers an area of 325,490 km<sup>2</sup> and the total population is projected at 86.02 million people in 2009, according to the GSO, while population growth rate has declined to about 1.06% about 22% of the population is under 21 years of age. The GDP grew at about 2.2% in real terms from 2008 to 2009.. In 2009 total GDP was estimated provisionally by GSO to be US\$ 91.5 billion giving a per capita GDP of about US\$1,064 or about double that in Cambodia and substantially more than in Lao PDR at US\$ 911. The agriculture sector has shown lower growth at around 5% and forestry has only grown at 1.1%. Together they currently account for about 31.4% of total national GDP despite the fact that about 72% of the workforce is engaged in agriculture and forestry activities.

**Table 1. Key economic indicators for Vietnam and comparison with other BCI countries.**

	Cambodia	Lao PDR	Vietnam	Region
Land area (km <sup>2</sup> )	181,035	236,820	325,490	743,345
Population (million persons)	14.1	6.13	86.02	106.25
Population density (persons/km <sup>2</sup> )	77.9	25.9	264.3	142.9
Population growth rate (5)	1.40%	2.13%	1.06%	1.16%
GDP at constant prices 2009 (US\$)	6,917,000	5,585,036	91,530,548	104,032,584
GDP growth rate 2008-9 (%)	-2.04%	5.77%	2.21%	2.10%
Per capita GDP (US\$/cap)	491	911	1,064	979

2. In Vietnam the agriculture sector, which includes forestry contributes about 21% of national GDP, and this proportion has been fairly steady over the past five years as the sector growth has kept pace with the economy as a whole. By contrast the growth rate of the forestry sub-sector has only been a little over a third of the growth of the whole sector and as a result its contribution to the agriculture sector GDP has been declining steadily from around 7% in 2000 to 4.4% in 2009.

**Table 1. Relative contribution of Agriculture and Forestry to national GDP**

Item	Cambodia	Lao PDR	Vietnam	Regional
AFF % National GDP	32.2%	30.5%	21.0%	22.20%
Forestry % AFF	7.0%	10.6%	4.4%	5.04%
% labour force in AFF	72.0%	63.0%	48.2%	55.75%

#### B. The forestry and natural resources sector

Vietnam was densely forested until relatively recently, but a combination of war, population and economic growth and poor governance have resulted in almost half the forest area disappearing through clearance and most of the remaining forest becoming seriously degraded. Shifting cultivation has been the predominant farming system in the uplands, where most of the ethnic minorities live, and this has resulted in large areas of primary forest being converted to secondary forest and grassland. Some of the forest clearance has been for conversion of the land-use for agriculture

or perennial crops such as rubber, coffee, and tea. A significant proportion of the forest has been cleared for growing cash crops such as corn, sugar and cassava.

### **Biodiversity**

3. The natural forests in the country, especially in the Central Annamites were extremely rich in biodiversity and in the past have been vital sources of a wide range of NTFPs that have enabled rural communities to survive during the wars when many communities were displaced. Apart from their survival value, the forests also have many particularly valuable tree species that have important commercial and spiritual values to most rural communities.

In Vietnam, the flora of the Central Annamite landscape is extremely diverse, comprising elements of four floristic regions: Indian, Malesian, Sino-Himalayan and Indochinese. According to Laubenfels (1975), "the complex merging of floras in the highlands of Southeast Asia has no parallel in any other part of the world" and is rich in endemic species. Almost all of the priority vascular plant taxa and vegetation formations are found within forest habitats. A total of 133 priority vascular plant taxa have been provisionally identified in the landscape, which include 46 species listed in the 2000 IUCN Red List of threatened Species (IUCN 2000)

4. The Central Annamites appear to be a major centre of mammal endemism, and most mammal species endemic to mainland South-East Asia occur in the Central Annamites (Timmins and Duckworth unpublished) and include Saola, Large-antlered (giant) Muntjac (*Muntiacus vuquangensis*), Annamite muntjac (*M. truongsonensis*), Heude's pig (*Sus bucculentus*), 'grey-shanked' Douc langur (*Pygathrix nemaeus cinerea*) and Annamite striped rabbit (*Nesolagus timminsi*). The region also supports remnant populations of a number of globally threatened large mammal species, such as Asian elephant (*Elephas maximus*), gaur (*Bos gaurus*), Tiger and Asiatic black bear (*Ursus thibetanus*). The area supports at least 12 restricted-range bird species, including three whose global ranges are restricted to the Central Annamites: chestnut-eared laughing thrush (*Garrulax konkakinhensis*), golden-winged laughing thrush (*G. ngoclinensis*) and black-crowned barwing (*Actinodura sodangorum*)

### **NTFPs**

5. In Vietnam, Raintree (2002)<sup>1</sup> found that NTFPs provided about half the annual income for households living in or near Protected Areas in the Central Annamites worth around US\$300 at the exchange rate at the time. The major source of the income was from fuelwood and charcoal making, but medicinal plants, honey, fruit and fish were also important. In a survey in Dakrong District in Quang Tri Province in 2007, SNV found that on average about 120 households per Commune were engaged in collecting NTFPs, that included Bamboo and rattan as well as leaves for thatching, honey and medicinal plants.

### **Forest cover**

6. During the past three decades the forest sub-sectors has experienced a series of upheavals, including a war followed by a period of excessive logging activity from the early 1980s onwards, when post-war reconstruction and economic development

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<sup>1</sup> Raintree et al (2002) quoted in Assessment of Biodiversity and NTFP status in BCI project Areas, (2010) Vu Van Dung

fuelled the need for timber and for the foreign exchange that could be derived from exporting logs and wood products. As a result forest cover in Vietnam declined to less than 28% in 1995, although it has been on the increase again for a few years, due to expansion in the area of plantations. While some of these plantations provide economic benefits in the form of timber or soil and water conservation, they have relatively little value for biodiversity,.

**Table 2. Recent estimates of average annual changes in forest cover for the three countries (1965-2006).**

Country	Period	Average Annual change in forest area (ha)
Cambodia	2002-2008	-124,504
Lao PDR	1992-2002	-134,173
Vietnam	2005-2007	+110,000
Region		-148,677

Sources: Forest Cover changes in Cambodia 2002-2006, Council for Development of Cambodia, Paper to TWG F&E June 2007, Forest cover and land-use assessment, 1992-2002, Forestry Department Lao PDR and FIPI, Vietnam

There are few data available on the quality of the forest and the definition of forest has been regularly changed in accordance with FAO guidelines that now consider forest as any land with tree crown cover of over 30% in Vietnam and a tree height of more than 5m. Recent inventories have mainly focussed on the area of forest and not on the quality and in particular the stock density, measured either as crown canopy closure, basal area or volume per ha. In Vietnam the latest FRA indicates that "rich" forest is only 0.2% of the land area nationally, although locally data for Dakrong District in Quang Tri Province found almost 9% of the area had dense forest.

7. The degraded state of much of the residual forest is illustrated by the average growing stock 76.5 m<sup>3</sup>/ha in Vietnam<sup>2</sup> which compare with stocking density of over 200 m<sup>3</sup>/ha in the few remaining areas of dense forest, which probably represents the stocking that would have been present before the degradation process began.

8. Vietnam, like Cambodia and Lao PDR assigns forests to one of three forest management categories for Production, Protection and Conservation. The Table 3 below give the areas of each forest management category for each country and the region.

**Table 3. Assignment of forest area to primary management function ('000ha)**

Country	Production	Protection	Conservation	Total
Cambodia,	3,374	1,490	3,130	7,994
Lao PDR	3,207	517	4,826	8,550
Vietnam	8,400	5,270	2,160	15,830
Region	14,981	7,277	10,116	32,374

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<sup>2</sup> Vietnam Forest Sector Indicators 2005 Baseline Report, Chapter 1, FSSP.

In Vietnam the 8.4 million ha of production forest are managed by several entities including State-owned enterprises, Management Boards, Joint Ventures, Households and Communities but the annual harvest from the natural forests is only around 700,000m<sup>3</sup>, due to the low stocking level of much of the natural forest. Most legal timber production now comes from plantations.

9. Data on the composition of the forests in the GMS are limited and suffer from the different definitions of forest types in each country, so that comparison and aggregation is impossible. **Error! Reference source not found.**<sup>4</sup> below shows the main forest types recognised in Vietnam. There are some other forest types such as coniferous that are locally important, especially for biodiversity, that have been merged into “mixed” category, although there are pure coniferous forests in Vietnam. However, they are difficult to distinguish from satellite imagery at national level.

**Table 4. Forest cover by main forest types**

Land Cover Category	Vietnam	
	Area (km <sup>2</sup> )	%
Evergreen Forest	80,303.3	24.7
Deciduous Forest	11,348.6	3.5
Mangrove Forest	1,150.4	0.4
Marshes	6,039.2	1.9
Scrubland	162,841.0	50.1
Agriculture	60,886.5	18.7
Water Bodies	1,393.3	0.4
No data available (Cloud)	1,278.4	0.4
<b>TOTAL</b>	<b>325,240.7</b>	

### Logging and timber production

10. The forestry sector in Vietnam is considered as a sub-sector of agriculture and is mainly concerned with forest resource management and associated harvesting activities. The output of the sub-sector is measured as the value of the industrial logs produced from natural forests and plantations, establishment of plantations and an estimate of the value of environmental services provided by the sector. Primary processing by state forest enterprises and the private sector and secondary processing of wood for manufacturing a wide range of wood products, including furniture, paper and paperboard and joinery products, some of which is exported, is considered as a sub-sector of industry. The national statistics on the forestry sector cover some of the inputs into other important economic services provided by forests, such as recreation and tourism and environmental protection, but do not take account of the quantity or the value of the outputs. The value of the output of the forestry sector in 2009 was reported as VND 15,367 billion<sup>3</sup> (US\$ 892.05million at the median market rate in mid 2009), (see Table 1 below) which represents the value of the primary products processed from the officially recorded harvest of logs plus expenditure on plantation establishment and is about 0.97% of national GDP in the same year.

11. Statistics on trade in forest products are handled by the Customs Bureau and the Ministry of Trade, and are not published on a regular basis for the forest products. The above figure does not include fuelwood, or the output of wood processing industry. It is important to construct a complete picture of the sub-sector

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<sup>3</sup> GSO, 2010.

because the current and future needs of the population for wood products, a healthy environment and for habitats for the wide range of native flora and fauna must be met somehow and the rapid expansion of the wood processing industry in recent years has increased the demand for timber well over the sustainable supplies from the national resources. This results in a combination of pressure to log illegally in the remaining areas of natural forest in the country and to import raw material, much of which is felled illegally, from neighbouring countries, with a negative impact on their environments. There are risks associated with heavy reliance on imports, since prices and currency values can vary substantially and in an unpredictable manner. The environment and the wildlife are totally dependent on the way the forests within the country are managed.

5. The recorded production of logs in 2009 according to GSO was 3.766 million m<sup>3</sup>, of which almost 2.5 million m<sup>3</sup> was from plantations and almost 20% from the Region that includes the provinces where the BCI investment will be undertaken. This represents a trebling of output compared with the year 2000, and shows the importance of plantations to the economy.

**Table 1: Vietnam Forestry sector output statistics 2000-2009**

Year	Wood production and forest plantation		Gross output of forestry at current price by activities (billion VNDs)			
	Wood production (thousand m <sup>3</sup> )	Area of concentrated planted forest (thousand ha)	Total	Planting and care of forest	Exploitation of forest products	Forestry service
2000	2,375.6	196.4	7,673.9	1,131.5	6,235.4	307.0
2001	2,397.2	190.8	7,999.9	1,054.2	6,623.6	322.1
2002	2,504.0	190.0	8,411.1	1,165.2	6,855.0	390.9
2003	2,435.8	181.3	8,653.6	1,250.2	6,882.3	521.1
2004	2,627.8	184.4	9,064.1	1,359.7	7,175.8	528.6
2005	2,996.4	177.3	9,496.2	1,403.5	7,550.3	542.4
2006	3,128.5	192.7	10,331.4	1,490.5	8,250.0	590.9
2007	3,461.8	189.9	12,108.3	1,637.1	9,781.0	690.2
2008	3,552.9	200.1	14,369.8	2,040.5	11,524.6	804.7
2009*	3,766.7	212.0	15,367.2	2,182.2	12,309.1	875.9

Source: Statistical handbook 2009 (published in 2010) and data collected from different reports by General Statistical Office of Vietnam

**Table 2: Quang Nam, Quang Tri and TT Hue Forestry sector output statistics 2000-2009**

Province/ Year	Wood production and forest plantation		Gross output of forestry at current price by activities (billion VNDs)			
	Wood production (thousand m <sup>3</sup> )	Area of concentrated planted forest (thousand ha)	Total	Planting and care of forest	Exploitation of forest products	Forestry services
<b>Quang Tri</b>						
2006	48.40	4.53	149.10	29.60	104.60	14.90
2007	54.10	4.22	158.10	23.40	118.00	16.70
2008	66.00	5.26	212.00	39.20	148.80	24.00
2009*	90.50	5.74	218.80	57.50	137.30	24.00
<b>Quang Nam</b>						

2005	126.89	7.76	271.48	48.67	186.30	36.51
2006	141.29	8.68	299.50	57.67	199.50	42.34
2007	156.03	9.49	339.46	69.75	222.50	47.21
2008	206.30	10.40	388.60	78.93	257.42	52.24
2009*	na	na		na	na	na
<b>TT Hue</b>						
2006	59.67	5.93	217.77	19.17	168.79	29.81
2007	62.00	5.05	229.93	30.53	166.34	33.06
2008	61.14	5.43	250.99	37.44	176.86	36.68
2009*	62.16	4.01	252.85	36.99	176.16	39.70

Source: Statistical handbook 2009 (published in 2010) of Quang Tri, TT Hue and 2008 from Quang Nam

6. An analysis of the total supply demand balance for Vietnam is difficult because imports of logs and partially processed wood, especially from neighbouring countries are not recorded and domestic production is higher than that reported. Production from plantations appears to be growing rapidly as illustrated by comparing the GSO recorded log production of 490,000m<sup>3</sup> in 2005 and 1,057,200m<sup>3</sup> in 2008 for the Central Coastal Region, which includes the 3 BCI Provinces and 10 others Provinces. However the recorded production for the three provinces in 2008 was 333,440 m<sup>3</sup> (see Table 2 above) but information obtained during visits to the major consumers and a sample of the smaller units suggested that actual consumption of plantation logs is currently around 2 million m<sup>3</sup>. There are three chipmills that together are processing almost 1 million m<sup>3</sup> of logs, which they reported came almost entirely from within the three provinces. Such rapid growth is partly explained by the expansion of the area of plantations in the early 2000s, and partly by under-recording of the output in the past.

7. In addition to the unrecorded imports of logs and squared timber, there is still illegal logging in many forest areas in Vietnam. Some of this is by local residents cutting trees and converting them in the forest with chainsaws for house-building, but some is also organised to supply the major hardwood processing industries. The Government is certainly aware that such a problem exists and there are regular reports in the press, about the government's efforts to deal with "poachers" of timber and perpetrators being captured, but these clearly only represent the "tip of the iceberg". The substantial quantities of logs and partially processed timber imported from Lao PDR and Vietnam is not officially recorded, although some comes from officially sanctioned land clearing in the exporting countries, while significant quantities are felled illegally by operators crossing the border and felling the trees, which are then squared with chainsaws and transported back across the border. Occasionally small quantities are seized, but it is likely to be a very small proportion of the total. Unless timber harvesting can be strictly controlled and maintained at levels that are sustainable in relation to the growth of the growing stock, and the balance of demand met by unrestricted imports, then demand is likely to be met by "illegal" logging that depletes the resource. This is a particular risk when there is a high incidence of poverty in the rural areas where the forests remain, and cutting trees provides a ready source of income for the local inhabitants.

8. According to the GSO statistical yearbook the total value of the output of the wood processing industry in 2007 (the latest available) was VND 54,730 billion (US\$ 4.07 billion). Taking a weighted mean value of the products of US\$ 700 per m<sup>3</sup> this represents about 5.8 million m<sup>3</sup> of product or around 11.5 million m<sup>3</sup> of roundwood. This is consistent with the Vietnam Forestry development Strategy 2006-2020 which projected a total demand for wood of 14 million m<sup>3</sup> and had targets of 9.7 million m<sup>3</sup> of timber and 3.7 million m<sup>3</sup> of pulpwood by 2010. An unknown proportion of the wood raw material for the wood processing inventory is being imported either as logs

or partially processed. The products range from wood chips currently exported at about US\$60 per tonne through sawnwood at US\$ 200-500 per tonne to furniture which according to trade statistics has a FOB value of US\$ 700-900 per tonne. This adds weight to the conclusion that the quantity of wood consumed annually is far higher than the recorded production. The implications of this analysis are that the real contribution of the sector to the national economy is far higher than the official statistics suggest, but that the remaining resources are under serious threat, because they are being depleted rather than sustained. Evidence for this comes from limited data on the condition of the natural forest which suggests that areas of "rich" and "medium" forest are declining steadily and are being compensated for by increasing areas of plantations, which not only have much lower stocking densities of carbon and timber, but are mainly monocultures with little value for biodiversity.

9. Such uncontrolled harvesting is not only seriously depleting the remaining natural forests but it also means that the government is losing a substantial amount of revenue, both in rent from the forest and in taxes on the value added. The value of the products made from the illegally harvested wood is probably of the order of US\$ 500-800 million annually or roughly equivalent to the current recorded value of imports. Thus imports would have to be doubled to meet the current demand from sustainable supplies. The sector's ability to achieve the national goal of protecting the environment and maintaining habitats is clearly under serious threat despite the recorded increase in the area covered by forest. Especially if much of the latter is comprised of monoculture plantations of exotic species.

10. An industrial survey conducted by UNIDO in 1999<sup>4</sup> (the most recent data available) reported a total of about 169,000 establishments employing 512,000 persons, processing wood products including wooden furniture, and paper and paperboard. It is likely that there have been some changes in the absolute numbers and sizes of establishment during the past decade, but the overall situation is almost certainly still very similar. The majority of these are clearly very small establishments, with most employing only about 2 people, but the aggregate value of the output was measured at US\$ 690 million, which was 6% of the total industrial output. It is not clear how much of this output is captured in the official statistics quoted above. Of greater importance, it is estimated from the value of the output, that in aggregate these establishments must process an amount of wood equivalent to about 4 million m<sup>3</sup> of logs. The national population census (1999) includes data on the number and size of houses constructed from wood. At that time almost 6 million houses (around 15% of the total) were constructed predominantly of wood and there are in addition a substantial number of houses classed as temporary that are likely to be mainly made from Bamboo and other forest products. Based on the recorded data on numbers of houses by floor area it is estimated that the housing stock contains around 17-20 million m<sup>3</sup> of processed wood, and requires around 500,000 m<sup>3</sup> of processed wood annually for construction and maintenance. This will require between 1 and 1.5 million m<sup>3</sup> of logs.

11. As part of the government's drive to expand the economy, it is promoting exports of wood products, particularly wooden furniture and exports reached USD2.829 billion in 2008 – (General Statistics Office of Vietnam 2009). It is not clear where the raw material for these products is coming from, as there are no records of log or sawn timber imports. However, most of the products being

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1. <sup>4</sup> Industrial survey of Vietnam 1999, UNIDO, Project No. VIE/99/051, Government Statistics Office, Hanoi.

exported, are said to have been made from timber from "sustainably managed" and FSC certified sources, which would imply that the raw material is imported. This conclusion is reinforced by reports from wood manufacturing enterprises in the Central Highlands that they import logs from Brasil and Indonesia. About one third of the sawmills in the 3 Provinces where BCI will invest, reported processing wood from Lao PDR and in aggregate they would appear to be processing around 1.5 million m<sup>3</sup> of wood annually. The lack of information makes it impossible to judge how much value is being added. The HCM City Arts and Wood Processors Association reported in 2005 that there are around 2,000 members of, of whom about 300 are engaged in exporting. The net contribution to GDP may be around 50% of the value of the exports.

12. Vietnam does not have detailed measures of domestic wood consumption, although various estimates have been made.. A study by Meyfroidt and Lambin (2009)<sup>5</sup> estimated that the demand for wood raw material in Vietnam drew in a volume of about 5 million m<sup>3</sup> in 2000 from outside the country, which had increased to almost 10 million m<sup>3</sup> by 2005. This has displaced deforestation that would have occurred in Vietnam, had these volumes been harvested from the country's forests, to other countries, primarily Cambodia and Lao PDR. This goes some way to explaining the marked degradation that has taken place in these two country's forests.

13. The demand for timber leads to deterioration of the resource and hence to habitat destruction and this has severe negative impact on biodiversity. Cambodia still has rich biodiversity and many species still survive in the forests, but an increasing number will be lost if habitats continue to be degraded and fragmented. The BCI project is located in some of the most extensive and important remaining areas of relatively rich and undisturbed forest, but pressure from mining, hydro-power and agriculture means that the threats are large and increasing, so that strong measures are needed to halt the continued decline in the habitats and biodiversity.

### **Environmental services**

14. The forestry sector also makes an important contribution to the nation's energy balance. The total recorded production of fuelwood in 2005 (the latest year for which statistics are available) was 26.24 million steres, (18.4 million m<sup>3</sup>) representing about 7% of the total national energy consumption. The Forest Sector Strategy (2006-2020) forecast demand for fuelwood in 2010 at 25.7 million m<sup>3</sup>. It is unlikely that the quantity has changed substantially in the past few years, and according to the strategy is likely to have increased further so that the consumption represents a substantial contribution of the sector to livelihoods, especially in rural areas. There is no data as to how much of this fuelwood is collected as a "free good" from forests and how much comes from home gardens and scattered trees, but it does not appear as an output from the sector. If it is valued at the market price of fuelwood, which basically reflects the cost of bringing it to the market, it is worth around VND 2,000 billion (an additional 0.4% of GDP). However, if measured at its energy value, based on substituting for the next cheapest fuel, it is worth about three times that amount or almost the same as the recorded output from the sector. Taking the value of fuelwood and the value added to the unrecorded harvest of logs, the total contribution of the forest-based sector appears to be around 5%.

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<sup>5</sup> Meyfroidt, P. and E.F. Lambin, (2009), Forest transition in Vietnam and displacement of deforestation abroad,

15. Although the extent of forest cover has been increasing nationally for the past decade, the natural forest has been declining and is being replaced with plantations. The quality of the remaining natural forest has also been declining as mentioned above with a steady reduction in the proportion of well stocked "rich" forest. This results in a steady reduction in carbon stocks, which leads to emissions of CO<sub>2</sub>. According to the first National Communication to IPCC (2003) forestry and land-use produced net emissions of 19.38 million tonnes CO<sub>2</sub> equ annually, which was about 18.7% of the total estimated national emissions of 103.8 million tonnes CO<sub>2</sub> equ. The total emissions were projected to increase to 140 million tonnes CO<sub>2</sub> equ by 2010, by which time the forestry and land-use sector is expected to contribute net sequestration of about 21.7 million tonnes CO<sub>2</sub> equ. The estimate of the emissions was for the year 1994 and the net emissions were composed of about 68 million tonnes CO<sub>2</sub> equ emitted and 39 million tonnes CO<sub>2</sub> equ sequestered by plantations and natural regeneration. These figures did not include the emissions from the burning of wood for fuel, which was accounted for under the energy sector and amounted to 40.8 million tonnes CO<sub>2</sub> equ: almost double the emissions from all other energy sources. The Communication also reported that a combination of six mitigation options for the forestry and land-use sector could be used to reduce emissions and sequester CO<sub>2</sub>. These options include strict protection of 3 million ha of natural forest, and a total of 5.5 million ha of plantations, restoration of degraded forest and planting of scattered trees over a 15 year period.

16. The role of forests in watershed protection and biodiversity conservation is strongly emphasised in national policy statements. Decree No. 661, that regulates the Five Million Hectare Reforestation Program (5MHRP) mainly allocates government funds to restoring Protection and Special-use forest for these two broad functions. Very few statistics are published that provide an indication of the value of the benefits derived from these investments. There are records of the annual area planted in Protection and Special-use forest, which total around 150,000 to 200,000 ha. but no information is provided on the quality or effectiveness of these plantations in meeting their objectives. Plantations in Vietnam in the past have tended to have poor stocking, and there are reports that areas are often classified as Protection forest in order to qualify for funding from the 661 Program. This is born out by data on forest cover on different slope classes of land<sup>6</sup>, which show that more than 40% of forest land is on slopes of steeper than 35°, but nationally only about 60% of such sloping land has forest cover. The proportion of steep slopes without forest cover is as high as 70% in the critical northern part of the country. Where there is no forest, it cannot provide protection against soil erosion and flooding.

17. Vietnam experiences a monsoonal climate with pronounced wet and dry seasons and occasional very heavy rainfall events. That part of the country to the west of the main Annamite mountain range, which forms the Central Highlands region, and includes small areas in the west of the three provinces is strongly influenced by the SW Monsoon, which brings rain from the Indian Ocean. This gives a distinct wet season between about May and September, characterised by intermittent very heavy rainfall events, with 80-200 mm falling in 24 hrs. To the east of the divide, where most of the population live, the climate is more affected by weather from the China Sea and the rainy season is later in the year from September to December. The area can experience tropical cyclones with high winds and very heavy rain. The Mekong delta in the south of the country is prone to flooding induced by rainfall in Vietnam, Laos and parts of Thailand. This pattern of periodic

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<sup>6</sup> Do Binh Sam and Nguyen Ngoc Binh, 2001, Assessment of potential productivity of forest land in Vietnam. Statistics Publishing House.

very heavy rainfall makes protection of watersheds particularly important. The seasonal nature of rainfall combined with the tendency for heavy rainfall events makes management of water critical for irrigated agriculture. Water shortages, even during the rainy season are a serious constraint to raising agricultural productivity. Part of the problem is attributed to deforestation<sup>7</sup> adversely affecting seasonal river flow. Loss of forest cover that increases run-off makes conservation of the water for use between rainfall events and during the dry season more difficult.

18. A study of the impact of loss of forest cover on the hydrology<sup>8</sup> of the Sesan and Srepok river basins, that are tributaries of the Mekong rising in the Central Highlands, shows that flooding is only brought about by rainfall events of more than about 80mm in 24 hrs. The risk of flooding is much higher late in the season when soils are saturated, than at the beginning when the absorptive capacity of the soils are high. The impact and severity of flooding can be ameliorated or accentuated by water abstraction schemes and hydropower development, and can cause severe human and ecological impacts in downstream areas<sup>see 6</sup>.

### C. Policy environment

19. In 2004 the government revised the Law on Forest Protection and Development (No 29/2004/QH11) which provided the basis for a five year development plan approved the following year, that contributed to the national socio-economic development plan for the period 2006 to 2010. At the same time the government developed the Vietnam Forestry Development Strategy to the year 2020 which was approved by PM's Decision No. 18/2007/QD-TTg dated 5<sup>th</sup> February 2007 and set out the broad long-term goals for the sector. These are to

- Sustainably establish, manage and protect 16.25 million ha of forest land,
- Increase the proportion of the land with forest cover to 43% by 2010 and 47% by 2020,
- Ensure wider participation from various economic sectors and organisations in forest development to increase their contribution to socio-economic development, environmental protection, biodiversity conservation and the supply of environmental services, to reduce poverty and improve the livelihoods of the rural mountainous people and to contribute to national defence and security.

20. These goals are to be achieved by considering three interlocking objectives: Economic, Social and Environmental. Thus, forest management will be multi-purpose, to optimise the overall benefits, but with emphasis on production, protection and conservation according to the designated function of each forest area. Protected areas will be managed primarily for conservation, but will also protect the soil and water resources. The proposed investments in the Biodiversity Corridor are therefore fully in line with the overall government policy for the sector.

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<sup>7</sup> Vietnam-ADB RETA 5571 Poverty reduction and environmental management in the Sesan Watershed. Final Report, Volume 5, 2000. ADB:Manila

<sup>8</sup> Forest Cover and River System Hydrology, 2001, Fraser, A.I. and N.Jewell, Asian Environmental Outlook RETA, ADB:Manila

see 6

## Conclusions

21. Protecting and maintaining as much as possible of the remaining natural forest and restoring and expanding habitats is essential to conserve the remaining rich biodiversity in the region. Most of the natural forest that remains in the region is in the uplands and is seriously degraded, while much of it has also become fragmented so that habitats for many species have been reduced in extent to a point where they may no longer be large enough to support viable populations, especially of larger mammals. With an increasing risk of climate change, habitats will be further disturbed and modified, and human agriculture may move uphill to maintain temperature regimes if higher temperatures at lower elevations begin to impact negatively on crop productivity and human living conditions.

22. The growth in human population and economic development is leading to expansion of agriculture and growing demand for energy and water. This in turn is driving development of infrastructure, especially roads, hydro-power and dams for impounding water for irrigation and domestic water supply. The continued expansion of the global economy is also driving demand for minerals which appear to be relatively abundant in the corridor area, judged by the extent of current prospecting and applications for developing mines. The threats to the remaining forests are therefore substantial and increasing and strong measures are needed to protect the forests, the habitats and livelihoods of the communities that depend on the forests and the land around them.

23. The consequences of not protecting the forest, especially in the Central Annamites, on both the Vietnam and the Lao PDR side, will be increased costs for downstream populations in the form of reduced available water supplies, increased flash floods and landslides, increased salt water intrusion in the coastal areas of Vietnam due to reduced river flow in the dry season, and loss of environmental integrity and biodiversity that will reduce the medium-term potential for developing recreation and tourism facilities..