

**Disappearing Diversity:
An Overview on Indonesia's Degrading Forest and
Its Biodiversity**

Indonesia Case Study

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TABLE OF CONTENT

	Page
Introduction	1
The extractive timber management	1
Degradation: how much time left?	8
Paper parks, fragile fortress	18
Re-arrange the framework: giving sustainability a chance	24
Epilogue	30

FIGURES

	Page	
Figure 1	Change in forest cover - Sumatra	10
Figure 2	Change in forest cover - Kalimantan	11
Figure 3	Change in forest cover - Sulawesi	12
Figure 4	The institutional framework for biodiversity management in Indonesia	22
Figure 5	Inter-related systems in sustainable forest management	27
Figure 6	Typology of biodiversity conservation condition in Indonesia	29
Figure 7	Strategy for biodiversity conservation based on typology	30

BOXES

	Page	
Box 1	An emerald in the equator	2
Box 2	The case of Gunung Leuser National Park	28

TABLES

		Page
Table 1	Production and export value of log until export log ban in 1985	3
Table 2	Export value of Indonesia's plywood and pulp and paper	4
Table 3	Forest classification based on UUPK	5
Table 4	The classification of forest area from 1984 and 1996 TGHK	5
Table 5	Log production in five main production areas	6
Table 6	Forest potential in five main production area	6
Table 7	Log, sawntimber and plywood productions during last ten years	7
Table 8	The development of HTI during Pelita VI	7
Table 9	Estimated Indonesian biotic richness	8
Table 10	Comparison of biotic richness and endemism among outer islands	8
Table 11	The development of HPH in Indonesia	14
Table 12	Log production and its source	15
Table 13	Production capacity and roundwood consumption of Indonesia's major wood based industries, 1997	16
Table 14	Palm oil plantation area 1990-2000	16
Table 15	Conversion of forest land to oil palm plantation (until June 2001)	17
Table 16	Gazette and proposed protected areas of different categories	18
Table 17	Activities permitted and prohibited in protected areas	19
Table 18	Budget allocation of PHPA in 2000	23
Table 19	Biodiversity management in Indonesia after decentralization	25
Table 20	Logical framework of conservation goals in Indonesia	29

ACRONYMS

ADB	Asia Development Bank
AMDAL/EIA	Environmental Impact Assessment
APL	Area for other use (than forest)
Bappenas	National Planning Board
BPS	Center of Statistics Body
CGI	Consultative (Donors) Group on Indonesia
HPH	Large-scale timber concessions
HTI	Timber plantation for industrial woods
IPK	Clear- felling/cutting permit for forest conversion
ITTO	International Tropical Timber Organization
KLH/Men LH	State Ministry of Environment
KNPPN	National Commission on Conservation of Germplasm
KSDA	PHPA's regional office
LEI	The Indonesian Ecolabeling Foundation
LMU	Leuser's Management Unit
NBAP	National Biodiversity Action Plan
NGO	Non Governmental Organization
PHPA	Directorate General of Forest Protection and Nature Conservation
PIR	Nucleus estates and smallholders scheme
Repelita	Five years national development plan
RKT	Annual work plan of a HPH
RTRWP	Provincial spatial planning
TGHK	Agreed functional forest land classification system
TPTI	Indonesia's timber selective cutting method
UN-CBD	United nations Convention on Biological Diversity
UPT	Technical management units
UUPK	Basic Forestry Law

Introduction

Indonesia, once, was inherited with abundant forest resources. Ranked third after Brazil and Zaire for its tropical forest richness, Indonesia's forest covered around 144 million¹ hectares of its land area with diverse ecosystems ranging from tropical lowland and highland forest to peat swamp, freshwater swamp and mangrove forest (Sunderlin and Resosudarmo, 1997). Located between two biogeographical zones, those greenbelt become the home for many world's plant and animal species. At least 400 species of *dipterocarps*, 515 species of mammals, 600 species of reptiles and 1,519 bird's species live inside and depend on the Indonesia's forest sustainability to survive (Bappenas, 1993).

However, a great heritage needs proper management and wise utilization to make it last. Something that lost in the modern history of Indonesia's forest management conducted by the New Order regime. During the 1980's, annual deforestation rate reached 1,3 million hectares and was estimated to reach 1,5 million hectares in the 1990's (World Bank, 2000). Bryant *et al* (1997) estimated that Indonesia has lost 72% of its frontier forest² and 54% of its remaining frontier forest is under serious threat from logging and other human activities (agriculture clearing, mining etc.). As forest became degraded and fragmented, so did the biodiversity inside. Indonesia's forest and its biodiversity are shrinking and they are shrinking fast.

Many writings have been conducted to study this phenomenon, analyze its cause, and proposing solutions for the problem. This writing owes them much for a better understanding of the recent forest condition in Indonesia. As a case study, this paper will focus its scope on the relation between the state of Indonesia's forest and its biodiversity. It will give a brief review on the past and recent forest management practice in Indonesia, its impact on the present state of biodiversity and on going biodiversity conservation actions, and several advise to be conducted in the near future to improve the integration of biodiversity conservation into forest management practice.

The extractive timber management

Natural resource exploitation was the main foundation of New Order development strategy during their governance that started in 1966³. The regime, along with the power, inherited a declined economy with soaring inflation, abundant foreign debt, and isolation from donors institution from their predecessor. The urgent need for economic recovery through capital and foreign exchange inflow, and employment opportunities during the early stage of economic development induced the government to exploit its vast reserves of natural resources and since then natural resources have remained at the core of development policy. Using the authority mandated by the Constitution, the government put massive exploitation of natural resources, especially petroleum and forests, as the source of capital for development expenditures (Ahmad, 1995; Hill, 1996; Barber, 1996).

¹ Data from Land Utilization Design Based on Forest Land Use by Consensus in 1984, Ministry of Forestry

² Frontier forest refers to large, ecologically intact, and relatively undisturbed natural forest. Within these forests, natural ecological and evolutionary processes will continue to occur (Bryant *et al.*, 1997)

³ This regime ruled the country for almost 32 years before replaced by a more democratic regime in 1998 through a reformation movement that forced by a massive student demonstration

Box 1. An emerald in the equator

Indonesians often consider their country as “an emerald in the equator” due to its vast natural resources richness. A wealth that is not only bring fortune and prosperity for its people (at present there are more than 200 million inhabitants) in many kingdoms across 17,000 islands but also invited the evil side of international trade and external influence: colonialism. Portuguese, Dutch, English and then Japan were attracted by those treasure, and exploited them through bitter centuries of imperialism. Even after a modern state was formed, following a declaration of independence led by Soekarno and Hatta on August 1945, Indonesia had to wait almost for twenty years through decades of political turbulence and economic stagnation before it's able to utilize its resources for the national development.

The New Order Government, under Soeharto, came to power thirty years ago replacing Soekarno's Old Order and bringing with it a series of stabilization programs that successfully rehabilitated the economy. Under the regime, Indonesia enjoyed a high rate of economic growth at 6.5% per annum and, prior to Asia's financial crisis, was considered as part of the Asia's miracle. Systematic exploitation of natural resources and political stability was the foundation upon which Indonesia's extra ordinary economic growth flourished. Without vast reserves of oil, timber, minerals, and other resources the Indonesian economic story would be very different. On the other hand, the basis of political stability was laid by forging political infrastructure with the strength to support the formal requirements of economic growth. The political valve was practically closed shut, and the nation's full attention and energy were directed towards building the economy.

The re-engineering of the political system that brought rapid economic growth had affected the rapid structural transformation. The country's production base shifted quickly from agriculture to manufacturing. The contribution from manufacturing rised from 13% in 1980s to reach 24% in 1995, while the agriculture declined from 24% to 17%. In relatively short period of time, Indonesia was transformed from an agricultural country to a semi industrialized one. These successes were accompanied by a decline in the rate of population growth, brought by a successful national family planning program. The population growth rate declined dramatically from an average rate of 2.4% in 1971-1980 to 1.7% per annum in 1990-1995. This combination caused an increase of per capita income from US\$50 in 1970 to nearly US\$ 1200 a year before Asia's financial crisis. Indonesia had pulled itself out the ranks of the very poor countries and joined those of the lower middle income.

At time when the economy moved towards liberalization, changes in Indonesia's political orientation should also have taken place. Unfortunately, this did not happen. A more decentralized and democratic decision making process were not instituted. As a result, private agents did not become responsive to better allocation of scarce resources. Neither were check and balance instruments nor processes improved. Consequently, the nature of the situation gave rise to substantial market distortions. Condition that made Indonesia very vulnerable to the crisis.

Source: Barber (1996), Panggabean *et al.* (2000)

This policy did not have to wait too long for showing its impact on the nation's economy. Gross foreign exchange earnings from the forestry sector rose from \$6 million in 1966 to more than US\$564 million in 1974. By 1979, Indonesia was the world's major tropical log producer with a 41% share in the global market, representing a greater export volume of tropical hardwoods than all of Africa and Latin America combined (Gillis, 1988). Following the ban

on log export in 1985 and promotion of forest industry development, Indonesia then successfully controlled 90-95% of the world's tropical plywood market in 1987-1994 period. Forestry, together with its downstream industries, is an important sector in the Indonesian economy during the New Order. There are considerable backward and forward linkages for forestry and forest industries, between them and with other sectors. In 1987, all activities in forestry and forest industries (formal and informal) contributed to 5.4 % of total employment in Indonesia (FAO, 1990). It also became the important source of revenue for Indonesia's economic development, mostly through export earnings from various forest products. In recent years, forest products and downstream manufacturers contributed US\$9 billion per year or 7% of Indonesian GDP (State Ministry of Environment, 1997)⁴.

Table 1. Production and export value of log until export log ban in 1985

Year	Volume (million M.Cu)	Value (million US\$)
1975	16.3	527
1976	21.4	885
1977	22.2	943
1978	24.2	1,130
1979	25.3	2,172
1980	25.2	1,672
1981	15.9	951
1982	13.4	899
1983	14.9	1,161
1984	16.1	1,120
1985	24.3	1,185

Source: Ministry of Forestry and Finance in Skephi (1992)

It all began with the issuance of the Act No 5/1967 on Basic Forestry Provision, followed by Act No 6/1968 on Foreign and Domestic Investment. Both Acts created access for foreign and domestic private companies to extract timber in the forest-rich islands outside of Java, which had not been exploited until the early 1960's. Moreover, it marked the beginning of extractive timber management era through large scale logging concessions in Outer Islands (State Ministry of Environment, 1997). The Basic Forestry Law No. 5/1967 (UUPK), until replaced by the New Forestry Law in September 1999, is the primary source of authority and guidance of all forest administration and regulation. This law consists of eight chapters, covering forest definition, planning, administration, management, production, conservation and security. The management of forest lies within the Ministry of Forestry which supervise the mapping, utilization, conservation, and rehabilitation of forest although various other departments and agencies also have interests in forest lands for mining, transmigration, agriculture, plantation, public works, and other uses.

⁴ Despite this achievement, many researchers had criticized forestry contribution to the economy, especially its marginal contribution to government revenue through tax and rent on forest product. Gillis (1988), Ramli and Ahmad (1991), and Ahmad (1992) stated that most of the rent goes into the concessionaires and that benefit extracted from the forest sector was too small compared to the scale of the activities. The government attaches three basic fees to the operation of forest concessions: the IPHH is an annual area based fee paid at the granting of the concession; the reforestation fee is a fee per cubic meter of wood harvested. It varies with region and species group, and the IHH was a royalty on logs, charged on the basis of weight or volume, collected by Ministry of Forestry and Estate Crop. The IHH varied by region and species group. This royalty was semiannually based on the check price identified by The Ministry of Trade and Industry. Following the IMF package, IHH has been replaced by FRR (Forest Resource Royalty) that periodically revised to ensure capture of at least 60% rent from timber (World Bank, 2000).

Table 2. Export value of Indonesia's plywood and pulp and paper

Year	Value (US\$)	
	Pulp and Paper	Plywood
1995	1,257,950,000	3,886,943,896
1996	1,309,769,000	4,029,477,732
1997	2,000,000,000	3,887,998,676
1998	3,500,000,000	2,486,165,999
1999		2,704,740,868
Average	2,169,297,500	3,399,065,434

Source: APKI and APKINDO in Suparna (2000)

The Law has adversely affected millions of people who had previously had access to timber, non timber forest products and swidden lands under the traditional system of resource management. It subordinated the traditional rights of indigenous forest dwellers and communities dependent on forest for their livelihood. Instead, UUPK providing Ministry of Forestry the authority to grant timber concession licenses in areas designated as production and limited production forests. Adat rights were subordinated to those of the timber concessions; the communities and individuals could enjoy their adat rights so long as they did not disturb the functioning of large-scale timber (HPH) or plantation concessions⁵.

The Government regulation No. 21/1970 defines a HPH as "a right to exploit the forest in designated Forest Area, through cutting of timber, regenerating and caring for the forest, and processing and marketing forest products, in accordance with Forest Exploitation Work Plan, in line with existing regulations, and on the basis of conservation and sustainable production". It provided the HPH holder a non-transferable right for 20 years, and stipulated that the concessionaire follow the principles of sustainable forest management as prescribed by TPTI. TPTI prohibits harvesting trees with diameter of less than 50 cm and a certain amount of mother trees must be left in a hectare area to follow a 35-year rotation to permit adequate regeneration. The ministry and the HPH holder sign an agreement that contain rules for long term planning, harvest level based on approved annual work plans (RKT), land rehabilitation after harvests, and community development. After the push for the development of domestic processing industry for wood products, the applicant guarantees the establishment of a vertically integrated forest industrial activity (sawmill or plymill) in association with the concession (FAO, 1990; State Ministry of Environment, 1997; World Bank, 2000).

This timber extraction activity is focused on production forest. In 1993, there was 61.70 million hectares production forest that granted to 575 HPHs. Beforehand, through UUPK and following ministerial decree, the government classified Indonesia's forest into several categories as described on the Table 3. The categories, except for conservation forest, were defined according to an erosion index based on the erodability of the dominant soil type, the average slope and the rainfall intensity (FAO, 1990). The production forest area was previously estimated through TGHK to reach 94,929,300 hectares (including 30,537,400 hectares conversion production forest) but after the TGHK⁶ was merged with provincial

⁵ The 1967 Basic Forestry Law states that "the enjoyment of adat rights, whether individual or communal, to exploit forest resources directly or indirectly...may not be allowed to disturb the attainment of the purposes of this Law". FAO (1990) stated that a 1970 implementing regulation further elaborates and weakens adat rights in HPH concession areas, saying:

(1) The rights of the adat community and its members to harvest forest products...shall be organized in such manner that they do not disturb forest production

(3) In the interest of public safety, adat rights to harvest forest product in a particular area shall be frozen while forest production activities are under way

The New Order considered the traditional swidden agriculture practices to be environmentally destructive, backward, and wasteful (World Bank, 2000)

⁶ The official measures of Indonesia's forests were established by a consensus of provincial government agencies in 1984, approved at the ministerial level of the central government, using the agreed functional forest land classification system (TGHK). The provincial agencies made their

spatial planning (RTRWP) classification system following the Spatial Management Act of 1992, the production forest area became 66,332,516 hectares (including 8,078,056 hectares conversion production forest), as described in Table 4.

Table 3. Forest classification based on UUPK

Category	Main Purpose	Permitted Use
Conservation	Nature reserve, genetic conservation, research and recreation	No logging
Protection	Water conservation and soil protection	No logging
Limited production	Timber production and control of soil erosion	Selective felling
Production	Timber production	Selective or clear felling
Conversion	Conversion to agriculture or other use	Clear felling

Source: FAO (1990)

After the joint implementation of TGHK and RTRWP, forest area is classified into two main areas: protected area and production area. Protection area is consist of protection forest, natural reserve and conservation forest. Production area is consist of forest production area (production forest, limited production forest and convertible production forest) and non-forest production area (area for other use/APL) (Manurung and Saragih, 1999). Table 4 shows that protection forest increased from about 30 million ha in 1984 to about 35 million ha in 1997. The conservation forest has remained at roughly 19 million ha, the production forest area changed from about 64 million ha in 1984 to about 58 million in 1997 (of which, permanent production forest have increased to 35 million ha, but limited production forest have declined from 30 million to 23 million ha). Meanwhile, the area of conversion forest that is used for tree crop plantation, transmigration, and other purposes has experienced the biggest decline, from about 30 million ha in 1984 to about 8 million ha in 1997 (World Bank, 2000).

Table 4. The classification of forest area from 1984 and 1996 TGHK

Forest Classification	Area in 1984 TGHK (ha)	Area in 1996 TGHK (ha)
Protection Forest	30,316,100	33,519,600
Park and Nature Reserve	18,725,215	20,500,988
Limited Production Forest	30,525,300	23,057,449
Production Forest	33,866,600	35,197,011
Non Convertible Forest	113,433,215	112,275,048
Convertible Production Forest	30,537,400	8,078,056
Total Forest Area	143,970,615	120,363,104

Source: Directorate General of Production Forest Management (1997)

The main production area for logs or roundwood production are provinces in Sumatra and Kalimantan. The World Bank (1999) has identified six main provinces based on their production forest area, namely Irian Jaya (Papua), Central Kalimantan, East Kalimantan, Riau, South Sumatra, and West Kalimantan. However, the actual log production data shows that those main areas should be Central Kalimantan, East Kalimantan, Riau, Irian Jaya, and North Sumatra. Table 5 shows the recent figure of log production in those provinces, compared to Table 6 that shows their production forest area. It can be predicted that North Sumatra will not be able to sustain its role as main province in log production.

assignments of land to forest based on land use maps available in the provincial offices at the time. Essentially, they defined forests as all lands not otherwise identified with existing agricultural or urban land uses. This means that the 1984 inventory was only an estimate (World Bank, 2000)

Table 5. Log production in five main production areas (M.Cu)

Province	1995/96	1996/97	1997/98	1998/99	1999/00
Central Kalimantan	5,435,557.18	5,089,425.86	5,130,325.81	4,214,512.26	4,198,989.72
East Kalimantan	4,590,770.14	4,836,853.00	6,600,653.73	3,885,875.78	1,402,650.20
Riau	2,430,161.92	2,220,419.32	3,201,304.94	1,307,654.42	4,882,514.29
Irian Jaya	2,010,701.25	2,834,851.41	2,716,688.57	1,500,985.02	1,492,603.77
North Sumatra	1,346,676.10	1,714,955.74	1,246,284.77	1,295,045.91	1,452,246.99

Source: Directorate General of Production Forest Management (2000)

Table 6. Forest potential in five main production area (hectares)

Province	Production Forest	Limited Production Forest	Non Convertible Forest	Convertible production Forest
Central Kalimantan	4,448,222	4,593,003	10,735,935	0
East Kalimantan	4,727,488	4,755,494	14,584,672	0
Riau	2,649,608	0	3,571,812	334,521
Irian Jaya	10,379,684	3,365,475	32,737,449	2,671,275
North Sumatra	871,183	760,958	3,810,581	37,797

Source: Forestry and Estate Crops Planning Agency (2000)

Forests product were dominated by raw timber export until the early 1980 when the government started to impose a ban on log export that became effective in 1985. Since then, in adjustment of lower oil price period, the export diversification drive in forestry sector led to a growth strategy relying on a higher value added through the development domestic processing of wood products (Hill, 1994; World Bank, 2000). The government has actively promoted down stream processing industry since the early 1980s through sets of incentive that generated large economic rents for the license holders and since then, the dominant industry has been plywood, followed by pulp and paper industry. In 1997, preceding the Asian crisis, there were 2,345 units of sawmill and molding industry, and 115 plywood industries (Barr, 2000). Table 7 shows the production of forest products in the last ten years.

The drive for diversification to sustain export earnings has more recently focused on expanding the production and exports of pulp and paper products. Industrial forest or timber plantations have grown rapidly since the early 1980s due to government anticipation of the growing demand of industrial wood, primarily for the pulp and paper industry through the HTI program (World Bank, 2000). The aim of the program was to encourage the establishment of a large industrial forest estate to meet the country's long term needs. The scheme was designated to rehabilitate the unproductive (or degraded) forest with a residual standing forest inventory of less than 20 m³ per hectare of commercial species with a minimum diameter of 30 cm. Private investors, cooperatives, and state owned companies (or joint ventures among these) can apply for an HTI permit for a period of 35 years⁷.

⁷ Before the 1989, the HTI scheme required the HPH concession holders to undertake plantation activity as part of the agreement. However, poor results and quality of tree-stand led to a new approach in 1989 that granted a land use right in the form of an HTI concession, with an understanding that the developer would have the right to the wood produced. HTI management is distinct from the management of forest concessions, where selective harvest practices are required to obtain natural regeneration and maintain the existing forest (World Bank, 2000).

Table 7. Log, sawntimber and plywood productions during last ten years (M. Cu)

Year	Log	Sawn timber	Plywood
1990/91	25,312,000	3,117,000	9,415,000
1991/92	23,892,000	3,006,046	9,123,500
1992/93	28,267,000	3,534,356	9,874,000
1993/94	26,848,010	2,244,000	9,924,000
1994/95	24,027,277	1,729,839	8,066,400
1995/96	24,850,061	2,014,193	9,122,401
1996/97	26,069,282	3,565,475	10,270,230
1997/98	29,520,322	2,613,452	6,709,836
1998/99	19,026,944	2,707,221	7,154,729
1999/00	20,619,942	2,060,163	4,611,878

Source: Directorate General of Production Forest Management (2000)

There are three types of HTI; pulpwood plantation, non-pulp, and HTI-transmigration. In consonance with the government effort to promote pulp and paper industry, pulp plantations have been regulated with different sets of rules than the other, longer-rotation timber plantation. Whereas the concession size of non-pulp timber plantation is limited to 60,000 hectares, the pulp plantation limit is 300,000 hectares. Further, where all area of non-pulp plantations must be planted, pulp plantations are allowed to plant a portion of the area, but can log the rest for the use as pulp until the pulpwood production comes on stream. The HTI-transmigration scheme allows clear cutting in an HPH site provided 10% of the area is reserved for transmigration purposes. The rest of the arrangements are similar to other HTI contract. Table 8 shows the trend of HTI development proportion of HTI-pulpwood in that trend.

Table 8. The development of HTI during Pelita VI

Year	Total HTI Area (ha)	Area of HTI-pulpwood (ha)
1994/95	296,786	117,940
1995/96	326,448	162,200
1996/97	390,542	172,320
1997/98	266,609	100,833
1998/99	180,506	82,604

Source: Directorate General of Production Forest Management (1999)

This shift in forest sector development orientation are reflected in national development strategy (FAO, 1990). The sector strategy in the Five Year Development Plan (Repelita) had shifted from promotion of forest utilization in the Outer Islands (Repelita I and II), rehabilitation, conservation and reforestation (Repelita III), balancing the utilization with conservation (Repelita IV), and the sound and sustainable management of the forest resources along with related institutional strengthening (Repelita V).

As part of those dynamic adjustments and realizing the influence of increasing demand from international community for goods produced through environmentally-sound processes in the future, the Government of Indonesia has declared its intention to ensure that its forest export come from sustainably managed forests by the year 2000, as required by the International Tropical Timber Organization (ITTO). One effort is through the development of ecolabels for forest product, beginning with natural forest timber. The Indonesian Ecolabeling Foundation (LEI) was established in 1994 to develop criteria and indicators for Sustainable Forest Management and implement it for the assessment of forest management in Indonesia by independent party. The government has also issued several policy measures in line with the issues of sustainability. Among them is the decree of Director General of Forest Utilization No. 208/Kpts/IV-set/1993 on technical guidelines for the implementation of criteria and

indicators for the sustainable management of natural production forests at the management unit level or concession level (State Ministry of Environment, 1997)

Degradation: how much time left?

Indonesia's biodiversity richness is made possible by several factors: it is located between two continents (Asia and Australia) and two oceans (Pacific and Indian) and it has a unique geographical feature (State Ministry of Environment, 1997). Indonesia is an archipelago of more than 17,000 islands extending 5,000 km along the equator and spanning two major biogeographical realms (Indomalaya and Australasia) with the Wallace Line in between, as well as several distinct biogeographical provinces. As a result, Indonesia is not only a mega-biodiversity country but also has a high level of endemism. Table 9 shows Indonesia's estimated biotic richness.

There are seven major biogeography regions in Indonesia, centered on the major islands and groups and their surrounding seas. Those regions are: 1) Sumatra and off-shore islands, 2) Java and Bali, 3) Kalimantan, including Natuna and Anambas islands, 4) Sulawesi, and offshore islands including Sula, 5) Nusa Tenggara, 6) Maluku, and 7) Irian Jaya. There are 14 habitat types in Indonesia that consist of peat swamp (PS), freshwater swamp (FS), montane rainforest (MF), mangrove forest (Mn), monsoon forest (MSF), lowland evergreen rainforest (LR), alpine (Alp), forest on limestone (FL), semi-evergreen rainforest (SER), heath forest (HF), forest on ultra basic (UB), tropical pine forest (TPF), ironwood forest (IF) and savanna (Sav) habitats. Those habitats originally covered 1,895,512 km² of Indonesia's land (MacKinnon and MacKinnon in Bappenas, 1993). The three major biodiversity centers are Irian Jaya (high species richness and endemism), Kalimantan (high species richness, moderate endemism), and Sulawesi (moderate species richness, high endemism). Irian Jaya has 7 types of habitats (Alp, MF, LR, LF, FS, PS, Mn), Kalimantan has 8 types (FL, FS, HF, IF, LR, MF, Mn, PS) and Sulawesi have 9 type habitats (FL, FS, LR, MF, MSF, Mn, PS, SER, UB). Table 10 shows the comparison among those regions.

Table 9. Estimated Indonesian biotic richness

Groups	Number of Species in Indonesia	Total World Species
Flowering plants	25,000	250,000
Insects	250,000	750,000
Mollucas	20,000	50,000
Fish	8,500	19,000
Amphibians	1,000	4,200
Reptiles	2,000	6,300
Birds	1,500	9,200
Mammals	500	4,170

Source: KLH and McNeely in Bappenas (1993)

Table 10. Comparison of biotic richness and endemism among outer islands

Islands	Bird Richness	Bird Endemism	Mammal Richness	Mammal Endemism	Reptile Richness	Reptile endemism	Relative Plant species	% Plant endemism
Irian Jaya	602	52	223	58	223	35	1030	55
Sulawesi	289	32	114	60	117	26	520	7
Kalimantan	420	6	201	18	254	24	900	33
Sumatra	465	2	194	10	217	11	820	11

Source: MacKinnon in Bappenas (1993)

Officially, FAO and the Government of Indonesia grouped forest habitats into six types based on their management potential (State Ministry of Environment, 1997). Those forests are:

- Mixed hill forest; the most important type of forest in timber production, covering about 65% of total natural forest in Indonesia. In Sulawesi, Kalimantan and Sumatra these forests are dominated by the *dipterocarpaceae* family. In drier Nusa Tenggara, Maluku and Irian Jaya, more important species include *Pometia* spp., *Paluquium* spp., *Intsia palembanica*, and *Octomeles*
- Submontane, montane and alpine forests. Dominant families are *lauraceae* and *fagaceae*
- Savannah/bamboo/deciduous/mountain monsoon forests. These types do not cover vast areas individually. Natural grass savannas are found in Irian Jaya, associated with *Eucalyptus* spp, in Maluku associated with *Maleleuca*, and in Nusa Tenggara associated with *Eucalyptus alba*. Deciduous forests harboring genera not present in rainforests, such as *Acacia*, *Albizia* and *Eucalyptus*. Burning over the centuries has resulted in the dominance of single forest species such as teak (*Tectona grandis*) in Java, *Maleleuca leucadendron* in Maluku and Irian Jaya, and *Timonius sericeus*, *Borassus flabellifer* and *Corypha utan* in Nusa Tenggara
- Peat swamp forests; found only in permanent swamps in Kalimantan, Sumatra and Irian Jaya. Peat swamp forests cover 13 million ha of the total forestland in Indonesia. Important species are *Gonystylus buncanus* in Kalimantan and *Camnosperma macrophyllum* in Sumatra
- Freshwater swamp forests; cover area about 5,6 million ha on the eastern coast of Sumatra, the western coast of Kalimantan, and in some areas of Irian Jaya. Genera are similar to those which occur in dry land rain forest. In Irian Jaya, sago palms are predominant in this type of forest
- Tidal forests; mangrove forests are an important part of tidal forest, covering an area of about 4,5 million ha. Mangroves are mainly found in Kalimantan, Sumatra, and Irian Jaya with limited area in southern Sulawesi and northern Java. *Rhizophora*, *Avicennia*, *Sonneratia* and *Ceriops* are the main genera.

However, those species and habitats richness are not safe from harm. Biodiversity in the developing countries always threaten by over-exploitation, habitat loss and habitat fragmentation (Soule', 1993) and in Indonesia deforestation, representing those three main threats, is the clear and present danger for the biodiversity. With deforestation, not only are lands degraded, but habitats are lost and species are threatened. Figures for deforestation rates vary, but in the late 1980s is estimated between 0,6 million ha and 1,3 million ha annually (Sunderlin and Resosudarmo, 1997)⁸. The official figure as stated by The Ministry of Forestry indicated an average deforestation rate at 0,8 million hectares annually but in the 1990s the degradation is currently believed to be at unprecedented level of more than 1.5 million ha per year (World Bank, 2000)

MacKinnon and Mackinnon in State Ministry of Environment (1997) estimate that in 1986 the remaining area of Indonesia's habitat is only 55,8% of its original area⁹. The semi-evergreen rainforest were the most threatened habitat (28.3% remaining) followed by heath forest (28.8%), ironwood forest (34.2%) and monsoon forest (38.0%). In 1997, Indonesia was estimated to loss 72% of its frontier forest (Bryant *et al.*, 1997). The remaining frontier forest was classified into "not much time" category (or frontier forest will continue to fall without further action) because 54% of those remnants are under serious threat¹⁰. The impact

⁸ The biggest estimation of deforestation on their list was the one from Hasanudin that estimated the deforestation level to reach 2,3 million hectares annually.

⁹ The remaining areas of original habitats vary among three centers of biodiversity. Irian Jaya still had 93% of its original habitat those days, while both Kalimantan and Sulawesi had 59% of it. As comparison, Java and Bali only had 9% remaining original habitat

¹⁰ Indonesia was grouped in the same classification with Zaire but with higher frontier forest index (39 from the worst 99) that reflected a better opportunity to save the remaining forest. Brazil the country with largest forest area and diversity was classified into "great opportunity" group.

of deforestation on the lost of forest cover and its current trend in Outer Islands is described by the figure 1, 2 and 3 below¹¹: It shows that only montane forest have the big enough opportunity to survive beyond 2010 if there is no change in the current trend.

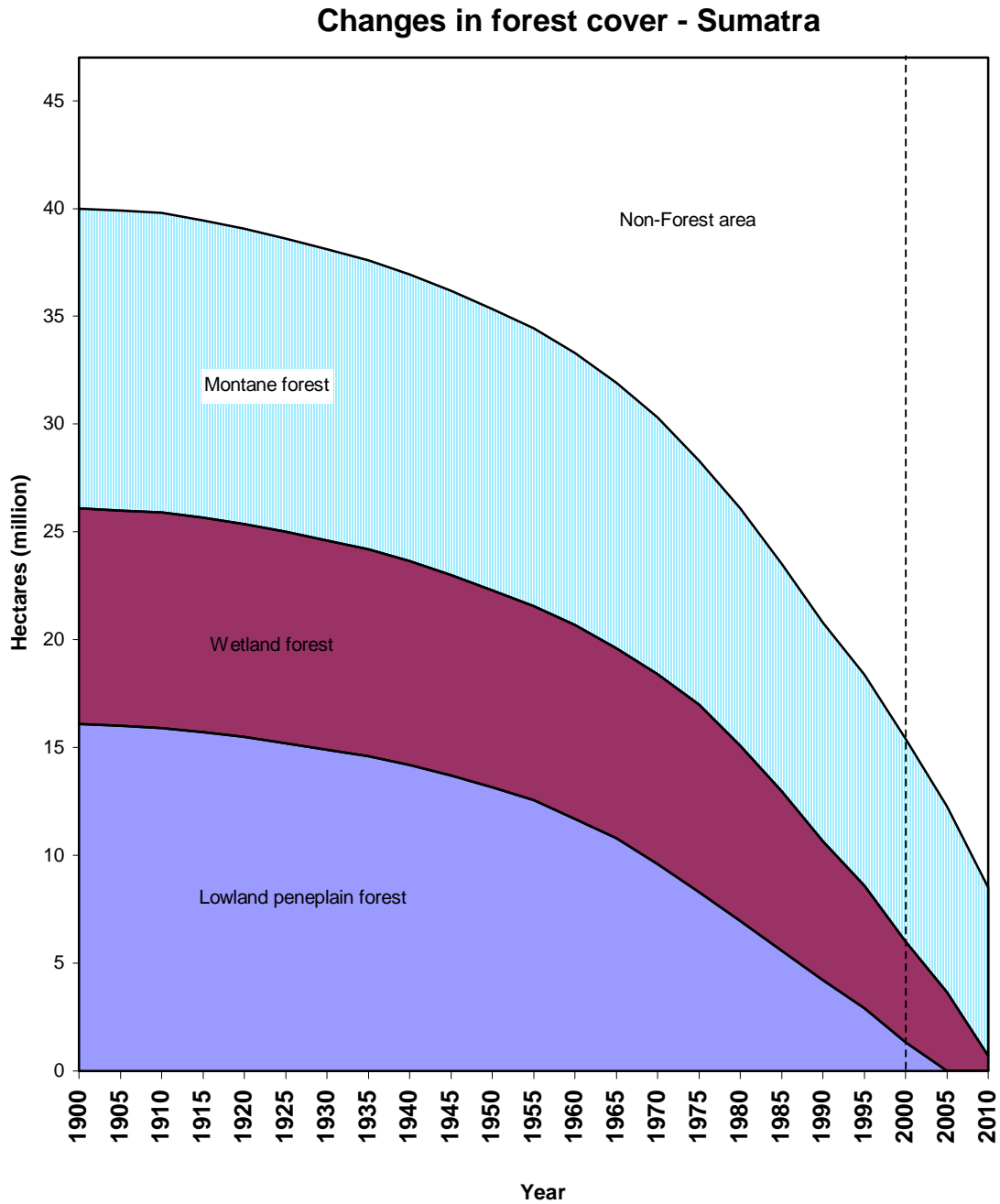


Figure 1

¹¹ Tonny Whitten, personal communication.

Changes in forest cover - Kalimantan

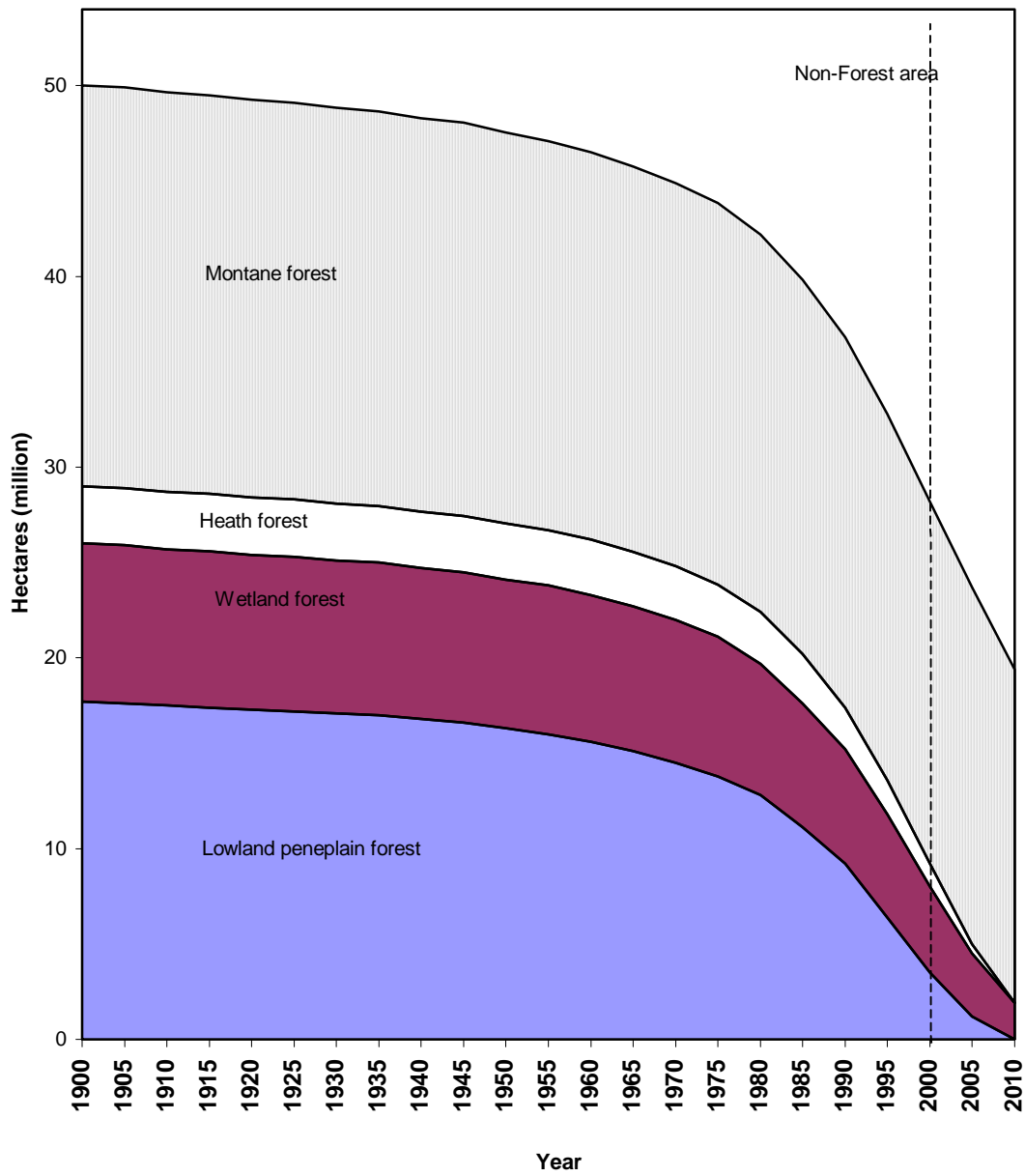


Figure 2

Changes in forest cover - Sulawesi

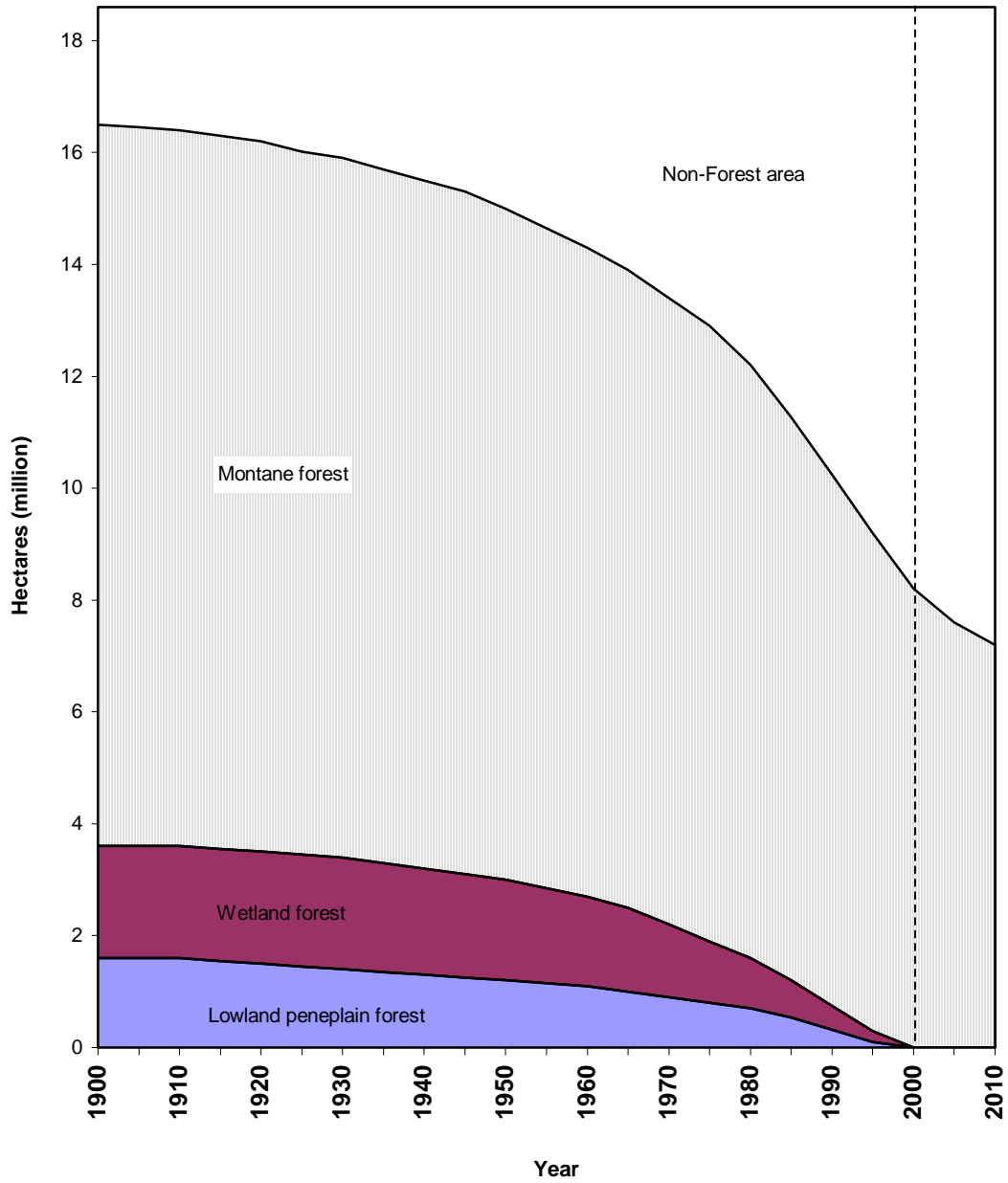


Figure 3

Various factors cause deforestation in Indonesia, such as smallholders agriculture and shifting cultivation, transmigration, infrastructure development, tree crop plantation and timber sector, but the relative importance of government programs and commercial interest is increasingly being accepted (Sunderlin and Resosudarmo, 1997). Barber and Schweithelm (2000) argued that the deforestation in Indonesia was underlined by “bad governance” on forestry sector development. They identified four most important policies on forestry development that affected the recent and on going forest degradation:

- The logging industry
- The government push, since 1990s, toward rapid development of industrial timber plantation to supply raw materials for the growing pulp and paper industry
- The rapid development of oil palm plantations
- The government transmigration program

This study found that those policies caused deforestation through bad HPHs and HTIs management, structural timber deficit on forest product industry and excessive forest conversion for non-forest use¹².

Commercial logging has played a leading role in deforestation and forest degradation in Indonesia. The lack of implementation of rules and regulations governing concession contracts provides strong incentive for the concessionaires not to adopt sustainable practices (World Bank, 2000). Few concession-holders properly allow the silviculture practice and selective cutting system mandated by their concession agreements (Barber *et al* in Barber, 1996). Prakosa (1996) stated that this violation included limited activities in standing stock inventory, lack of enrichment planting, cutting outside area defined in annual working plan or in the rate exceed annual cutting target, re-logging before the planned period and high grading.

The logging activities have conducted an inefficient extraction of timber, unnecessary damage to remaining trees, excessive waste wood left in the forest, soil erosion and river pollution. The concessionaires show little interest to reduce timber waste, mitigate environment impact, and manage their concession sustainably. The World Bank reported that for every cubic meter cut, at least an equal amount of usable wood is left behind and that at least 8 million m³ are left rooting in the forest every year (Barber and Schweithelm, 2000). This reckless logging activities also made the forest vulnerable for fire by providing abundant easily combustible material that covered much of the forest floor. Reckless logging transformed the fire-resistant primary rainforest into a degraded and fire-prone ecosystem¹³.

These facts show that concessionaires are simply not interested in a second, less profitable cut that would require years of costly interim management and protection (Barber *et al* in Barber, 1996). Sunderlin and Resosudarmo (1997) argued that method applied in the license distribution that allow concessionaires to obtain very large concession area combines with certain policies that encourage rent seeking behavior among concessionaires reduce the incentive for long term sustainable forest management. Thiele in Sunderlin and Resosudarmo (1997) explained that low concession fees motivated the concessionaires to “possess” very large concession area. The possession of such abundant tract of land will reduce the needs for good concession management. On the other hand, low royalty payment allows the concessionaires to extract most of the economic rent in forest production. The opportunity to

¹² In accordance with Barber and Schweithelm, this study use framework developed by Sunderlin and Resosudarmo (1997) to distinct three factors behind deforestation, namely actors, direct causes and underlying causes. Actors are person/institution that conduct the practice or physical action that cause deforestation, direct causes are the factors that affects the actors' behavior while underlying causes are structural factors that affected the direct causes. The underlying causes lie on the government economy and political structure and relationship with other actors. The factors described in this section are direct causes.

¹³ Study by GTZ claimed that reckless logging practice that changed the forest condition in East Kalimantan was responsible for the great forest fire that burned 1.3 million ha forest in 1982-1983

obtain the excess of rent drive the occurrence of rent seeking behavior among the concessionaires through corruption and violation of previous agreement in maintaining the sustainability of forest resources (Thiele in Sunderlin and Resosudarmo, 1997). The low rent capture by the government undervalued the forest and encourages bad management practice (Ascher in Sunderlin and Resosudarmo, 1997). In the end, it drives the concessionaires to re-log their concession prematurely to maximize the rent extraction during their 20-year concession period.

This bad management led to the degradation of the resources. The decline in the amount of official annual cut from concession area indicate it. According to Ministry of Forestry data, timber production level realized under concessionaires approved annual work plan (RKT) dropped from just under 24 million m³ in 1990/1991 to 15 million m³ in 1996/1997. This 37,5% drop in RKT output at the national level was, in fact, surpassed by the declines recorded for many of Indonesia's major timber-producing provinces. RKT level for Central Kalimantan fell by 32%, while East Kalimantan dropped by 48% and Riau fell by 79% during this period (Barr, 2000). Some part of the decline is affected by the declining number of active HPHs in operation¹⁴, as shows by Table 11, but the declining potency of standing stock is also give significant contribution.

Table 11. The development of HPH in Indonesia

Year	Units	Concession Area (million ha)
1989/90	557	58.88
1990/91	564	59.62
1991/92	567	60.48
1992/93	580	61.38
1993/94	575	61.70
1994/95	540	61.03
1995/96	487	56.17
1996/97	447	54.09
1997/98	427	52.28
1998/99	420	51.58
1999/00	387	41.84

Source: Directorate General of Production Forest Management (2000)

The declining supply from HPH production also raise another problem, as shown in Table 12. The proportion of log supplied from conversion forest through clear felling activities in the annual official log supply become bigger. In 1994/1995, the proportion was only 19.6% but four years later, in 1998/1999, climbed to 31.8%. This fact will encourage the continuity of conversion activities and threat the existence of permanent natural forest¹⁵.

¹⁴ In 1997/98, there are 340 expired concessions. Some of them have completed their first concession period and did not propose extension of their license, some of them were not granted the extension or revoked before completed their concession period due to their bad management practice.

¹⁵ The other related significant impact is the government effort to rise the level of production not by improving the management practice but by lowering the silviculture standard. The introduction of Selective Logging and line Planting (TPTJ) weaken the standard implied by TPTI and will enable the extraction of more timber than under the implementation of TPTI on the same area (Barr, 2000)

Table 12. Log production and its source (million M.Cu)

	1994/95	1995/96	1996/97	1997/98	1998/99
Natural Forest production	17.309	16.944	15.268	15.598	10.179
Conversion Forest Production	4.709	5.398	8.021	10.038	6.056
Total (incl. Other source)	24.027	24.850	26.069	29.149	19.027
Proportion of Conversion Forest (%)	19.6	21.7	30.8	34.4	31.8

Source: Ministry of Forestry in Scotland *et al.* (1999)

The case of HTI management is not very different with the HPH's. Following the ambitious plan to establish vast areas of fast-growing timber plantations, many forestry companies assumed an inordinate degree of risk by investing large sums of capital in wood processing industries without first securing a legal supply of raw materials that can be sustained over the long term. Between 1988-1997, conglomerates invested approximately US\$ 8 billion in the pulp and paper sub-sector to raise the pulp industry's processing capacity from 605,000 to 3.9 million tons/year and the paper industry's capacity from 1.2 to 7.2 million tons/year (APPKI in Barr *et al.*, 1999). However, they failed to develop plantations at this same pace. Instead, most producers have chosen to obtain a large portion of their fiber by clear cutting natural forests (Barr *et al.*, 1999).

There is thus a significant mismatch between capacity and supply for Indonesia's pulp industry due to the creation of large capacity mills in area that may not be able to supply them adequately, and an inadequacy of a timber planting program to meet the demand for the timber for pulp (World Bank, 1999). This discrepancy heightened the dependency of timber from clear felling/clear cutting practice through the issuance of IPK license and became the source of misuse in the HTI implementation. HTI scheme became the justification of excessive demand of IPK license. The fact shows that Indonesia's pulp industry currently consumes the equivalent of 15 million m³ of roundwood per year with only 3% of that comes from plantation. Between 20 and 40% of pulp mills' raw material comes from legal clear cutting of mixed tropical hardwoods under the IPK licensing system, while nearly all of the rest comes from undocumented and presumably illegal sources (Scotland *et al.*, Brown, ITMFP in Barr *et al.*, 1999). The concessionaires then often use HTI scheme to cover their bad HPH management practice (Barber *et al.* in Barber, 1996). As the World Bank points out "logging operations can degrade a site with little risk of serious penalty, and in the process set them up to receive a license to convert the site so damaged into a HTI or tree crop estate" (Barber and Schweithelm, 2000)

This practice, unfortunately, was encouraged by the government. According to government regulation No. 7/1990, HTI development can take place within production forest, and the permit allows the holder to clear-cut a designated area and to replant it with commercial tree species (Barr *et al.*, 1999). Ministry of Forestry also introducing regulation in 1992, requiring all Production Forest within a 100 km radius of a pulp mill to be used for pulpwood plantations. So, while the government's policy is to establish HTI on degraded lands, the reality is that this are established in moderately logged-over forest areas (State Ministry of Environment, 1997). Something that allowed by Ministerial Decree 442/1992 that circumvents the original HTI regulations on converting productive natural forests and permits clear-cutting of significant stands of commercially valuable timber (World Bank, 1999).

Despite its professed intentions, timber plantation and its pulp industry has heightened the log consumption for forest industry. Indonesia's major log consuming industries then became sawmill industry (for lumber or sawn timber), molding and building components, plywood and particleboard, and pulp and paper. The installed production capacities of the nation's forest industry have created a demand for logs and fiber that substantially exceeds the supply capacity of Indonesia's formal timber production apparatus (Barr, 2000).

Table 13 shows the installed production and wood utilization capacities of these three industries in 1997. While aggregate roundwood consumption capacity for the three industries stood at approximately 76 million m³ during 1997, it is conservatively estimated that those industries consumed 55 million m³¹⁶ of raw materials. This figure is higher than official log supply in the same period (around 26 million m³) and even exceeded the sustainable level of annual log harvest that estimated at level of 22 million m³ in 1995 by The World Bank (World Bank, 2000).

Table 13. Production capacity and roundwood consumption of Indonesia's major wood based industries, 1997

Industry	Units	Production Capacity (M.Cu)	Estimated Real Production (M.Cu)	Estimated Roundwood Consumption (M.Cu)
Sawnwood and Moulding	2,345	18,975,000	13,300,000	24,180,000
Plywood	115	12,600,000	10,080,000	20,160,000
Pulp	15	3,900,000	3,400,000	10,965,000
Total				55,305,000

Source: ISA, APKINDO and APKI in Barr (2000)

This problem had been identified from the early 1990s. Ahmad (1995) stated that in 1995, there was already 19-22 million m³ supply deficit for forest industry. A steady decline in the volume of logs officially produced within the HPH system since 1990 widened the existing supply-demand gap and the existence of such a substantial structural timber deficit poses fundamental problems for the sustainable logging reform agenda. The structural demand for substantial volumes of timber above and beyond those generated by the official log supply is a central factor driving Indonesia's illegal timber trade. Estimates of illegal log removals in recent years have ranged from 12 to 32 million m³ per year (Barr, 2000).

The last major cause for deforestation is the land conversion for non-forest use. The rapid expansion of oil palm plantations in 1990s has been the major force in this category (World Bank, 1999). The strategic importance of oil palm (foreign exchange earnings, domestic cooking oil supply, rural labor absorption) has made the sector top priority for the government (Casson in World Bank, 1999). Several schemes have facilitated the growth of the sector: state owned companies (started in 1968), support for smallholders through PIR (since 1978) and PIR-Trans (from 1986-1994), and support for large scale private estate (since 1986).

Table 14. Palm oil plantation area 1990-2000 (Ha)

Year	Smallholders	Stated-owned	Private	Total
1990	291,338	372,246	463,093	1,126,677
1991	384,594	395,183	531,219	1,310,996
1992	439,468	389,761	638,241	1,467,470
1993	502,332	380,746	730,109	1,613,187
1994	572,544	386,309	845,296	1,804,149
1995	658,536	404,732	961,718	2,024,986
1996	738,887	426,804	1,083,823	2,249,514
1997	813,175	448,735	1,254,169	2,516,079

¹⁶ Scotland *et al.* (1999) estimated higher level of log consumption by the industry. The structural timber deficit therefore much bigger than one that estimated by Barr (2000). It was estimated to reach 41.2 million m³ in 1997 and 56.6 million m³ in 1998.

1998	890,506	489,143	1,409,134	2,788,783
1999	1,038,289	516,447	1,617,427	3,172,163
2000	1,093,690	523,447	1,776,284	3,393,421

Source: The Director General of Estate Crops (2001)

The area covered by these plantations grew from about 843,000 ha in the mid-1980s to more than 3 million ha in 2000. One third of oil palm plantations has been planted in the last five years (BPS in World Bank, 1999). Table 14 shows the growth of oil palm plantation area during the last ten year. Most plantations are currently I Sumatra, but Kalimantan is being rapidly developed and Irian Jaya is the primary target for future expansion (Barber and Schweithelm, 2000).

The conversion of forestland to oil palm plantations is not confined to land designated as conversion forest but frequently, in practice, include land designated as production forest (Barber and Schweithelm, 2000). It can be said that almost all of the existing oil palm plantation areas result from the conversion of production forest. This is because the procedure for acquiring forestland is relatively easy and the firm can clear cut and sell the standing timber as a profitable side business. Table 15 shows total forestland that have been converted for oil palm plantation until June 2001. From the data, it is clear that almost 80% of the existing oil palm plantation was establish by converting forestland.

The use of fire for land clearance is also a significant negative impact that brought by the vast development of oil palm plantation. Burning is attractive to plantation firm because it removes waste wood and vegetation rapidly and require relatively little heavy equipment, technical expertise and operational cost (Wakker in Barber and Schweithelm, 2000). Indonesia's haste to expand the oil palm industry has made land clearing for oil palm plantation the largest single forest fire risk factor in Sumatra and Kalimantan (Barber and Schweithelm, 2000).

Table 15. Conversion of forestland to oil palm plantation (until June 2001)

Province	Units	Area (ha)
Aceh	46	218,034.10
Bengkulu	4	25,250.00
Irian Jaya	7	194,200.56
Jambi	17	163,816.25
West Kalimantan	10	145,830.60
South Kalimantan	7	73,278.00
Central Kalimantan	40	433,980.33
East Kalimantan	22	270,651.28
Maluku	1	652.3
North Maluku	1	2,160.00
Riau	47	814,024.89
South Sulawesi	10	60,251.50
Central Sulawesi	4	57,804.00
West Sumatra	19	121,964.87
South Sumatra	6	48,457.00
North Sumatra	12	75,099.95
Total	253	2,705,455.63

Source: Director General of Estate Crops (personal communication)

FAO offered three scenarios of timber supply and demand that will affect the change of forest cover and deforestation in Indonesia (State Ministry of Environment, 1997). The first is the base scenario in which there are productivity gains in natural forests and plantations in Outer Islands, production gains in Java's plantation, and increased utilization and development of estate crops and small-scale private plantations. The second is optimistic development scenario, which has all the assumptions of the base scenario with slightly more ambitious reforestation program. The third is the traditional scenario in which there is no improvement in forest management, no plantations, and no utilization of timber from estate crops and small-scale private plantations. FAO concluded that even if optimistic long-term forecasts are used, by the year 2030 some 25-30% of the forest cover of 1990 would be lost, mostly in production and conversion forest. Assuming the worst scenario, in which total deforestation is 0.8 million hectares per year, while reforestation and rehabilitation fails substantially, Indonesia would lose another 5.6 million hectares of forest by 2003 and 19.2 million hectares by 2020.

However, for several experts, the prospect is dimmer than that¹⁷. Some argued that with the current pressure from forest fire, illegal logging and forest conversion, Indonesia's natural production forest will be in a critical point in 2005, and if an adequate reforestation program can not be implemented, the whole natural forest will be in critical condition in 2010. Unfortunately, this prediction might be true. The current level of annual log harvest was above the predicted sustainable level on 22 million m³¹⁸ and the recent decline was only caused by the degradation of the standing stock itself. The estimation by Whitten, as mentioned before, also supports that dime prediction. It was predicted that Sulawesi has lost all of its remaining lowland peneplain forest in 2000, followed by Sumatra in 2005, and Kalimantan in 2010. Heath forest was predicted to be disappear from Kalimantan in 2010, so did the wetland forest in Sulawesi in 2000.

Paper parks, fragile fortress

The tide of habitat loss and degradation has besieged Indonesia's protected area. Illegal logging and forest fire, two main symptoms of Indonesia's production forest mismanagement, are also threatening the survival of many Indonesia's biodiversity last fortress: nature reserves and national parks. Recent well-documented investigation on illegal logging activities in two important national parks, Tanjung Puting and Gunung Leuser, shows that the line of defense is already broken.

As matter of fact, Indonesia has made a strong commitment to protect its biodiversity. As noted above, TGHK reserved 30,316,100 hectares of the forest estate as the protected forest and another 18,725,215 hectares as conservation forest. The area of parks and nature reserves was even increased to reach 20,500,988 hectares after the implementation of RTRWP in 1997. There were a network of conservation area that consist of 368 units of established protected areas in January 1995 and in addition, there is a proposal to establish another 308 units of protected area covering 15.7 million hectares (State Ministry of Environment, 1997). Table 16 shows the detail description of gazette and proposed protected areas in Indonesia.

¹⁷ Hariadi Kartodihardjo, personal communication.

¹⁸ The World Bank (2000) The Bank believed that, consider the current rate of deforestation, the level of annual sustainable harvest is lower than this level.

Table 16. Gazette and proposed protected areas of different categories

Types	Gazette area (ha)	Number	Proposed area (ha)	Number
Nature Reserve	6,365,935	185	5,908,238	150
Wildlife Reserve	3,670,658	49	7,795,396	96
National Parks	7,936,255	31	1,219,100	7
Recreation Parks	649,476	79	312,944	41
Grand Forest Parks	253,307	7	48,300	4
Hunting Parks	234,599	14	418,750	10
Total	19,110,230	368	15,702,728	308

Source: State Ministry of Environment (1997)

The table shows several different types of protected areas. Indonesia's protected areas consist of strict nature reserves, wildlife reserve, national parks, recreation parks, grand forest parks, and hunting parks. Each of them has different characteristic and management requirement, as described by FAO (1990) below¹⁹:

1. Wildlife reserve; generally medium sized areas (typically 200-1600 square km) of relatively undisturbed stable habitats of moderate or high conservation importance
2. National parks; medium to large sized (typically 500-7000 square km) relatively undisturbed areas of outstanding natural values with high conservation importance, high recreation potential, of easy access to visitors, and clearly a benefit to region. These areas are generally zoned according to the intensity and type of use permitted.
3. Strict nature reserves; generally small to medium sized (typically 50-1,300 square km) undisturbed fragile habitats of high conservation importance, unique natural sites, or homes of particular rare species
4. Hunting parks; medium or large sized natural or semi natural habitats with relatively easy access for hunters, and with large population of permitted game species. Such reserves are of low conservation importance or have conservation value that are not threatened by the hunting
5. National recreation parks/grand forest parks; generally somewhat disturbed areas designed for high intensity use and limited ex situ genetic conservation respectively, and by themselves are of minor conservation value, except where they are an integral part of national park zoning scheme wherein some areas are planned for recreation

Table 17. Activities permitted and prohibited in protected areas

Activities	Protected Areas			
	Nature reserve	Wildlife reserve	Recreation parks	Hunting parks
Growing food crops	X	X	X	X
Growing tree crops	X	X	V	V
Settlement	X	X	X	X
Commercial logging	X	X	X	X
Herb + firewood collection	X	V	X	V
Hunting	X	X	X	V
Fishing	X	X	X	V
Camping	X	V	V	V
Scientific activities	X	V	V	V
Active habitat management	X	V	V	V
Non exotic introduction	X	V	V	V
Rattan + poles collection	X	X	X	V

¹⁹ According to Act No. 24/1992 on Spatial Planning that serve as basis for RTRWP implementation, protection zones are areas whose main function is to protect the environment which includes natural resources, human made resources, historical values and cultural values for the benefit of sustainable development. In the forestry sector this is translated as protected forests, peat forests, water catchment areas, natural reserves, mangrove-lined coastal area, protection areas, game parks, biosphere reserves, migrants area for wildlife, and germplasm protection reserves

Mineral exploitation	X	V	X	V
Wildlife control	X	V	V	V
Visitor use	X	V	V	V
Exotic introduction	X	X	V	V

Source: FAO (1990)

The government has also taken several strategic steps to strengthen the basis of its conservation policy. In 1989, the State Minister of Population and Environment compiled a National Strategy of the Management of Biodiversity that followed by Country Study on Biodiversity in 1992²⁰. In 1990, the National Development Planning Agency (Bappenas) formed a team to compile National Biodiversity Action Plan (NBAP) which was published in 1993. Various decrees and government regulations on protection of wildlife, like Act no. 5/1990 on Conservation of Natural Resources and Their Ecosystem²¹, Act No. 24/1992 on Spatial Planning, and Act No. 5/1994 on Ratification of the UN-CBD, has been issued afterward to support the implementation of NBAP.

The goal of the NBAP is to conserve as much as possible of the biodiversity on which the livelihood and prosperity of Indonesia depends. The plan's major objectives are:

1. To slow the loss of primary forests, wetlands, and coral reefs and other terrestrial and marine habitats of primary importance to biodiversity
2. To expand the data and information available on the nation's biodiversity and make it available to policy makers and the public
3. To foster the utilization of biological resources in ways that are sustainable and less harmful than current practice

The first priority for maintaining biodiversity must be in situ conservation, both within protected areas networks and in oceans, coastal zones, forests and agricultural landscapes outside protected areas. Ex situ conservation can be a useful supplement to species protection within natural ecosystems and for genetic variety in agricultural system. The action plan also stated the need of community participation, research and development, information use and management, and education, training and extension programs to be integrated in biodiversity conservation strategy (Bappenas, 1993).

Unfortunately, while Indonesia has placed a considerable area of the country under protection and has established a network of reserves and national parks, it has failed to establish a solid management system (MacAndrews, 1998). Although interims of area, protected zone may be adequate, lack of management skills, inter-agency coordination and public participation are currently threatening the viability of national parks, reserves and protected areas (State Ministry of Environment, 1997)

Indonesia's protected areas face pressure from low local community participation (State Ministry of Environment, 1997). As many as 65 million in Indonesia depend directly on the forest for their livelihood; this include indigenous people, farmers and tribal communities. Modern functional classification and development of the forestry sector is often in conflict with the community customary rights and tenure over land and forest resources. This stem from lack of recognition of customary laws and the boundaries separating modern forestry operation from community forest in outer islands. In the past, reserves and national parks were established by removing the access of local communities to forest. In places where

²⁰ Indonesia has also ratified the Convention on International Trade of Endangered Flora and Fauna Species (CITES) in 1978. The Directorate General of Forest protection and nature Conservation (PHPA) of the Ministry of Forestry is the management authority and the National institute of Science (LIPI) is the scientific authority. The country has also ratified Ramsar convention and established several Ramsar sites. The Ujung Kulon and Komodo National Parks have been established in World Heritage Sites while six national parks have been gazette as Biosphere Reserves by UNESCO

²¹ This act is a step towards sustainable utilization of forest resource and conservation of vulnerable ecosystems and species. The fact remains that the lack of implementation guidelines and regulations make this act less effective

government-designated forestland overlaps with areas in which forest dependent communities farm, hunt, fish and gather non-timber forest products, serious adverse impact to local communities occur.

This leads to loss of economic and socio-cultural access to forest resource, and to conflict between forestry companies with the communities as well as forestry officials and communities. These conflicts sometimes lead to community protest that create physical and ecological damage, and to non-cooperation on the part of the community. This condition makes effective management of protected areas difficult because of encroachment and destruction, resulting in even more damage in conservation area. The final result is erosion of local customary institutions and knowledge in biodiversity conservation which might otherwise offer a mechanism for increased sustainable forest management (State Ministry of Environment, 1997).

The Act No. 5/1990 attempt to overcome this problem through a provision to establish buffer zone in protected areas where controlled harvesting of forest product may be conducted by community, through tree plantation and agriculture (State Ministry of Environment, 1997). The purpose of buffer zone is to prevent encroachment on protected areas by providing areas of production to be used by the community. This might work for certain extent, but law enforcement is often weak and buffer zones are sometimes rented out to outside companies for commercial purposes, those undermining the original objectives²² (State Ministry of Environment, 1997).

At the national level, no specific agency has been assigned to manage biodiversity as whole. Instead, authorities are spread over several institutions. An evaluation on the implementation of CBD in Indonesia concluded that biodiversity conservation is a joint product²³ among various stakeholders with the Ministry of Forestry, Ministry of Agriculture and The Ministry of State for the Environment as the main agencies (Haryanto *et al.*, 1998). In fact, Indonesia's national parks are administered by the Ministry of Forestry through the Directorate General of Forest protection and Nature Conservation (PHPA). The Ministry of State for the Environment (Men LH) advises the government on conservation, environment and biodiversity policy. It has direct responsibility for environmental policy and regulation. The National Development Planning Board (Bappenas) has responsibility for incorporating conservation needs into macro development policies in the five years and 25 years development plan. The provincial planning agency plays an important role in decision on the location of national parks in individual province. The Ministry of Agriculture, through the National commission on Conservation of Germplasm (KNPPN) is responsible for the conservation of crop, medicinal and livestock biodiversity. The other sector also have the responsibility, although limited and often indirect, through the Environmental Impact Assessment (EIA/AMDAL) since their activities of many other sector (mining, transmigration and public works) have considerable impact on biodiversity (Bappenas, 1993; State Ministry of Environment, 1997; MacAndrews, 1998)

²² The main approach to conservation in Indonesia in the 1990s has been through the Integrated Conservation Development Program (ICDP). While some individual ICDPs are promising, they have not had any significant impact on biodiversity conservation, and they are not sustainable (Wells *et al* in World Bank, 2000). The main problem lies in the seemingly incomplete approach to biodiversity conservation. The ICDP focus on local communities as the primary threat to protected areas and biodiversity, whereas the major threat are from large scale operations such as road construction, mining, logging concession and sponsored migration. At the same time, ICDP efforts to establish incentives for conservation by investing in local development are frustrated by inadequate law enforcement and expropriation of natural resources by non local interests. Thus although in principle the past government tried to strike a balance between conservation and the productive use of forest, in practice-its actions-including lack of attention to governance issues-have shown a preference for the exploitation of forests over conservation (World Bank, 2000)

²³ Joint product was developed from joint use concept from Orstrom, Schroeder and Wynne (1993). Joint use refer to a product that is simultaneously utilized or consumed by many stakeholders

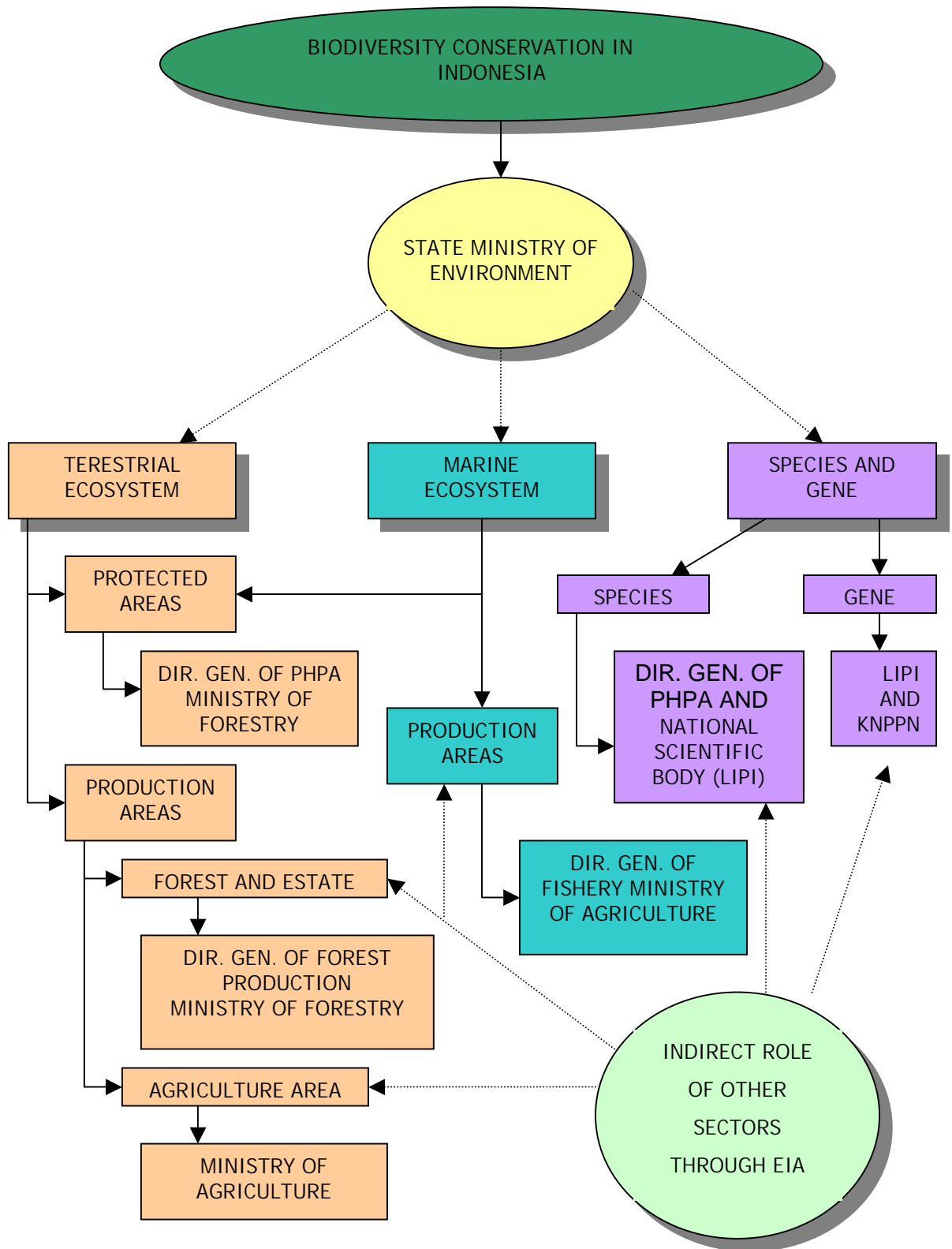


Figure 4. The institutional framework for biodiversity management in Indonesia

The number of stakeholders with different authority and interest in biodiversity conservation may trigger conflict among government agencies and levels. There is often conflict of interest at the national, provincial and local level. For example, although PHPA in the Ministry of Forestry is given the mandate to plan and manage conservation areas, there are many cases in which there is overlap between the authority of PHPA and the authority of provincial or local government. Sector conflict is also a serious issue in which oil and mining exploration in conservation areas often conducted without proper coordination with forestry authority (State Ministry of Environment, 1997). Many sectors act like free riders that put all the burden of biodiversity conservation to the leading agencies, especially Ministry of Forestry, while their activities constantly erode it (Haryanto *et al.*, 1998)

This conflict is worsened by the ambiguity of the Ministry of Forestry's dual role in forest management. The ministry of forestry is responsible for protection (conservation entity) and production (business entity). There are circumstances in which the functions of protection and production can conflict, and short term economic considerations often ensure that protection loses out (IEED, 1985). The fact that conservation does not bring in revenue made it is of low priority for regional governments and even for the Ministry of Forestry until recently (State Ministry of Environment, 1997)

Table 18. Budget allocation of PHPA in 2000 (Rp. '000)

	Routine	State Budget (APBN)	Foreign Assistance	Forest resource provision fee (PSDH)	Reforestation Fund (DR)	Total
Central Office	3,515,905	619,657	11,236,200	1,312,250	18,111,035	34,795,047
22 National Park Offices (balai)	8,199,508	3,682,470	4,348,798	4,273,037	9,924,715	30,428,528
12 National Park Units (UPTs)	2,059,738	1,549,751	0	1,091,008	4,917,210	9,617,707
32 Regional Offices (KSDAs)	0	0	0	4,982,164	21,510,103	26,492,267
Total	13,775,151	5,851,878	15,584,998	11,658,459	54,463,063	101,333,549

Source: Directorate General of PHPA (2001)

Other serious constraint to the effectiveness of conservation program to date has been the weak capability of PHPA as leading conservation agency. PHPA is believed to have limited financial resources. Many parks do not obtain enough funds to support their activities. However, this shortage partly is affected by the inefficient budget allocation among management levels in PHPA. Table 18 shows that central office in Jakarta obtained bigger financial support than all level of field management units (balai, UPTs and KSDAs). It controlled 34% of the total budget compare to KSDAs that received only 26% but have to manage 234 reserves all around Indonesia. This management level also obtains bigger share in foreign assistance and reforestation fund when compared to national parks. This inefficient allocation made many field management units facing financial trouble while the resources actually were not scarce.

Shortage of trained staff is another major constraint. However, similar with the financial resources, the human resources also distributed inefficiently. The staffs' distribution is not based on needs but on bureaucracy consideration (MacAndrews, 1998). This scheme made many small parks being grossly over staffed and large ones understaffed. In addition, there is a lack of skilled technical and management professionals in the field, even though overall staff numbers are high.

The picture is obvious. The biodiversity conservation policy in Indonesia, as a joint product, has created a weak leading agency and many free riders (Haryanto *et al.*, 1998). While most of its strategy was focused on the creation of protected areas network for in situ biodiversity conservation, they are face low social acceptance, latent local tenurial conflict, encroachment from other sector, inefficient management, and weak program implementation. It becomes apparent that many reserves, especially on the Outer islands, are poorly equipped, have no staffs, no budget, and no effective protection. A large part of the 368 established protected areas at present have not been surveyed, mapped or have a clear boundaries (ADB in State ministry of Environment, 1997). Eventually, they are just paper parks that cannot shelter them from the outside threat of habitat deterioration. A fragile fortress for the fate of Indonesia's biodiversity.

The Indonesian NGOs have played an active role in stimulating public interests on biodiversity issues, urging government to strengthen conservation and environmental issues in national legislation, policy documents and development activities. Indonesia has more than 400 NGOs working with the local communities to resist and counter destruction and simplification of habitats (FAO, 1990). However, that's not enough. As recommended in NBAP, successful implementation of the action plan (and also biodiversity conservation as whole) in each area will require reform and strengthening of policies, institutions and legal arrangements, strong inter-sector cooperation, strengthening of arrangements for public participation. Something that, according to Haryanto *et al* (1998), rarely to be achieved when transaction cost for those reform is high, reluctantly and only partially paid or just shifted by the free riders to the local community and the sustainability of the resource itself.

Re-arrange the framework: giving sustainability a chance

The problems rooted deep in the structure of Indonesia's economy and politic. Forests were never valued as natural resources as whole but only as economy and political resources. For years, the drive for forest sector reformation was impeded by the government's paradigm that sees forest as an economic asset to be liquidated for economy diversification or as precious resources but could be sacrificed to finance the industrialization (Ascher, Ross in Sunderlin and Resosudarmo, 1997). This condition made the production aspect receives more attention in the forest management than the conservation aspect (State Ministry of Environment, 1997).

King in Sunderlin and Resosudarmo (1997) argued that the significant reform could only be possible when there is a change in ruling regime, a critical condition in domestic wood supply or external threat for Indonesia's forest product export. However, the momentum arrived from an unpredicted direction. The Asia's financial crisis which started in 1997 had stimulated the process of democratic transition in the ruling regime and opened the door for that reform. It is true that the crisis have increased the pressure faced by Indonesia's natural forests and the communities that depend on them, but on the other hand, the opportunities have never been greater for fundamental forest policy change that might lead to improvement (Sunderlin, 1999). Donor institutions, especially The World Bank and IMF, have used this momentum to force forest policy reform as part of conditionalities to be implemented for obtaining multilateral financial support (Barber and Schweithelm, 2000; Seymour and Kartodihardjo, 2000).

Table 19. Biodiversity management in Indonesia after decentralization

Level of Biodiversity Unit	Government Units	
	Central Government	Local Government
Preservation Areas		
• National Parks	Dir. General of PHPA (balai and UPTs)	-
• Grand Forest Parks	State Owned Company (Perhutani) in Java	Local Government in Outer Islands
• Recreation Parks	State Owned Company (Perhutani) in Java	Local Government in Outer Islands
Nature Reserves		
• Nature Reserves	Dir. General of PHPA (KSDAs)	-
• Wildlife Reserves	Dir. General of PHPA (KSDAs)	-
• Hunting Parks	Dir. General of PHPA (KSDAs)	-
Protection Forest	-	Local Government (regencies)
Production Forest	Dir. General of Forest Production through HPHs	Local Government (regencies) through small scale concessions
Non Forest Production Area		
• Terrestrial	Ministry of Agriculture	Local Government
• Marine	Ministry of Marine and Fishery	Local Government
Species and gene	Dir. General of PHPA, LIPI, KNPPN	-

Source: various sources (shaded areas are new roles or new institution)

Those reform, as included in the Letter of Intent (LoI) and other supporting agreement, can be classified into three groups: reform affecting market structure (reduction of export taxes on logs, sawn timber and rattan up to 10%; removal of the restrictive forest products marketing arrangement as embodied in APKINDO-the exporters' cartel of plywood; incorporate the Reforestation Fund into the central government budget rather than retention under the unmonitored control of Ministry of Forestry, and ensure that funds are used exclusively for financing reforestation), direct taxation (increase in forest land tax; abolition of existing forestry levies and their replacement by a resource rental tax; linkage of forest royalties to the world price), and ownership (reform of logging concession regulations to allow for periodic review of stumpage charges, lengthening the concession terms beyond the current of 20-years limit, and authorization to trade concession rights in order to give concessionaires a commercial incentives to practice better forest management; competitive auctioning of concession rights; moratorium in issuing new logging licenses until these new measures are in place; introduction of performance bonds on forest operation; introduction of independent system for monitoring forest resources, including participation of local communities).

However, the proposed reform was far from perfect. Biodiversity conservation was not viewed as integral part of forestry reform and not clearly articulated in reform packages. The conditionalities often have been criticized for their unrealistic tight deadline, their inconsistency, completeness and feasibility (Seymour and Kartodihardjo, 2000; Barber and Schweithelm, 2000). Different from recommended structural reform in other economy sectors, forestry policies are complex and many of the actions mandated by IMF, such as auctioning concession, have no precedents in Indonesia. Thus the deadlines for many of the forest policy related conditions have been allowed to slip, although pressure to complete it

continues (Barber and Schweithelm, 2000). The consistency has been questioned because there were some competing objectives in the policy package, while their feasibility was doubted since they did not address the necessary condition for many of the efficiency oriented reforms (Kartodihardjo, 1999). Moreover, their contribution to biodiversity conservation also unclear.

The proposed reforms only focused in improving efficiency within the existing forest management paradigm, which was based on large scale corporate concession, and ignoring the adat ownership issues (Seymour and Kartodihardjo, 2000). Barr (2000) argued that structural reform of the HPH alone will not able to address key factors that are encouraging unsustainable rates of log removals, most notably effective demand for timber on the part of the nation's wood processing industries and new technologies that have made previously marginal areas and species commercially viable. The effectiveness of the proposed policy interventions is likely to be limited in that they:

- Seek to control timber supply without reducing effective demand on the part of Indonesia's wood-based industry
- Overlook or inadequately address roundwood extraction from large areas, including areas designated protection and conversion forest, as well areas under state-owned company (Inhutani) control
- Fail to provide a credible plan for reducing illegal logging
- Encourage investments in efficiency without regard for the often damaging impacts that such investments may have on natural forests
- Assume that sustainable concession management is profitable over both the short and long term, in spite of strong indications to the contrary after the crisis
- Assume, without evidence, that the Government of Indonesia has the institutional capacity needed to make systemic changes to HPH system and the forest product trade

Barr (2000) also argued that the current decentralization scheme have worsened the situation and exacerbated the existing institutional weaknesses. Under the decentralized system, significant responsibilities for forest sector policy making and planning remain with the Ministry of Forestry in Jakarta, while implementation responsibilities lie with the kabupaten governments that previously played a minimal role in forest management, little technical capacity and currently is driven with the needs for maximizing local financial income (see Table 19). This implies that implementation of a coherent policy for sustainable timber extraction will require a substantial amount of coordination across the various tiers of government with competing institutional interests. Decentralization, therefore, does not reduce the transaction cost for sustainable forest management nor biodiversity conservation.

So, what the Indonesia have are nothing more than a basket of troubles. The problem is enormous but the time is limited. There were a momentum for change but the "donor driven reform" was not complete enough and only stimulated "a half hearted reformation" (Seymour and Kartodihardjo, 2000). A new Forestry Law was formulated but could not escape the same old mistake from intransparency and state domination (Seymour and Kartodihardjo, 2000). The local institutions capacities were weak but, under decentralization, their authorities were increased. Then, what to do to overcome the problem in the next five year, when the natural production forest were predicted to be in critical point, is not easy question to answer.

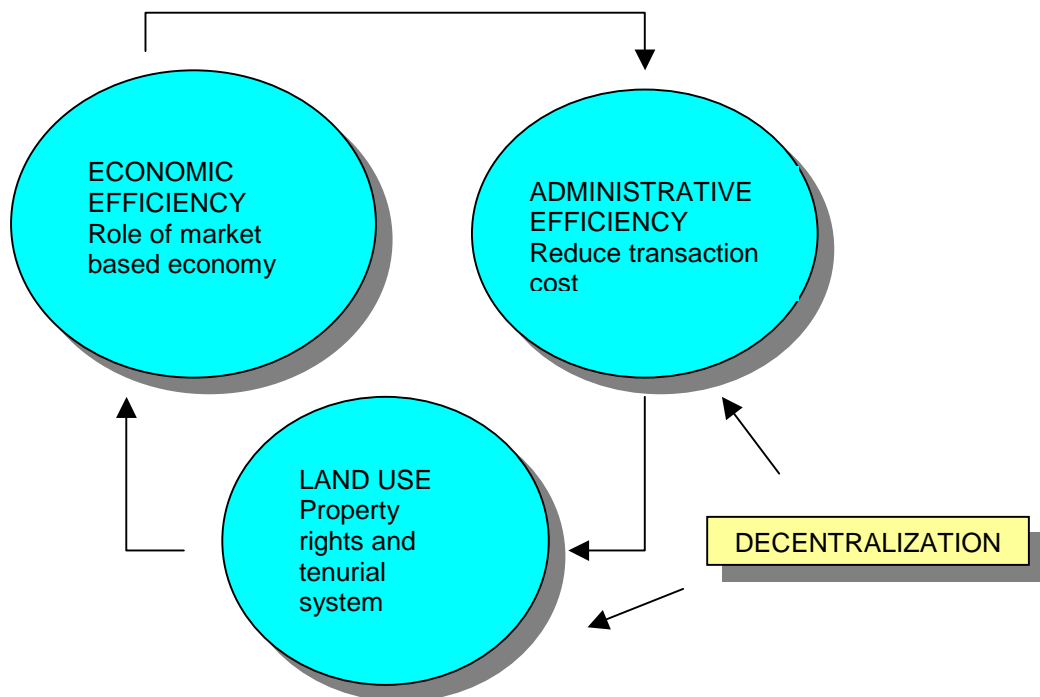


Figure 5. Inter-related systems in sustainable forest management
Source: Kartodihardjo (1999)

There are three inter-related conditions that must simultaneously be addressed to achieve sustainable forest management which include biodiversity conservation as integrated part (Kartodihardjo, 1999) Figure 5 shows that market efficiency, administrative efficiency and land use arrangement can not be treated separately and must be implemented comprehensively to the forests area. The previous reform proposed through LoI was heavily emphasized on market efficiency for large scale concession forest. A change then was made on the later reform package agreed by the government and CGI donor countries. Eleven actions that were formulated in four programs (sustaining the remaining forest, redirection and reformation on existing forest management, restructuring on forest industry based on timber resources, and forest management in decentralization era) have covered those conditions. These commitments are good starting point to force the needed reform. The time is running out but still there is no short cut for a fundamental improvement.

However, to be implemented effectively, some extra attention must be given to the administrative efficiency condition. Previous analysis showed that institutional arrangement in forest management and biodiversity conservation was dominated by inefficient management, high transaction cost that creates free riders and rent seekers, and limited resources. This uncondusive framework has failed the prerequisites for NBAP implementation, such as law enforcement, inter sectoral coordination, and clear management responsibility. Figure 6 shows the typology of condition for biodiversity conservation in Indonesia based on existing institutional arrangement. The vertical axis shows the level of biodiversity degradation, while the horizontal axis shows the level of resources (and capacity) in the institutional structure. No region can be classified to best practice in this typology and most of them classified under extractive management arrangement.

Box 2. The Case of Gunung Leuser National Park

Gunung Leuser National Park covers nearly 910,000 hectares area in the north of Sumatra Island from the mountainous area of Bukit Barisan mountain range until turtle beaches, mangroves, swamp land and lowland rainforest in the southern part of Aceh province. This park formerly consisted of a number of nature reserves that preserve 325 bird species and at least 105 mammals species (60 percent of the Sumatran total) such as Sumatran tiger, Sumatran rhinoceros, orangutan, clouded leopard and Asian elephant. The park and the surrounding ecosystem are also important for protecting the water supply, preventing flooding down stream and act as carbon sink.

A development and management project for the Leuser ecosystem was created during the New Order regime. The project, known as Leuser Management Unit (LMU), is a joint of Indonesia government and European Union funded project which is designed to manage the park and the surrounding ecosystem, including protection and production forest that overlaps two provinces (Aceh and North Sumatra) and eight regencies in total of 2,1 million hectares with two million people live in the surrounding area. LMU's implement five major ICDP program areas including conservation (park management, boundary demarcation, and law enforcement), buffer zone development (outside the park but inside its ecosystem), intensive zone development (outside the ecosystem but inside the regency that include the ecosystem) and research, monitoring and evaluation.

The project already break new ground in conservation by having (a) paid substantial attention to establishing strong political support, a sound legal basis, and functional institutional arrangements at a high level, (b) established a well supported project management unit independent from the ministry of forestry in a provincial capital rather than in the park, (c) ensured continuity between the preparation and implementation phases, (d) understood the importance of balancing positive incentives with the law enforcement, (e) established a flexible financing mechanism, (f) adopted a landscape – ecosystem scale approach.

However, the threats for the park is yet to be overcome. The project can do little about large scale organized illegal logging, poorly managed forest concessions on the park boundaries, conversion in neighboring forest for estate and transmigration site, and road construction in and around the park. The project has been criticized for its top down approach and for working principally with government agencies. The project failed to develop a coherent bottom up process for villagers to participate directly in the project. This weakness made the project obtained inadequate support from the grass root community and villagers that after the "reformation era" are becoming more aware on the opportunity to take some control of the land and extract the resources. Stirred by the local timber barons with military and police support, who are exploiting the current vacuum of power, the project found itself in a difficult position vis a vis with the "community". Meanwhile, illegal encroachment and logging inside the park are clearly expanding and are apparently not constrained by any enforcement measure. Like other ICDP scheme, so far, the project cannot address the underlying threat to biological diversity and can only play a modest role in mitigating the powerful forces causing environmental degradation.

Source: Barber, Afiff and Purnomo (1995), Telapak Indonesia (1999), Wells *et al.* (1999)

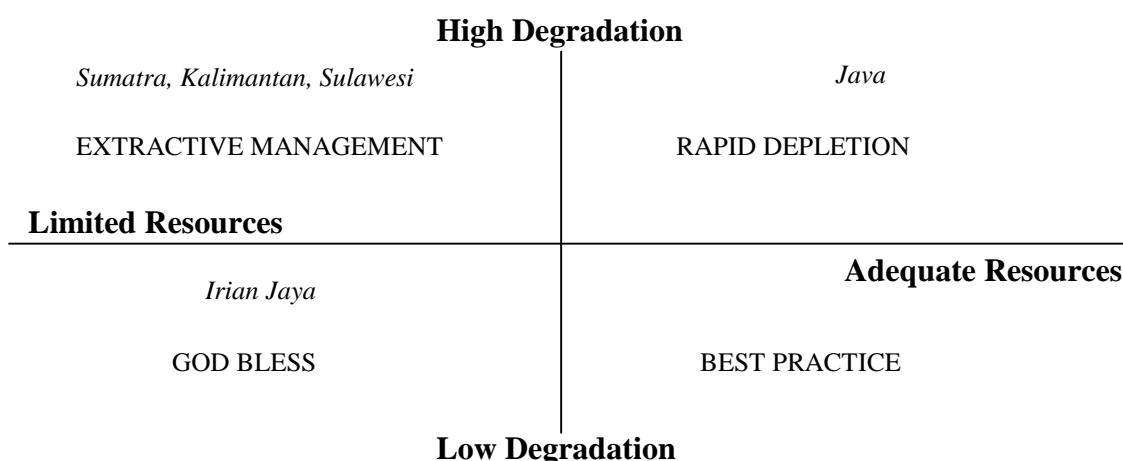


Figure 6. Typology of biodiversity conservation condition in Indonesia

Institution structural re-arrangement then must be the first priority in improving the administrative efficiency. Table 20 shows the framework approach for the re-arrangement to achieve the biodiversity conservation goals in Indonesia. The framework is based on the involvement of broad range actors with clear management responsibility in every spatial and political units. The framework accommodates the significant role of local government and local initiatives in conserving biodiversity in accordance with regional autonomy and decentralization scheme. Local government was not only responsible in rational use of forest as natural resources, but also in improving local people welfare, good management of conservation areas, and maintaining clear, secure and conflict-free conservation areas.

Table 20. Logical framework of conservation goals in Indonesia

Conservation goals in Indonesia			
Clear, secure and conflict-free conservation area	Good management of conservation areas	Local people welfare	Rational use of forest resources
Good Public national/local policy on conservation areas determination	<ul style="list-style-type: none"> • Strong formal conservation institutions • High local participation 	<ul style="list-style-type: none"> • High local people income • Legal recognition of local right • Spiritual security and health insurance • High awareness of local people on environment 	<ul style="list-style-type: none"> • Strong natural resources management policy at national/local level • High environmental awareness of economic actors
Central government, local government, PHPA	Central government, local government, PHPA, NGOs	Central government, local government, PHPA, NGOs	Central government, local government, PHPA, business or private sectors (HPHs etc), local people, NGOs
Good scientific information/database at provincial level	Good site-specific information/database on certain conservation areas	Good site-specific information/database on certain community group	Good site-specific information/database on natural resources
PHPA, scientific community, local government	PHPA, NGOs, scientific community, local people	NGOs, local people, scientific community	PHPA, Central government, scientific community

The framework is important to enable the development of specific conservation strategy based on existing problems' typology. The site-specific strategy must be developed because there are no generic measures that can be applied to protect biodiversity. Figure 7 shows that a generic strategy is not possible for Indonesia and every typology required different strategy. First quadrant typology needs priority setting strategy to protect high significance conservation area. Second quadrant typology needs social engineering to control the degradation so at least it could be pushed towards first quadrant. Meanwhile, the third typology quadrant needs capacity improvement to move towards sustainable utilization in the fourth quadrant or at least hold them not to move to the second quadrant.

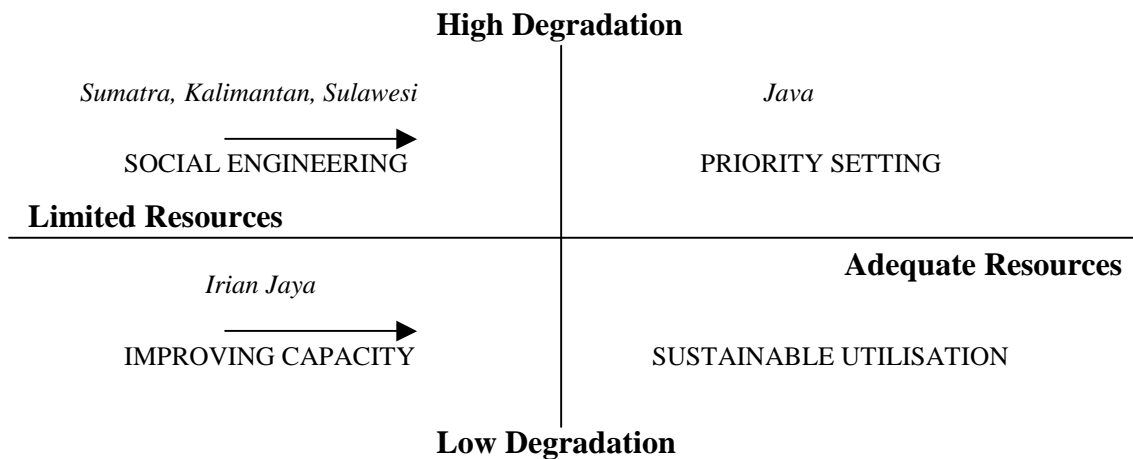


Figure 7. Strategy for Biodiversity Conservation Based on Typology

Epilogue

The conditions of the forest are determined, not by decisions about or within it, but by the forces that control in what degree such decisions can be implemented (Romm in IEED, 1985). The problems have been identified, solutions and actions for reform have been proposed but still the road of implementation is a long way to go. Romm was right, the issue is about people, the institution that they built and the way it is arranged. Action to overcome the symptom and the direct causes of deforestation and biodiversity depletion must be conducted continuously. The commitment should be kept alive. However, the necessity should not be overlooked. The inter-related linkage between market, administrative and land use efficiency for reform require a fundamental re-arrangement of institutional framework to be implemented. For years, uncondusive frameworks have impeded the effective reform and it should no longer be.

No one can ensure the outcome. Five or ten years are very brief period to turn the table around. Even if all the necessity is conducted, there will be no assurance that Indonesia's forest can escape the critical point. May be Indonesia has to learn to live without natural forest, learn to adjust with depleted biodiversity. A "doomsday scenario" should be prepared. But, there is an obligation to do the right thing. Even a slightest possibility must be utilized optimally. There are strategies for improvement that can be conducted. So, let them be conducted. Who knows?

Bibliography

- Ahmad, M. 1995. The role of timber production in Indonesian economy: reality or illusion? Konphalindo, Jakarta.
- Bappenas. 1993. Biodiversity action plan for Indonesia. Government of Indonesia, Jakarta.
- Barber, C.V. and Schweithelm, J. 2000. Trial by fire: forest fires and forestry policy in Indonesia's era of crisis and reform. World Resources Institute, Washington DC.
- Barber, C.V. 1996. Environmental scarcity, state capacity and civil violence. Indonesia case study. (Third Draft). World Resources Institute, Washington DC.
- Barber, C.V., Afiff, S. and Purnomo, A. 1995. Tiger by the tail? Reorienting biodiversity conservation and development in Indonesia. World Resources Institute, Washington DC.
- Barr, C., Brown, D., Casson, A. and Kaimowitz, D. 1999. Corporate debt and the Indonesian forestry sector. Forthcoming in Colfer, C.J.P. and Resosudarmo, I.A.P. Which way forward? Forest, policy and people in Indonesia. Resources for the Future, Washington DC.
- Barr, C. 2000. Will HPH reform lead to sustainable forest management? Questioning the assumptions of the "Sustainable Logging" paradigm in Indonesia. Forthcoming in Colfer, C.J.P. and Resosudarmo, I.A.P. Which way forward? Forest, policy and people in Indonesia. Resources for the Future, Washington DC.
- Bryant, D., Nielsen, D. and Tangle, L. 1997. The last frontier forests: ecosystem and economic on the edge. World Resources Institute, Washington DC.
- FAO. 1990. Situation and outlook of the forestry sector in Indonesia. Volume I-IV. Ministry of Forestry, Jakarta.
- Gillis, M. 1988. Indonesia: public policies, resource management, and the tropical forest. *In*: Repetto, R. and Gillis, M. (eds.) Public policies and the misuse of forest resources, 43-113. World Resources Institute, Washington DC.
- Haryanto., Triwibowo, D., Jalal. and Setyobudi, Y.T. 1999. Beyond the ratification of UN-Convention on Biological Diversity: a policy analysis. Unpublished.
- Hill, H. 1996. Transformasi ekonomi Indonesia sejak 1966: sebuah studi kritis dan komprehensif. PT Tiara Wacana, Jogjakarta.
- International Institute for Environment and Development (IIED). 1985. A review of policies affecting the sustainable development of forest lands in Indonesia. Volume II. Government of Indonesia, Jakarta.
- Kartodihardjo, H. 1999. Masalah kebijakan pengelolaan hutan produksi. Pustaka Latin, Bogor.
- MacAndrews, C. 1998. Improving the management of Indonesia's National Parks: lessons from two cases studies. BIES, Volume 34, No. 1. The Australia National University.
- Manurung, E.G.T. and Saragih, J. 1999. Konversi hutan alam di Indonesia. WWF Indonesia, Jakarta.

- Panggabean, A., Brojonegoro, B. and Panggabean, M. 2000. Understanding the Indonesian crisis: the first step towards recovery. *In: EDAP Joint Policy Studies 9 Proceedings*. UNDP and Korea Development Institute, Seoul.
- Prakosa, M. 1996. Rencana kebijakan kehutanan. Aditya Media, Jogjakarta.
- Ramli, R. and Ahmad, M. 1991. Rantai ekonomi pengusaha hutan di Indonesia. WALHI, Jakarta.
- Scotland, N., Fraser, A. and Jewell, N. 1999. Pasokan dan permintaan kayu bulat dalam sektor kehutanan di Indonesia. Indonesia-UK Tropical Management Programme, Jakarta.
- Seymour, F.J. and Kartodihardjo, H. 2000. Indonesia. *In: Seymour, F.J. and Dubash, N. K. (eds.) The right conditions: the World Bank, structural adjustment and forest policy reform*, 83-112. World Resources Institute, Washington DC.
- Soule', M. E. 1993. Conservation: tactics for a constant crisis. *In: Potter, C.S., Cohen, J.I. and Janczewski, D. (eds.) Perspective on biodiversity: case studies of genetic resources conservation and development*, 3-17. AAAS Press, Washington DC.
- State Ministry of Environment. 1997. Agenda 21-Indonesia: a national strategy for sustainable development. UNDP, Jakarta
- Sunderlin, W.D. 1999. Between danger and opportunity: Indonesia and forests in era of economic crisis and political change. CIFOR, Bogor.
- Sunderlin, W.D. and Resosudarmo, I.A.P. 1997. Laju dan penyebab deforestasi di Indonesia: penelaahan kerancuan dan penyelesaiannya. Occasional Paper No. 9. CIFOR, Bogor.
- Suparna, N. 2000. Penebangan liar (pencurian kayu) dari perspektif rimbawan praktisi *In: Proceeding on Lokakarya II Penebangan Kayu Secara Liar (Illegal Logging)*. The World Bank, WWF and Ministry of Forestry, Jakarta.
- Telapak Indonesia. 1999. The final cut: illegal logging in Indonesia's orangutan parks. Environmental Investigation Agency, Washington DC.
- Wells, M., Guggenheim, S.A., Khan, W., Wardojo. and Jepson, P. 1999. Investing in biodiversity: a review of Indonesia's integrated conservation and development projects. The World Bank, Washington DC.
- World Bank. 2000. Indonesia: the challenges of World Bank involvement in forests. Evaluation Country Case Study Series. The World Bank, Washington DC.
- World Bank. 1999. Forest use policies and strategies in Indonesia: a need for change. The World Bank, Washington DC.