ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY II

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INDONESIA FORESTRY OUTLOOK STUDY

by

Center for Forestry Planning and Statistics
Ministry of Forestry

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC

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Contents

INFORMATION NOTE ON THE ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

The Asia-Pacific Forestry Sector Outlook Study (APFSOS) is a wide-ranging initiative to gather information on, and examine, the evolution of key forestry issues as well as to review important trends in forests and forestry. The main purpose of the study is to provide a better understanding of the changing relationships between society and forests and thus to facilitate timely policy reviews and reforms in national forest sectors. The specific objectives are to:

1. Identify emerging socio-economic changes impacting on forest and forestry
2. Analyze probable scenarios for forestry developments to 2020
3. Identify priorities and strategies to address emerging opportunities and challenges

The first APFSOS was completed in 1998, with an outlook horizon to 2010. During its twenty-first session, held in Dehradun, India, in April 2006, the Asia-Pacific Forestry Commission (APFC) resolved to update the outlook extending the horizon to 2020. The study commenced in October 2006 and is expected to be completed by September 2009.

The study has been coordinated by the Food and Agriculture Organization of the United Nations (FAO), through its regional office in Bangkok and its headquarters in Rome, and implemented in close partnership with APFC member countries with support from a number of international and regional agencies. The Asian Development Bank (ADB), the International Tropical Timber Organization (ITTO), and the United Kingdom's Department for International Development (DFID) provided substantial financial support to implement the study. Partnerships with the Asia-Pacific Association of Forest Research Institutes (APAFRI) and the Secretariat of the Pacific Community (SPC) supported the organizing and implementing of national focal points' workshops and other activities, which have been crucial to the success of this initiative. The contributions of many other individuals and institutions are gratefully acknowledged in the main APFSOS report.

Working papers have been contributed or commissioned on a wide range of topics. These fall under the following categories: country profiles, sub-regional studies and thematic studies. Working papers have been prepared by individual authors or groups of authors and represent their personal views and perspectives; therefore, opinions expressed do not necessarily reflect the views of their employers, the governments of the APFC member countries or of FAO. Material from these working papers has been extracted and combined with information from a wide range of additional sources to produce the main regional outlook report.

Working papers are moderately edited for style and clarity and are formatted to provide a measure of uniformity, but otherwise remain the work of the authors. Copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained from:

Mr. Patrick Durst
Senior Forestry Officer
FAO Regional Office for Asia and the Pacific
39 Phra Atit Road
Bangkok 10200
THAILAND
Ph. (66-2) 697 4000
Fax: (66-2) 697 4445
Email: patrick.durst@fao.org

EXECUTIVE SUMMARY

It is generally acknowledged that forest resources not only have local impact but also national, regional and even international impact. Thus, it becomes a global concern to preserve all forest resources through various schemes for their sustainable development. However this is not an easy task. It needs comprehensive and concerted efforts from all stakeholders including non-forestry stakeholders.

Currently, the total degraded forest area in Indonesia is around 33.4 million hectares excluding Convertible Forest. These degraded lands are a high priority for intervention because of the vast land area involved, the rapid rate of change of land status from forested to other uses, and because of the relatively unmanaged status of much of this land. This is also a high priority because it is one of the most obvious and logical places to begin to think about rationalizing the forest estate and allowing more equitable and pro-poor access and activities. Given the reduction of services, non-wood forest products (NWFPs) and timber supplies from natural forests, forest rehabilitation and plantation development become of central importance to the forestry sector in Indonesia.

Three main objectives for managing forestland have been identified in Indonesia: supporting economic development, improving rural livelihoods and reducing poverty, and producing environmental services and benefits. To accomplish any of these objectives, considerable work on governance issues including law enforcement, decentralization, conflict and inequity, are needed the most. Economic development to finance investment in the forestry sector is needed as well. However, these two factors are the most uncertain and unpredictable of the five most important factors in the development of this outlook: population and labor change, environmental threats, economic development, and governance issues.

Based on the effectiveness of policy implementation and institutions and the economic growth rate, a scenario analysis has been developed. By doing this, policy measures can be developed that take the main risks to the sector into account. This also provides an opportunity to reflect on forestry as one of the many sectors within a dynamic economy. Within this framework, consideration was given to the two major forestry policy objectives: forest rehabilitation and plantation development. As a result, four scenarios have been developed and analyzed, namely: socio-economic development stalls (S1), unsustainable growth (S2), low-growth development (S3) and sustainable development (S4).

The results show that only under S3 and S4 can Indonesian forest resources be assumed to be under sustainable forest management. Secondary forest and plantations areas are significantly increased, while non-forested areas are drastically declined over the period analysis of 2006-2020. Primary forests also decline, but this is due to sustainable harvesting.

The state of Indonesian forest resources in 2020 achieved under sustainable forest management would be:

- Production Forest: primary forest ranging from 8.5 to 8.6 million ha, secondary forest from 31 to 31.2 million ha, TPTII/SILIN system from 0.3 to 0.6 million ha, pulpwood plantation from 2.6 to 3.3 million ha, community timber plantation from 1.6 to 3.2 million ha, timber plantation from 1.5 to 1.7 million ha, and non-forested areas from 10.7 to 13.2 million ha
- Protection Forest: primary forest, secondary forest, non-forested areas are respectively 13.3 million ha, 10.5 million ha, and 5.6 million ha
- Conservation Forest: primary forest, secondary forest, non-forested areas are respectively 10.1 million ha, 5.5 million ha, and 3.9 million ha

- Convertible Production Forest: primary forest, secondary forest, non-forested areas are respectively 5.3 million ha, 5.3 million ha, and 12.2 million ha

Given the future state of Indonesian forest resources in 2020 mentioned above: the annual production and consumption growth of plywood, block board, sawnwood, and pulp would be increased to 10-15%, 28-34%, 17-23%, and 9-10%, respectively; while, their annual export growths would be increased to 12-17%, 28-34%, 17-23%, and 7-8%, respectively.

Moreover, the plywood, veneer, and block board industries as well as the sawnwood industry would still face a log deficit until 2017 given their capacities of 23 million m^3 RWE (round wood equivalent) and 21 million m^3 RWE, respectively. Those industries could even increase their capacities by 45% and 32%, respectively, if the timber production level for 2020 was achieved.

On the other hand, given installed capacity of 29 million m^3 RWE, the pulp industry could increase its installed capacity to 2009. It could even triple its capacity, if the timber production level for 2020 is achieved. However, this expansion opportunity is not as easy as it looks due to many critical problems facing Indonesia's forest product industry. To this end, the Ministry of Forestry has successfully developed "A Road Map for the Revitalization of Indonesia's Forest Industry."

Given the future state of Indonesian forest resources in 2020, there would be also direct employment generation in the range of 675-836 000 even though there may be substantially larger numbers of people who are "forest dependent" and people who work in small-scale sawmills and other processed wood industries.

Because data for most NWFPs and forest provided services are scarce and often inconsistent, their futures were addressed through estimating changes in environmental costs and forest stock values instead. Environmental costs were related to forest service loss due to illegal logging, whereas environmental benefits were related to forest service gains due to forest rehabilitation. In addition, change in forest stock values due to policy interventions such as forest rehabilitation and plantation development or illegal logging will reflect change in forest resource capacity to provide forest services and NWFPs. Over the period 2006-2020, total changes in environmental costs and forest stock value range from US$3.91 billion to US$7.48 billion, respectively. Of which, +US$0.25 billion to +US$0.29 billion is due to changes in natural forest stock value given the future state of Indonesian forest resources in 2020.

To ensure effective policy implementation, the essential pillars of good governance including transparency, rule of law, law enforcement, conflict resolution, decentralization, and dialogue-decision processes should be improved. Some opportunities have been identified in relation to good governance improvement: central government is re-orienting basic natural resource policies; local governments are becoming more responsive and accountable; civil society and business are repositioning for more constructive relationships; policy-making is more consultative and transparent; local governments and parliaments are better informed about forest and land issues; companies are more aware of the importance of partnerships and community engagement; and civil society groups are more engaged in development processes, government operations, and resource allocation decisions.

On the other hand: the political economy of rent seeking; weak incentive for sound and sustainable land and forest management; inadequate enforcement of the legal framework on holders of forest use rights; fire; roads through forested area, which could stimulate encroachment; illegal logging, wildlife trade, and land conversion; and political-economic change i.e. China's rapid growth in recent years as a competitor for sources of foreign direct investment, were also identified as threats to achieve the future state of forest resources.

Recognizing that there would be convergence between goals, allocated forest functions, and environmental conditions in some cases and discord in other cases, and considering that forest rehabilitation and plantation development will focus on degraded forest areas, strategic actions and policies should focus on economic development and poverty alleviation options in degraded Production Forest, and promotion of environmental service delivery in degraded Protection Forest and Conservation Forest.

Many options for economic development and poverty alleviation such as management, models, cross-learning, and incentives, and promoting community-company partnerships to open new kinds of benefit sharing, as well as new lands, for timber production are needed for planting more trees for production/timber uses in degraded lands. However, this tree planting will succeed only if better incentives for long-term investment, management, stewardship and production are provided.

Since it is not possible to return degraded Protection Forest and Conservation Forest lands to a fully natural state, options for producing environmental services and benefits should focus on management and rehabilitation of these areas to a state where they can produce more of the services for which they are allocated. Rehabilitation should focus on steep slopes and riparian land. Land re-classification that harmonizes slope/condition with function should be supported. High conservation value forests within protection forest areas might be good candidate areas for reallocation into conservation areas, especially if they are part of critical wildlife corridors or within the range of endangered or endemic species.

Options for improving governance and management focus on promoting transparency, independence, and accountability in the use and management of data on forestry land and production. But this should be accompanied by effective disclosure mechanisms so that the public and affected stakeholders can access the information in ways that are effective and useful to them in interacting with forest sector decision-makers.

In efforts to curb illegal logging, actions such as building capacity to carry out law enforcement; amending national laws and regulations to strengthen law enforcement efforts; and prosecuting those behind major forest harvesting, processing and transportation crimes could help to improve law enforcement.

On degraded Production Forest, enforcement efforts could usefully focus on reducing impacts of land clearing and the risks of fire. On Protection Forest and Conservation Forest, beyond efforts to curb illegal logging, enforcement could usefully focus on defining and marking boundaries to prevent encroachment and allow community self-policing. Also, increased efforts to curb the illegal wildlife trade are recommended.

A mechanism should be developed and implemented at all levels of government to address concerns, resolve conflicts, process grievances, settle claims, and compensate for losses. Options for interventions to improve the decentralized governance framework could begin with institutional development support to help clarify roles and responsibilities for district/province governments in management, implementation, licensing, and monitoring activities on forestlands. There is also a great need for capacity building in regional government forestry bureaucracies.

Finally, to promote, establish, support and sustain dialogue and decision processes on the future organization and management of the forestry sector, community-oriented and collaborative management approaches are increasingly being developed and tested and legal frameworks may be emerging that would allow more widespread application.

1. INTRODUCTION

Background

Forests play an important role in human life by providing social, economic and environmental benefits. They are places for people to live in and interact, and contain or protect cultural and spiritual values for specific societies and groups. Forests also produce wood, a raw material for the wood processing industry; NWFPs, such as medicines, fruits and nuts; materials for housing and shelter; forage for domestic animals; and some environmental services including hydrology and erosion control as well as biodiversity protection.

It is generally acknowledged that forest resources not only have local impact but also national, regional and even international impact. For instance, the role of forests in the provision of global public goods includes carbon sequestration and mitigation of global climate change. Thus, it becomes a global concern to preserve the existence of all forest resources through various schemes of sustainable development of forest management and utilization. However, this is not an easy task. It needs comprehensive and concerted efforts from all stakeholders including from non-forestry stakeholders.

To develop multi-stakeholder agreement and commitment, a survey of the current state of Asia-Pacific forests and forestry as well as future trends is needed. This should be comprehensive and based on particular situations that would evolve in the future in response to the impact of various factors. In addition, strategic environmental conditions and situations that affect forest management practices should also be considered.

Toward this goal, supported by the Food Agriculture Organization (FAO), the Center of Forestry Planning and Statistics, Ministry of Forestry of the Republic of Indonesia is trying to develop the Indonesia Forestry Outlook 2020. This outlook would give an overview of the current state of Indonesian forests and forestry and future trends. Future trends are subject to various factors and policies. This outlook is expected to provide important inputs in formulating forest management and governance as well as in developing international cooperation.

Scope and coverage

The Indonesia Forestry Outlook 2020 was developed to indicate the direction of forest and forestry management. To do so, the current state of Indonesian forests and forestry, which includes trends in forest resources, wood and wood products, wood as a source of energy, NWFPs, service functions of forests, policy and institutional framework, and key issues, were reviewed. Factors that will influence the future state of forests and forestry such as distribution of population, forestry and poverty, the political and institutional environment, economic changes, and environmental issues and policies and their impact on the forest sector were also reviewed. Probable scenarios and analysis approaches were developed and their implications on Indonesian forests and forestry were investigated. Finally, strategic actions and policies that would create a better future were recommended.

Methodology

The development of the Indonesia Forestry Outlook 2020 involved experts from various fields of forestry; they analyzed the current state of Indonesian forests and forestry and helped to develop probable scenarios and formulate rational implications. In addition, a team of representatives of all the first echelons of the Ministry of Forestry was involved in these activities.

Several activities in the development of the Indonesia Forestry Outlook 2020 are listed hereunder:

1. Preparation included preparing terms of reference (TOR), determining involved forestry experts, and collecting and clarifying preliminary data. Data and information on potential forest resources were collected from various related agencies
2. Identifying forest resource potentials and issues and developing a base analysis that defined the current state of Indonesian forests and forestry
3. Conducting two focus group discussions to get important feedback and to identify factors that influence the future state of forests and forestry as well as to develop probable scenarios and their implications
4. Writing a draft report that envisioned the future state of Indonesian forests and forestry in 2020, and contained recommended strategic actions and policies that need to be followed up
5. Conducting a one-day workshop to discuss the draft report before completing the Indonesia Forestry Outlook 2020 paper

Structure of the report

The outline of the Indonesia Forestry Outlook 2020 paper is as follows:

1. Introduction
2. The current state of Indonesian forests and forestry
3. Factors that influence the future state of forests and forestry
4. Probable scenarios and their implications
5. The state of Indonesian forests and forestry in 2020
6. Recommended strategic actions and policies that create s better future
7. Summary and conclusions

2. THE CURRENT STATE OF INDONESIAN FOREST AND FORESTRY

This chapter will explore and discuss the most important issues confronting the Indonesian forest sector and provide an overall indication of the broad trends in the recent decades. It includes trends in forest resources, wood and wood products, wood as a source of energy, NWFPs, the service functions of forests, policy and institutional framework, and key issues in the state of Indonesian forests and forestry.

Trends in forest resources

Forest cover and forestland classifications change from time to time. Based on the Forest Boundary Setting by Consensus (*Tata Guna Hutan Kesepakatan*, or TGHK), the total forestland area by year 1991 was about 143.97 million hectares. This TGHK attempted to deal with inter-agency conflicts over the use of land under the jurisdiction of the Ministry of Forestry and formed the basis for maps and plans. However, during the 1990s, local governments often contested the forest zone boundaries developed under the TGHK process and compromises were developed based on the provincial level spatial planning process (*Rencana Tata Ruang Wilayah Povinsi*, or RTRWP). The result of this process of harmonization between TGHK and RTRWP, which is known as *paduserasi*, shows that the total forestland area was about 120.35 million hectares by 1999.

A recent analysis of the 2003 forest cover status[1] showed the total land area of Indonesia was 187.9 million ha. Of this, 93.9 million ha (or 50%) was forested land, 83.3 million ha (or 44%) non-forested land, and 10.7 million ha (6%) had no data. Most of these forested land are located in Papua and Kalimantan, which accounts for 65% of Indonesia's forest cover as shown in Figure 1. Figure 2 shows about 133.6 million ha of the total land area are state-owned forest areas (or 72%) and 54.3 million ha are non-forest areas (or 28%). Moreover, about 39.1 million ha of forest areas and about 44.2 million ha of non-forest areas are non-forested land, respectively. Forest cover status by land use is shown in detail in Figure 3.

Forest areas are then classified based on their main functions: Conservation Forest (19.9 million ha or 11%), a forest that preserves biodiversity and the ecosystem; Protection Forest (30.1 million ha or 16%), a forest that protects life-supporting systems for hydrology, controls erosion, and prevents sea water intrusion; Production Forest (60.9 million ha or 33%), a forest that produces forest products; and Conversion Forest (22.7 million ha or 12%), a forest that can be converted into other land use such as agricultural expansion. The geographic distribution of forest areas by forest function and major islands is presented in Figure 4.

[1] Based on interpretation of Land Satellite Image 7 ETM+ taken in 2002/2003 conducted by the Bureau of Forest Planning, Ministry of Forestry (*Rekalkulasi Penutupan Lahan Indonesia* 2005, Centre of Forest Inventory and Mapping, Bureau of Forest Planning, Ministry of Forestry, 2005).

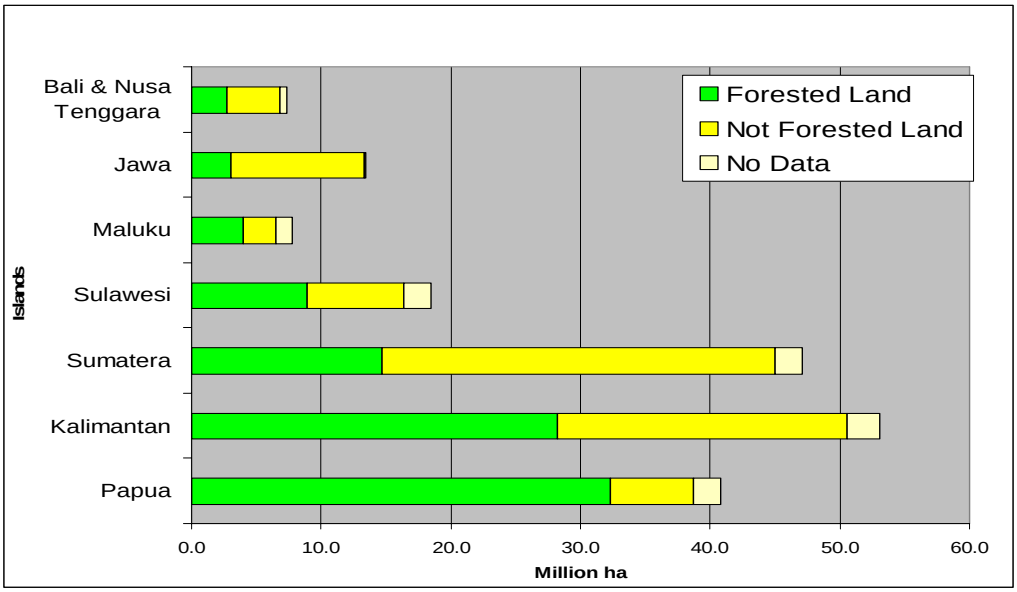


Figure 1. Forest cover status by major islands in Indonesia (Center for Forest Inventory and Mapping, Ministry of Forestry, 2005)

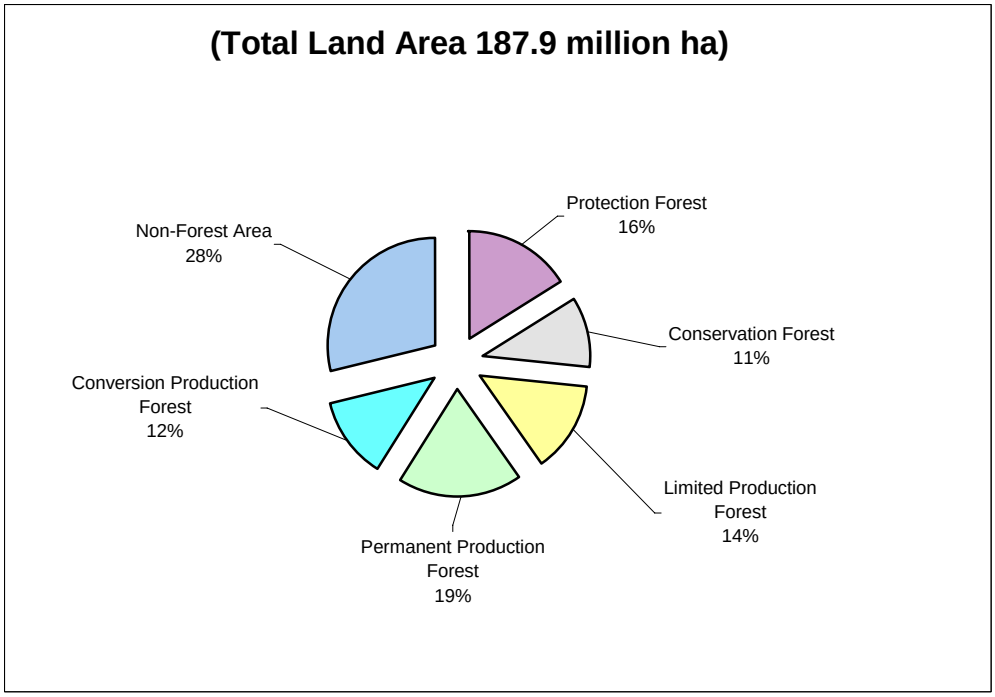


Figure 2. Land use in Indonesia (Center for Forest Inventory and Mapping, Ministry of Forestry, 2005)

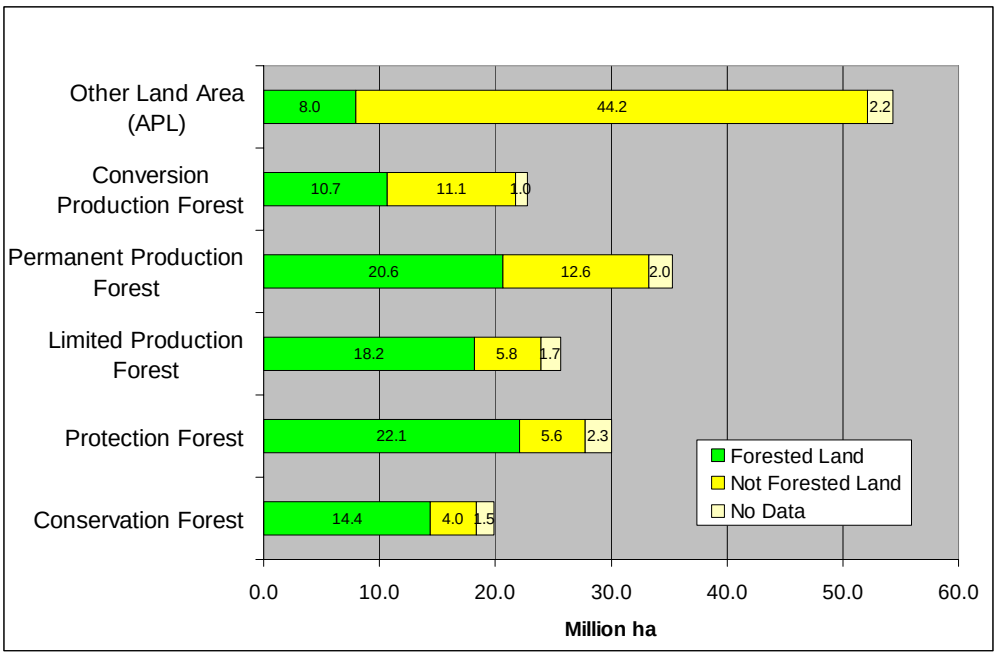


Figure 3. Forest cover status by land use in Indonesia (Center for Forest Inventory and Mapping, Ministry of Forestry, 2005)

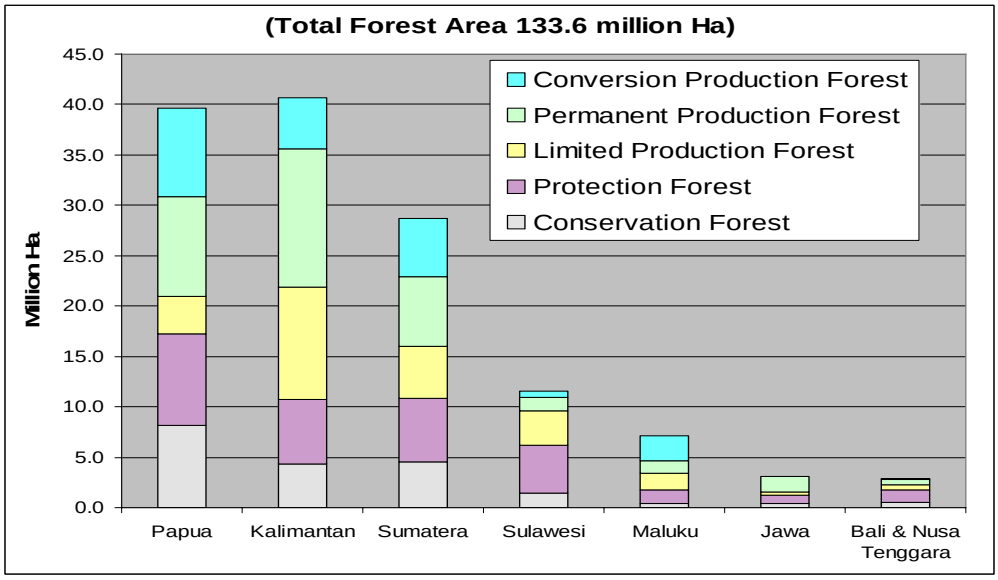


Figure 4. Forest area by forest function and major islands in Indonesia (Center for Forest Inventory and Mapping, Ministry of Forestry, 2005)

Based on Forest Resources Accounting 2002 (Neraca Sumberdaya Hutan 2002; MOF 2004), growing stocks of Indonesia's forests were estimated. There are at least two measures of growing stock: gross volume in m^3 per hectare (all tree species with diameter 10 cm and up) and volume of valuable logs (all commercial trees with diameter 50 cm and up). Table 1 shows growing stocks for all species and commercial trees by forest function and condition.

Table 1. Growing stocks of Indonesian forests

Forest Function	Forest Condition	Growing Stock (M3/Ha)	
		Commercial species	All species
Production Forest	Primary forest	56.5	152.0
	Secondary forest	51.3	103.2
	Plantation Forest	97.3	97.3
	Damaged forest	26.6	55.5
Protection Forest	Primary forest	63.5	171.1
	Secondary forest	25.0	56.5
	Damaged forest	13.0	46.5
Conservation Forest	Primary forest	47.7	146.8
	Secondary forest	26.6	82.2
	Damaged forest	11.5	47.4
Convertible Production Forest	Primary forest	32.2	127.6
	Secondary forest	23.1	53.6
	Damaged forest	13.0	38.0

Source: Calculated based on Neraca Sumberdaya Hutan 2002 (MOF, 2004).

Between 2000 and 2003, the percentage of forest cover of forest areas in Java, Bali, Sulawesi, Maluku, and Papua had increased. These increases, especially in Maluku and Papua, were not caused by reforestation nor by forest rehabilitation but were mainly due to the decreasing of forest cover percentage of areas with no data. On the other hand, a forest cover increase in Java's forest area (69 520 ha or 2.2%) was due to forest gains in protection forest of 0.6% and in production forest of 1.5%. Meanwhile, the forest cover percentage of Sumatera and Kalimantan' forest areas had decreased. Forest cover changes of Indonesian land area between 2000 and 2003 are shown in detail in Table 2.

Production forest

The estimate of the total area of Production Forest (Limited and Permanent Production Forests) in 2003, as shown in Figure 5, was about 60.9 million ha, which consisted of primary forest of 14.8 million ha (24.3%), secondary forest of 21.6 million ha (35.5%), plantation of 2.4 million ha (3.9%), non-forested land of 18.4 million ha (30.2%), and areas with no data of 3.7 million ha (6.1%).

Table 2. Forest cover changes of Indonesian land area between 2000 and 2003

ISLAND		PERCENTAGE OF FOREST COVER							
		FORESTED LAND		NON FORESTED LAND		NO DATA		TOTAL	
		2000	2003	2000	2003	2000	2003	2000	2003
SUMATERA									
A	Forest Area	29.4	28.7	24.3	28.8	6.9	3.3	60.6	60.8
B	Non-Forest Area	3.4	2.4	32.1	35.5	3.8	1.3	39.4	39.2
Total		**32.9**	**31.1**	**56.4**	**64.3**	**10.7**	**4.6**	**100.0**	**100.0**
JAVA									
A	Forest Area	14.0	16.2	8.9	6.7	0.5	0.5	23.4	23.4
B	Non-Forest Area	3.7	6.9	70.0	69.3	2.7	0.4	76.6	76.6
Total		**17.7**	**23.1**	**79.2**	**76.0**	**3.2**	**0.9**	**100.0**	**100.0**
KALIMANTAN									
A	Forest Area	49.4	48.0	19.5	25.1	7.0	3.5	75.9	76.6
B	Non-Forest Area	6.2	5.3	15.3	17.1	2.6	1.1	24.1	23.4
Total		**55.5**	**53.2**	**34.8**	**42.2**	**9.7**	**4.6**	**100.0**	**100.0**
SULAWESI									
A	Forest Area	38.2	42.5	8.9	12.0	15.5	8.0	62.7	62.5
B	Non-Forest Area	6.7	5.6	25.5	28.3	5.0	3.6	37.3	37.5
Total		**44.9**	**48.1**	**34.6**	**40.3**	**20.5**	**11.6**	**100.0**	**100.0**
BALI & NUSATENGGARA									
A	Forest Area	17.9	19.3	17.0	15.1	4.1	4.7	39.0	39.1
B	Non-Forest Area	9.1	17.6	45.2	40.6	6.6	2.8	61.0	60.9
Total		**27.1**	**36.9**	**62.2**	**55.6**	**10.7**	**7.5**	**100.0**	**100.0**
MALUKU									
A	Forest Area	46.0	49.3	21.5	25.7	23.6	16.0	91.1	91.1
B	Non-Forest Area	2.2	2.3	4.6	5.7	2.1	1.0	8.9	8.9
Total		**48.2**	**51.6**	**26.2**	**31.4**	**25.6**	**17.0**	**100.0**	**100.0**
PAPUA									
A	Forest Area	73.7	77.9	10.8	14.7	12.8	4.8	97.3	97.3
B	Non-Forest Area	1.5	1.5	0.9	1.0	0.2	0.1	2.7	2.7
Total		**75.2**	**79.4**	**11.7**	**15.7**	**13.1**	**4.9**	**100.0**	**100.0**
INDONESIA									
A	Forest Area	44.7	45.7	17.0	20.8	9.2	4.5	70.9	71.1
B	Non-Forest Area	4.3	4.2	22.0	23.5	2.8	1.2	29.1	28.9
Total		**49.0**	**50.0**	**39.0**	**44.3**	**12.0**	**5.7**	**100.0**	**100.0**

Source: Center for Forest Inventory and Mapping, Bureau of Forest Planning, Ministry of Forestry (2005).

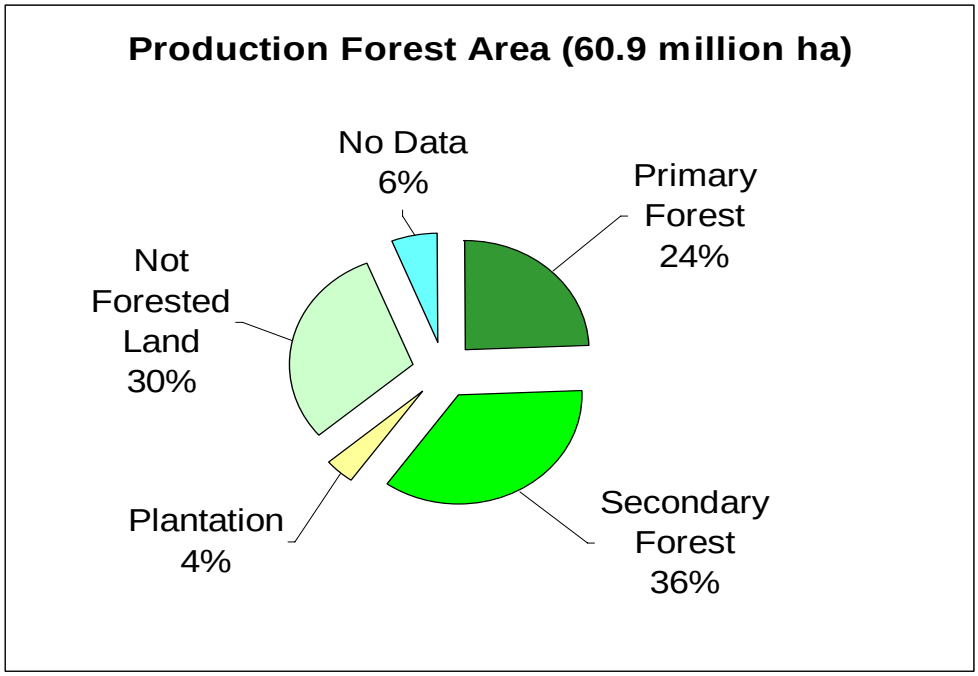


Figure 5. Production forest area by forest condition in Indonesia (Center for Forest Inventory and Mapping, Bureau of Forest Planning Ministry of Forestry, 2005)

Figure 6 shows most primary forests are located in Papua and Kalimantan islands, which together accounted for about 88% of total primary forests, whereas most secondary forests were located in Sumatera and Kalimantan islands, which together accounted for about 72% of total secondary forests. Plantations are mainly located in Java followed by Sumatera and Kalimantan, which together accounted for 99% of total plantations. However, 77% of non-forested areas, which amounted to about 14.2 million ha, were found in Sumatera and Kalimantan, indicating the very heavy damaged condition of natural production forests in those islands. A sharp decrease of log production from natural production forests during the period 1994-2006 confirmed this heavy depletion of natural production forest, where production declined from 17.3 million m^3 in 1994 to 5.6 million m^3 in 2006 (see Table 11). Moreover, even though the total production forest area in both these islands was only 61%, their share was about 78% of Indonesia's total log production during the period 1994-2006 (Figure 7). The standing stock of plantations in Java was also heavy depleted. Sawlogs or veneer log production from Perum Perhutani drastically declined from 1.87 million m^3 in 1994 to 0.34 million m^3 in 2006 (Table 11).

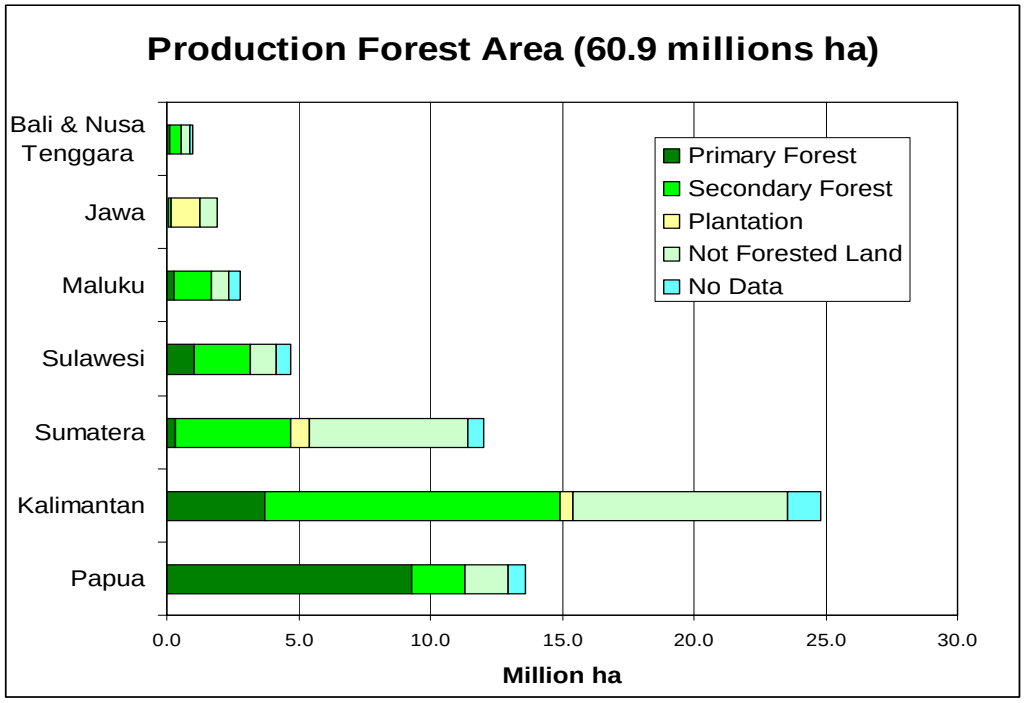


Figure 6. Production forest area by forest condition and major islands in Indonesia (Center for Forest Inventory and Mapping, Bureau of Forest Planning Ministry of Forestry, 2005)

In 1993, there were 575 forest concessionaires (HPH/IUPHHK) with a total area of 61.7 million ha. This number sharply decreased to 323 units with a total area of 28.8 million ha as of September 2007 (Figure 8). Moreover, Nugroho (2006) reported that only 149 units with total area of 14.6 million ha were active in 2006. The huge number of inactive companies was due to internal factors such as financial ill-health (debts), low-skilled employees, low commitment to sustainable forest management, and the wait for a conducive business environment. Further, if the total HPH/IUPHHK's area is compared with the total natural production forest area of 60.9 million ha, it was much lower. This implies a large "open-access" natural production forest area, which was reported to be about 16.4 million ha.[2]

[2] "Penyediaan bahan baku berasal dari produk hutan alam HPH/IUPHHK." Paper presented by Dr. Hilman Nugroho from Direktorat Bina Pengembangan Hutan Alam at a workshop on wood sources and supplies for the Indonesian wood processing industry held at Twin Plaza Hotel, Jakarta on October 12-13, 2006.

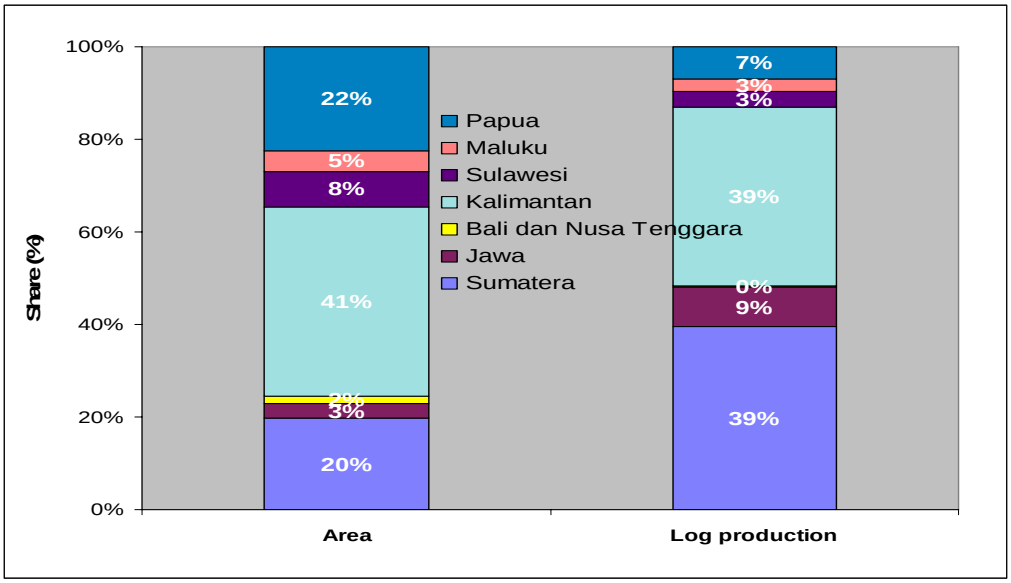


Figure 7. Production forest area and log production share by major islands in Indonesia (area was calculated based on Rekalkulasi Penutupan Lahan Indonesia 2005, Center for Forestry Planning and Mapping, 2005; log production was based on Indonesia Forestry Statistics, 1994-2006)

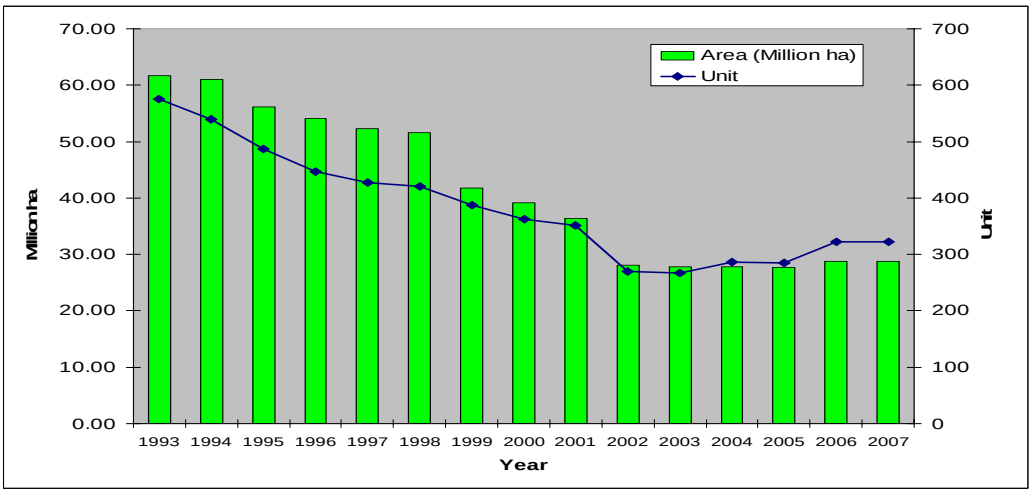


Figure 8. The Development of Forest Concessionaires in natural production forest,1993-2007 (Executive, Indonesia Strategic Forestry Data, MOF, various years)

The number of active forest concessionaires by province and stockholders as of September 2007 is presented in Table 3.[3] Sixty-seven percent of forest concessionaire units are private companies, which represent 71% of forest concessionaire areas. Meanwhile, only 27% of forest concessionaire units are state-owned companies, which represent 23% of forest concessionaire areas. The rest are either shared-owned or joint-owned companies. Most forest concessionaires are located in East Kalimantan, Central Kalimantan, Papua, Papua Barat (West Papua), West Kalimantan, Riau, and North Maluku provinces, which together accounted for about 82% of total units or 87% of total forest concessionaire areas.

[3] MOF. Data Strategis Kehutanan, 2007.

Table 3. Distribution of forest concessionaires in natural production forest as of August 2007

Province	Privates		State Owned		Shared Owned		Joint Owned		Total	
	Number of Unit	Area (million ha)	Number of Unit	Area (million ha)	Number of Unit	Area (million ha)	Number of Unit	Area (million ha)	Number of Unit	Area (million ha)
NAD	5	0.34	0	0.00	3	0.19	0	0.00	8	0.52
Sumut	6	0.34	0	0.00	2	0.10	0	0.00	8	0.44
Sumbar	4	0.21	0	0.00	0	0.00	0	0.00	4	0.21
Riau	7	0.36	0	0.00	7	0.40	1	0.05	15	0.81
Jambi	4	0.23	0	0.00	0	0.00	0	0.00	4	0.23
Sumsel	1	0.06	0	0.00	0	0.00	0	0.00	1	0.06
Bengkulu	1	0.02	0	0.00	0	0.00	0	0.00	1	0.02
Kaltim	48	3.87	10	0.80	26	1.85	1	0.22	85	6.73
Kalsel	1	0.02	2	0.12	3	0.22	0	0.00	6	0.36
Kalteng	25	1.85	0	0.00	31	2.31	5	0.41	61	4.57
Kalbar	13	0.59	0	0.00	10	0.59	0	0.00	23	1.18
Sulut	2	0.06	0	0.00	0	0.00	0	0.00	2	0.06
Gorontalo	4	0.19	0	0.00	0	0.00	0	0.00	4	0.19
Sulteng	13	0.85	0	0.00	2	0.15	0	0.00	15	0.99
Sultra	3	0.39	0	0.00	0	0.00	0	0.00	3	0.39
Sulsel	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Sulbar	5	0.24	1	0.05	0	0.00	0	0.00	6	0.29
NTB	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Maluku	9	0.57	0	0.00	1	0.06	1	0.15	11	0.78
Maluku Utara	14	0.84	0	0.00	1	0.09	0	0.00	15	0.92
Papua	26	5.06	0	0.00	1	0.68	0	0.00	27	5.73
Irja Barat	24	4.35	0	0.00	0	0.00	0	0.00	24	4.35
Indonesia	**215**	**20.42**	**13**	**0.97**	**87**	**6.63**	**8**	**0.82**	**323**	**28.84**

Source: Executive, Indonesia Strategic Forestry Data 2007 (MOF, 2007).

In addition to Perum Perhutani's designated production forest area of 1.77 million ha,[4] there were 10.12 million[5] ha of land allocated for industrial forest plantations (HTI or IUPHHK-HT) as of July 2007. But, only 3.22 million ha (or 32%) had been planted (Table 4). Table 4 also shows that 9.51 million ha or 94% of designated industrial forest plantations areas were pulpwood and construction-wood plantations, whereas the rest were mixed and other plantations. Of this, 2.13 million ha (66%) were planted for pulpwood and 0.97 million ha (30%) for construction wood (often called sawlogs or veneer logs).

Table 4. Industrial Forest Plantations (HTI or IUPHHK-HT) as of July 2007

Plantation type	Number of units	Allocated land		Planted		Percentage of planted
		Area	%	Area	%	
Pulpwood	48	5,970,039	59.0%	2,130,322	66.2%	35.7%
Construction wood	170	3,536,824	34.9%	968,413	30.1%	27.4%
Mixed species	2	12,100	0.1%	0	0.0%	0.0%
Others	45	603,708	6.0%	118,439	3.7%	19.6%
Total	265	10,122,671	100.0%	3,217,173	100.0%	31.8%

Source: Calculated based on data of Direktorat Bina Pengembangan Hutan Tanaman (as of July 2007).

[4] MOF. Data Strategis Kehutanan, 2007.

[5] "Kondisi dan tantangan pembangunan HTI di Indonesia saat ini." Paper presented by Ir. Deny Kustiawan, Direktur Bina Pengembangan Hutan Tanaman, *at In-house Experts Working Group* regular meeting on 8 June 2006.

During the period 1993-2006, the pulpwood plantation level sharply increased from 29 000 ha in 1989 to 200 000 ha in 2006 with an average of 104 000 ha per year. However the construction wood plantation level drastically decreased from 102 000 ha in 1989 to 32 000 ha in 2006 with an average of 72 000 ha per year (Figure 9).

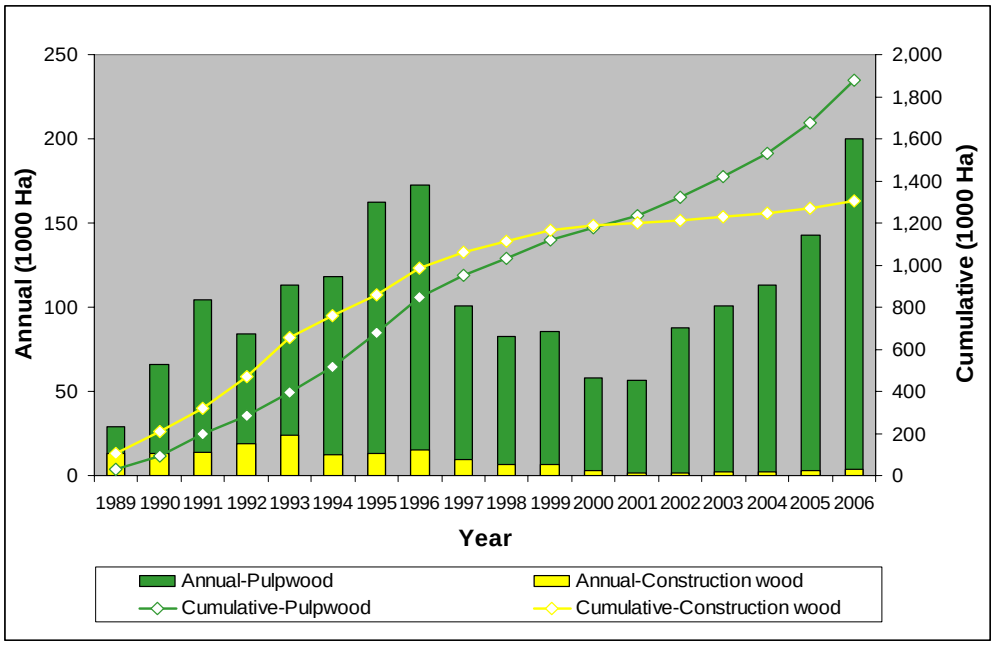


Figure 9. The development of industrial forest plantation, 1989-2006 Executive, Indonesia Strategic Forestry Data, MOF, various years)

Although Indonesia has many fast wood species, also called fast growing species, as shown in Table 5, only a few were planted as industrial pulpwood plantations such as *Acacia* spp., *Eucalyptus* spp., and *Pinus* spp. The rest was planted to produce sawlogs or veneer logs even plantations were few in number. One tree species that has been planted to produce sawlogs for years, particularly in Java, is teak (*Tectona grandis*) which has a very low rate of growth, a very long rotation age, and produces only a small fraction of Indonesia's sawlogs.

Table 5. Mean annual increment (MAI) and rotation age of Indonesia's fast growing species

Species	Mean annual increment at an operationas scale (m3/ha/year)	Rotation Age (year)
Acacia auriculiformis	12 - 23	8 -1 7
Acacia magnium	46 - 50	9
Agathis loranthifolia	27.7 - 24.9	30 - 50
Paraserianthes falcataria	37.4	15
Anthocephalus cadamba	20 - 24	5 - 10
Araucaria cuninghamii	17.0 - 18.5	9.5
Cassia siamea	15	17
Casuarina equisetifolia [1]	10 - 20	7 - 10
Dalbergia latifolia	23.7	40
Eucalyptus deglupta	24.5 - 34	9
Gmelina arborea	35	7
Maesopsis eminii	13 - 34	10
Musanga smithii	14 - 19	9.5
Pinus merkusii	19.9 - 22.4	15 - 25
Pinus caribaea	24	7
Swietenia macrophylla	15 - 20	40 - 50
Sesbania grandiflora	25	3

[1] in ton/ha/year

Source: Manual Kehutanan (MOF, 1992).

Of 45 HTI or IUPHHK-HT pulp companies, there were 5 major companies, which together accounted for about 56% of total planted pulpwood plantation. They were PT. Arara Abadi (17%), PT. Musi Hutan Persada (13%), PT. Wira Karya Sakti (11%), PT. Riau Andalan Pulp and Paper (10%), and PT. ITCI Hutani Manunggal (5%). Meanwhile, 30 out of 170 HTI or IUPHHK-HT construction wood companies had a planted area above 10 000 ha. They together accounted for about 59% of total planted construction wood plantations. The planted area of major IUPHHK-HT pulpwood and construction wood companies in Indonesia in 2007 is shown in Table 6.

As shown in Figure 9, pulpwood plantation as well as pulpwood production increased steadily from 1994 to 2006, however log supply cannot meet current levels of demand because plantation lands are not being planted at sufficient rates to produce logs in the right time frame. Also, lands that are planted are not, on average, yielding timber at industry-recognized levels of performance. However there are examples of high performing companies producing more than 100 m^3 per hectare over a growing cycle of 6-7 years.

There are at least five reasons why this figure is so low.[6] First, the official data could be in error. Second, actual production each year could be under-reported by industrial firms to avoid paying taxes or fees. Alternatively, some plantations or provinces could be entirely unreported. Third, the reported area planted could be artificially inflated to respond to politically established targets, rather than actual performance. Fourth, some planted lands could have been destroyed by fire or drought during the period 1997-2000. Fifth, some planted lands could be unsuitable for timber production or the planting stock could be of low quality or an unsuitable species for the location. Most likely, the result is a combination of these problems.

[6] Restructuring and Revitalization of Indonesia's Wood-Based Industry: Synthesis of Three Major Studies. T. H. Brown, B.C.H. Simangunsong, D. Sukadri, D.W. Brown, Subarudi S., A. Dermawan, Rufi'ie. Ministry of Forestry, CIFOR, and DFID-MFP. Jakarta. November 2005.

Table 6. Total planted area of major IUPHHK-HT pulpwood and construction wood companies in Indonesia as of July 2007

Company Type and Name	Location	Area (Ha)	Percentage
Pulpwood Company			
PT. Arara Abadi	Kampar ; Bengkalis ; Pelalawan ; Siak ; Pekanbaru ; Rokan Hilir	360,941	17%
PT. Musi Hutan Persada	Lahat ; Musi Rawas ; Ogan Komering Ulu ; Muara Enim.	285,639	13%
PT. Wira Karya Sakti	Tanjung Jabung Barat & Timur ; Batanghari ; Muaro Jambi	232,050	11%
PT. Riau Andalan Pulp and Paper	Kuantan Senggigi ; Pelalawan ; Siak	213,791	10%
PT. ITCI Hutani Manunggal	Pasir ; Kutai.	109,657	5%
PT. Surya Hutani Jaya	Kutai	91,378	4%
PT. Menara H. Buana/Rindang Banua	Tanah Laut, Kota Baru, Banjar	86,260	4%
PT. Toba Pulp Lestari Tbk.	Tapanuli Utara ; Dairi	69,491	3%
PT. SBA Wood Industries	Ogan Komering Ilir	63,539	3%
PT. Finnantara Intiga	Sanggau ; Sintang	56,894	3%
Construction wood Company			
PT. Inhutani-III Nanga Pinoh	Sintang	47,412	5%
PT. Perawang Sukses Perkasa Ind.	Kampar	42,267	4%
PT. Mayangkara Tanaman Industri	Ketapang	39,703	4%
PT. Inhutani-I Longnah	Kutai Timur	32,591	3%
PT. Inhutani-V Way Rebang - Muara Dua	Tulang Bawang ; Way Kanan	26,806	3%
PT. Silva Inhutani Lampung	Lampung Utara	24,137	2%
PT. Kirana Cakrawala	Halmahera Timur	20,999	2%
PT. Sumalindo Lestari Jaya II (Sangkulirang)	Kutai	17,548	2%
PT. Sumalindo Lestari Jaya I (Batu Putih)	Berau	17,491	2%
PT. Sumalindo Hutani Jaya	Kutai	17,479	2%
PT. Limbah Kayu Utama	Batanghari ; Bungo Tebo	17,242	2%
PT. Inhutani-II Tanah Grogot	Pasir	16,898	2%
PT. Rimba Lazuardi	Indragiri Hulu ; Kuantan Senggigi	16,861	2%
PT. Perintis Adiwana	Kapuas	16,742	2%
PT. Sam Hutani	Sarolangun	15,940	2%
PT. Kalpika Wanatama, Unit-I	Kepulauan Sula	15,697	2%
PT. Inhutani-III Sanggau	Sanggau	15,084	2%
PT. Inhutani-III Sebuhur-Pelaihari	Tanah Laut	14,970	2%
PT. Nusa Wana Raya	Kampar ; Pelalawan	14,907	2%
PT. Inhutani-I Batuampar - Mentawir	Kutai Kertanegara, Penajam Paser Utara	14,501	1%
PT. Inhutani-I Melak	Kutai Barat	14,501	1%
PT. Kodeco Timber	Kotabaru	14,410	1%
PT. Way Hijau Hutani	Ogan Komering Ilir	13,531	1%
PT. Putra Lika Perkasa	Labuhan Batu	13,401	1%
PT. Inhutani-III Riam Kiwa	Banjar	13,272	1%
PT. Sumber Hutani Lestari	Musi Banyuasin	13,093	1%
PT. National Timber & Forest Product	Bengkalis	11,852	1%
PT. Sumalindo Hutani Jaya Unit II)	Kutai Kartanegara	11,010	1%
PT. Anangga Pundinusa	Kutai	10,631	1%
PT. Hutan Mahligai	Kutai	10,260	1%

Source: Direktorat Bina Pengembangan Hutan Tanaman as of July 2007.

In order to accelerate forestry sector revitalization, the Government of Indonesia has planned to develop a new pattern of plantation, which is called an Industrial Community Forest Plantation (*Hutan Tanaman Rakyat/HTR*). This programme would be implemented from 2007 to 2016 and 5.4 million ha of degraded production forest areas would be allocated; especially areas that are now facing tenurial disputes. The total establishment cost over that period was estimated at around 43.2 trillion IDR. Annual planted area and needed budget are presented in Table 7.

Table 7. HTR Establishment Plan, 2007-2016

No	Year	Total (thousand ha)	Budget (trillion IDR)
1	2007	200	1,60
2	2008	400	3,20
3	2009	600	4,80
4	2010	770	6,16
5	2011	770	6,16
6	2012	770	6,16
7	2013	770	6,16
8	2014	570	4,56
9	2015	370	2,96
10	2016	180	1,44
Total		5,400	43,20

Source: Direktorat Bina Pengembangan Hutan Tanaman (2006).

Private and community forest

As of 2005 about 219,000 ha of community forest had been established through the National Movement on Forest and Land Rehabilitation (Gerakan Nasional Rehabilitasi Hutan dan Lahan, GN-RHL) and 2,000 ha through Government and community forest partnership. GN-RHL is a national initiative to plant trees in forest land and bare lands across the country as a commitment to improving the quality of the environment for people's prosperity. Private company and community forest partnership had also been established on about 7,606 ha of community forest. However, the total community forest area as shown above is much lower than 1.56 million ha, a figure reported by BPS based on the agricultural census in 2003. Further, Santoso (2006) stated at least 6 millions m^3 of logs could be produced from community forest annually. This discrepancy indicates an unavailable accurate database on community forest at the national level.

By 2009, the Government wants to reach the goal of achieving community forest development in the order of 0.5 million ha through the GN-RHL/Gerhan activity and in the order of 12 000 ha through Government and community forest partnership. If this goal is realized, community forest would produce about 2.5 million m^3 of logs over a rotation. Nevertheless, there are several issues that have been recognized by most stakeholders in realizing community forest development. The role of private or stated-owned enterprises as partners and the role of the government as a facilitator are not optimal. A government guideline on community forest partnership is not well developed.

Forest management and forest certification

Since 1989, Indonesia has applied the Indonesian Selective Cutting and Replanting System (*TPTI – Tebang Pilih Tanam Indonesia*) as a main silvicultural system for all natural forest types. In this system, natural production forest is divided into several forest management units (FMUs) where each FMU is managed based on a 35-year cutting cycle. The minimum tree diameter that can be harvested is varied and depends on the type of natural production forests: 50 cm in Production Forest, 60 cm in Limited Production Forest and 40 cm in Swamp Forest. At least 25 commercially valuable trees per hectare must be kept in each forest type after logging. The diameter of those remaining trees should be in the range of 20-50 cm in Production Forest, 20-60 cm in Limited Production Forest, and 20-40 cm in Swamp Forest. Moreover, enrichment planting is required after logging using seedling stock that may come either from nurseries or from dense natural regeneration elsewhere in the forests.

Based on a 35-year cutting cycle, each FMU or forest concessionaires is divided into 35 blocks. Only one block can be harvested each year and a minimum of 700 hectares in each

FMU is set aside as a conservation area. The annual allowable cut (AAC) in each block is set and approved by the Ministry of Forestry. Furthermore, each FMU must have a Forest Management Plan, which contains a description of forest area, the objectives of forest management, a prescription for silvicultural systems and treatments, forest harvesting systems to be used, tree species to be removed, a minimum tree diameter cutting limit, volume and number of tree stems of the AAC, and a variety of other prescriptions. A more detailed management plan, the Yearly Plan, must also be developed and includes: area specification; volume and number of tree stems to be harvested, by tree species; number of remaining trees; road construction and maintenance prescriptions; and measures to be taken to minimize soil erosion and other residual damage. This system is called Tebang Pilih dan Tanam Indonesia (TPTI).

Over the period 1977-2000, average commercial log production from natural production under the TPTI System was about 22.14 m^3/ha, or equivalent to a mean annual increment (MAI) of 1.13 m^3/ha/year (Indonesia Forestry Statistics, various years). This MAI figure is smaller than the MAI figure of 1.82 m^3/ha/year estimated by Sumarna et al. (2002), which resulted from observations in most forest concessionaires' sample permanent plots, but is bigger than the MAI figure of 0.3-0.5 m^3/ha/year estimated by Sist et al. (1998).

In order to improve the TPTI System and productivity of natural production forest, the Ministry of Forestry has recently developed a new silvicultural technique with a tree diameter-cutting limit of 40 cm and a 25-year cutting cycle. This system is called "Intensive Silviculture/TPTII" and is implemented in a degraded logged-over area where the meranti species is planted along a 3 m wide and 1000 m long-strips. A distance between strips is 20 m. The main species for planting are: *Shorea leprosula, Shorea johorensis, Shorea platycladus, Shorea macrophylla, Shorea parvipolia, Shorea selanica,* and *Shorea smithiana.* In this system, the MAI would increase and it is estimated to range from 10 m^3 to 20 m^3 with an average of 16 m^3 per ha per year.

Six FMU or forest concessionaires (HPH/IUPHHK) have implemented this TPTII system since 2005 and successfully planted logged-over areas of 15,870 ha (Table 8). The TPTII system was then extended to 25 forest concessionaires in 2007. In the future, the Ministry of Forestry plans to implement this system to approximately 10-20 percent of the total area of natural production forest.

Table 8. Implementation of TPTII in 6 forest concessionaires in 2005 and 2006

No	Forest Concessioniares	Area planted in TPTII System (ha)	
		2005	2006
1	PT.Balikpapan Forest Industry	500	1,000
2	PT. Suka Jaya Makmur	500	500
3	PT. Erna Djuliawati	500	500
4	PT. Sari Bumi Kusuma	4,169	4,151
5	PT. Serpatin	500	2,400
6	PT. Ikani	520	630
Total		**6,689**	**9,181**

Source: Elias, an expert on the Intensive Silviculture/TPTII team (2007).

Clear Cutting with Artificial Regeneration (*THPB-Tebang Habis Permudaan Buatan*) has been applied as a main silvicultural system in Indonesia's forest plantations. In contrast with the natural production forest management system, the rotation age or a cutting cycle in each FMU of forest plantation is varied and depends on tree species. For instance, the rotation age for teak plantation in Java ranges from 40-80 years whereas the rotation age for pulpwood

plantation such as *Acacia mangium* and *Eucalyptus* sp. in Sumatera and Kalimantan ranges from 6-8 years.

In Indonesia, progress towards achieving sustainable forest management may be gauged by the number of FMUs that have been certified. The FMU certification is issued either by the Indonesian Eco-labeling Institute (*Lembaga Ekolabel Indonesia-LEI*) and Forest Stewardship Council (FSC) on a voluntary basis or by the Independence Valuation Institute (*Lembaga Penilai Independen/LPI*) under the Department of Forestry, Government of Indonesia on a mandatory basis. However, up to 3 September 2007, only 11 FMUs covering 1,046,098.13 ha had been certified under the LEI timber certification scheme, and only 5 FMUs covering 555,162 ha under the FSC forest certification scheme. Detailed information on certified FMUs under the LEI timber certification scheme is given in Table 9.

Problems that undermine sustainable forest management

To date governmental reform is still occurring in Indonesia, including a changing paradigm in forestry development. Inevitably, forest management policies and regulations are also being adjusted to accommodate domestic concerns on economic and social development related to environmental conservation. In fact, the Forestry Act No. 41 of 1999 was issued to replace the Basic Forestry Act No. 5 of 1967, which was based on timber management. In principle, the Forestry Act No 41 of 1999 stipulates that extraction of forest products must not exceed the forest's carrying capacity. At the same time, Act No. 22 of 1999 concerning local government should also enable forest administration to be more decentralized. This would make forest management, including forest harvesting, more locally designed and hence more appropriate.

Table 9. Certified FMUs under the LEI Timber Certification Scheme as of 3 September 2007

FMU	Gross area (ha)	Issuance year	Forest type
PT. Diamond Raya Timber	90,957	2001	Natural Forest
PT. Intraca Wood Manufacturing	250,000	2001	Natural Forest
PT. Inhutani I, Unit Labanan	82,240	2001	Natural Forest
PT. Sari Bumi Kusuma	147,600	2002	Natural Forest
PT. Erna Djuliawati	184,206	2003	Natural Forest
PT. Sumalindo Lestari Jaya II	269,660.10	2003	Natural Forest
KPS Ds. Selopuro-Wonogiri	262.77	2004	Community-based Forest
KPS Ds. Sumberejo-Wonogiri	547.77	2004	Community-based Forest
Koperasi Wana Manunggal Lestari	815.18	2006	Community-based Forest
Wono Lestari Makmur	1,179.00	2007	Community-based Forest
Catur Giri Manunggal	2,434.24	2007	Community-based Forest
Total	**1,046,098.13**	**-**	**-**

Source: The Indonesian Ecolabeling Institute, 03 September 2007.

Unfortunately, the Indonesian economic crisis in 1997-1998, changes in national politics, and an initial implementation of regional autonomy through the decentralization process have become trigger factors for decreasing business certainty and increasing natural forest destruction. In this regard, illegal logging has emerged as a serious threat to the effective implementation and adoption of sustainable forest management practices. Illegal operations

that depress market prices for forest products reduce the comparative profitability of products produced under more sustainable regimes and undervalue Indonesia forest resources.

In addition, although forest management plans and the AAC are in place, their implementation in the field is rather weak due to socio-economic and political problems and weaknesses of local, national and regional monitoring and enforcement systems. The huge volume of sawlogs currently processed by the forest industry indicates that timber extraction rates from natural production forest far exceed the AAC. This is caused by a combination of problems such as an upsurge in demand for timber due to industrial over-capacity, illegal logging and illegal trade of forest products (both domestic and export-oriented), income generation from timber exports, and an unstable political situation due to policy reform and decentralization.

As explained before, over the period 1993-2007, there was sharp decrease in forest concessionaires (HPH/IUPHHK). This has significantly contributed to natural production forest degradation. Mining activities have also contributed to natural production forest degradation. The Forest Planning Bureau (2003) stated that the main causes of natural forest degradation were, among others: weakness of low enforcement, very intensive illegal logging, land and forest fires, community claim on forest area, log smuggling, mining activities, conversion of forest area to other land use, and review of the Provincial and District Land Use Plan. Certainly, most of those activities also contributed to deforestation. Figure 10 shows deforestation rates in Indonesia over the period 1982-2005.

To stop the deforestation and forest degradation, the Ministry of Forestry has determined five priority policies, which will gradually and selectively be implemented. They are elimination of illegal logging, overcoming of forest fires through preventive measures, restructuring of the forestry sector by increasing the efficiency and effectiveness of forest resource management, rehabilitation and conservation of forest resources to rehabilitate degraded forests and land, and decentralization of the forestry sector.

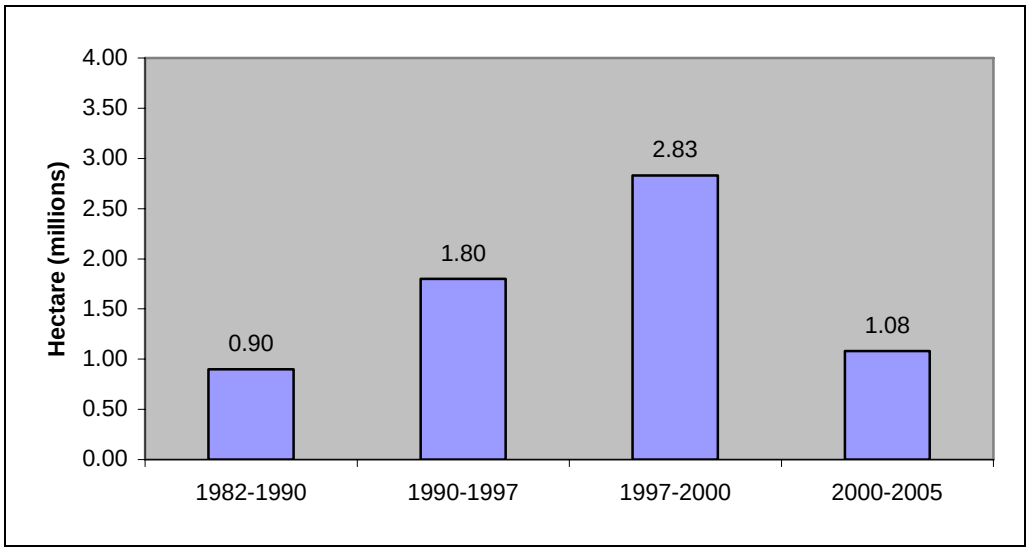


Figure 10. The development of the deforestation rate in Indonesia (Bureau of Forest Planning, Ministry of Forestry, 2007)
Source: Agency for Forestry Planning, Ministry of Forestry (2007).

Wood and wood products

Production and consumption of wood and wood products

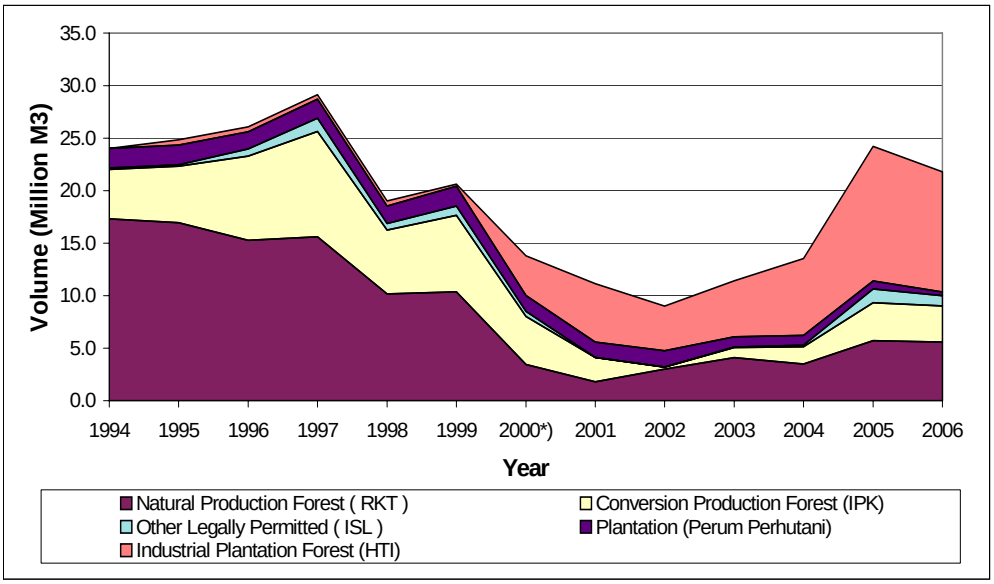


Figure 11. Log production by source (in million m³; Source: Executive, Strategic Forestry Data 2007 (MOF 2007)

Currently, logs produced in Indonesia originate from a number of sources: natural forests, industrial plantation forests, other legal permits, and conversion areas. The total timber production for 2006 was 21.8 million m^3, 5.6 million m^3 of which originated from natural forests, 11.5 million m^3 from industrial plantation forests, 0.3 million m^3 from the state-owned forestry company Perum Perhutani plantation forests, 3.4 million m^3 from conversion areas (IPK) and 1 million m^3 from other legal permits (ISL). Log production figures for the last 13 years are presented in Figure 11.

Although log production from natural production forests sharply decreased during the period 1994-2006 when production declined from 17.3 million m^3 in 1994 to 5.6 million m^3 in 2006, which indicates a heavily depleted natural production forest, total log production only slightly declined due to an increase of log production from plantations (Figure 11). As mentioned before, over that period, Sumatera and Kalimantan islands contributed 78% of Indonesia's total log production even though the total production forest area in both islands was only 61% (Figure 7). The main provinces for log producers were East Kalimantan, Riau, Central Kalimantan, South Sumatera and North Sumatera, and Papua (Figure 12).

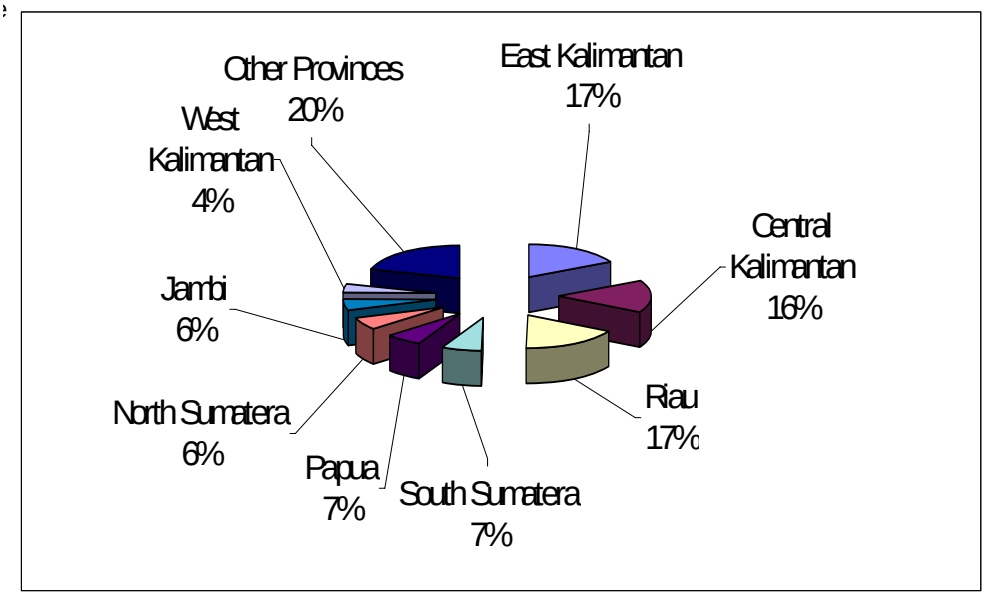


Figure 12. Total log production in 1994-2006, by province (calculated based on log production reported by Indonesia Forestry Statistics, 1994-2006)

The Indonesian wood processing industry experienced both rapid growth and structural change in the period 1980-2006 (Figure 13). This has, for the most part, been the result of government policies rather than market forces. Those policies that had important impacts were: the log export ban, first announced in May 1980 and totally imposed in 1985; the sawnwood export tax, imposed in November 1989; the prohibitive log export tax, enacted in June 1992 as a substitute for the lifted ban on log exports; and reducing log export tax to the level of 10% before December 2000 and then to 0% in 2003 (Simangunsong 2004 and Manurung 2002).

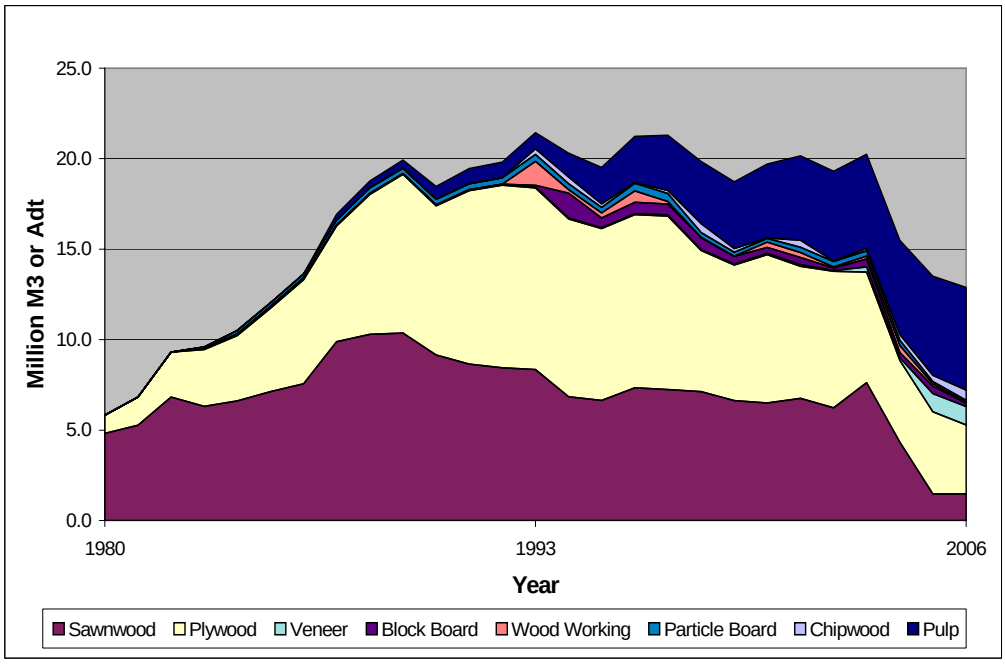


Figure 13. Wood product production, 1980-2006: FAO (2008) for sawnwood plywood, veneer sheets; Indonesia Forestry Statistics (2007) for woodwork, blockboard, and particleboard; and APKI (2007) for pulp production

As shown in Figure 13, total production of sawnwood grew rapidly from 4.8 million m^3 in 1980 to 7.1 million m^3 in 1985, peaked to 10.4 million m^3 in 1989, and then sharply decreased to 1.5 million m^3 in 2006 (FAO, 2008). Meanwhile, total production of plywood and veneer sheets grew drastically from 1 million m^3 in 1980 to 8.4 million m^3 in 1990, reached 9.7 million m^3 in 1997, and then decreased to 4.8 million m^3 in 2006 (FAO, 2008). Total production of pulp grew rapidly from 0.5 million tonnes in 1989 to 3.1 million tonnes in 1997, and reached 5.7 million tonnes in 2006 (APKI 2007). In addition to these major forest products, total production estimates for other forest products such as woodworking timber, blockboard, particle board and wood chips ranged from 0.1 million m^3 to 2.3 million m^3 in the period 1983-2006 (MOF 2007 and FAO 2008).

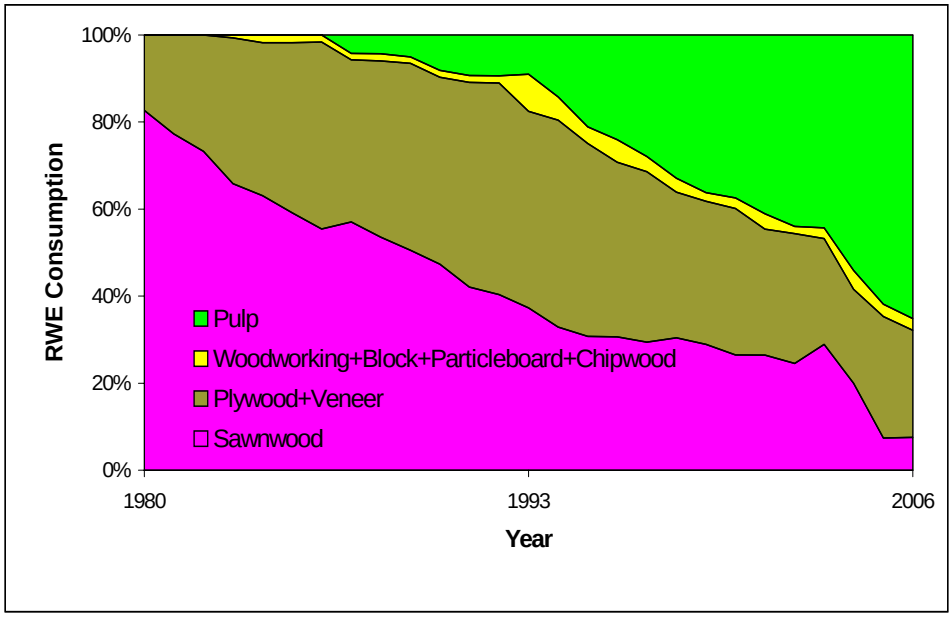


Figure 14. Roundwood equivalent (RWE) consumption, by industry type, 1980-2006 (calculated based on FAO (2008) for sawnwood and plywood, and veneer sheet production; Indonesia Forestry Statistics (2007) for woodworking, blockboard, and particleboard production; and APKI (2007) for pulp production)

Based on the production of forest products explained above, industry wood consumption in terms of RWE rose sharply from 11.7 million m^3 in 1980 to 24.1 million m^3 in 1985, peaked at 52.7 million m^3 in 2003, and then fell drastically to 39.2 million m^3 in 2006. Meanwhile, the timber industry also faced changes in sources of raw materials, which affected their quality (Figure 14).

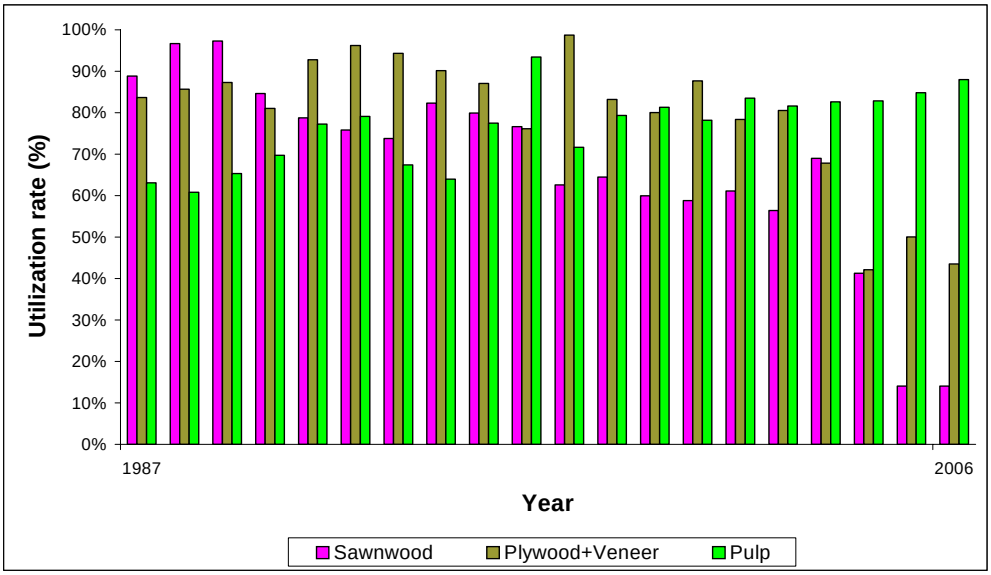


Figure 15. Utilization rate of wood industry capacity, 1987-2006. Based on FAO (2008) for sawnwood, plywood, veneer sheet production; and APKI (2007) for pulp production

The installed capacity utilisation rate for the sawnwood industry rose from 86% in 1980 to 97% in 1989, and then fell sharply to 14% in 2006. The installed capacity utilisation rate for the plywood industry increased from 51% in 1980 to 99% in 1997, before falling sharply to 44% in 2006. These trends show a very real increased roundwood deficit for the sawnwood and plywood+veneer industries as of 1997. This means assets invested in these two industries could not be utilised properly. Meanwhile, the installed capacity utilisation rate for the pulp industry continued to rise from 65% in 1989 to 88% in 2006. Installed capacity utilisation rates for the wood processed industry in the period 1987-2006 are shown in Figure 15.

State of forest industries

Almost 90% of the Indonesian Sawmill and Woodworking Association (ISWA) members consist of small and medium enterprises (UKM) with no forest concessionaires. The current number of export-orientated companies registered in the Forestry Industry Revitalization Agency (Badan Revitalisasi Industri Kehutanan or BRIK) stands at around 1600. However, the number of companies with active operations has fallen from year to year, and in 2006 was down to 602 (BRIK, 2006). Total exports for 2006 amounted to 2.3 millions m^3 valued at US$1.29 billion. This figure is almost identical to 2005 with total exports of 2.4 million m^3 worth US$1.27 billion. The main destination for woodworking exports is Japan followed by China, while the best average prices come from exports to European countries, though volumes are small. For now, accurate information regarding domestic supply and demand remains unavailable.

The Indonesian Panel Wood Producers Association (APKINDO) had a recorded membership of 130 companies on 6 October 2006. Only 68, however, were active with a production capacity of 6.1 million m^3 annually, while only 19 units were producing at normal capacity (1.54 million m^3 annually). Total exports for 2006 amounted to 2.91 million m^3 with a value of US$1.30 billion. This figure is significantly lower than the 3.47 million m^3 valued at US$1.25 billion for 2005. The main destinations for plywood exports are Japan, the United States and the United Kingdom.

The Indonesia Pulp and Paper Industry (APKI 2007) reported there were 10 integrated pulp and paper mills and 3 non-integrated mills with total installed capacity of 6.48 million Adt

(air-dried tonnes) in 2007. Of those capacities 86% were located in Sumatera and 49% were Private Company Foreign Investments. Total pulp production in 2006 was 5.67 million Adt with 2.80 million Adt being exported, while pulp imports for the same year were 0.92 million Adt. That year, Indonesia was the world's ninth largest pulp producer and the twelfth largest producer of paper. The main players in the pulp and paper industry in Indonesia are Asia Pulp and Paper (APP) from the Sinar Mas Group (SMG), which controls 40% of pulp capacity and 31.8% of paper capacity, and APRIL from the Raja Garuda Mas group controlling 33.3% and 7.8% of pulp and paper capacity, respectively.

Indonesia's installed pulp capacity increased from 5.23 million Adt in 2000 to 6.48 million Adt in 2006, a 23.3% increase. Coupled with an increase of installed capacity utilization rate of 12.5%, pulp production was then sharply increased by 38.7%, so that export quantity in the 2006 was more than twice that of exports in 2000. During that period, pulp consumption and import quantity were also increased though at much lower rates, which were 7.5% and 20%, respectively. However, in terms of value, pulp export was only increased by 58.2%, indicating a decrease in pulp export price. Fortunately, the import value in 2006 was only slightly higher than the import value in 2000 (7.1%). Based on MOF (2007), in 2006, the main importers of pulp from Indonesia were China (49%) followed by the Republic of Korea (21%), Japan (6%), Italy (5%) and India (5%).

Trade of forest products and trends

Based on FAO (2008), Indonesia's import and export values of forest products in the period 1980-2006 are shown in Figures 16 and 17. Over that period, total import values increased more than seven times, mostly wood pulp and paper and paperboard. Meanwhile, total export values increased more than sixteen times over that period.

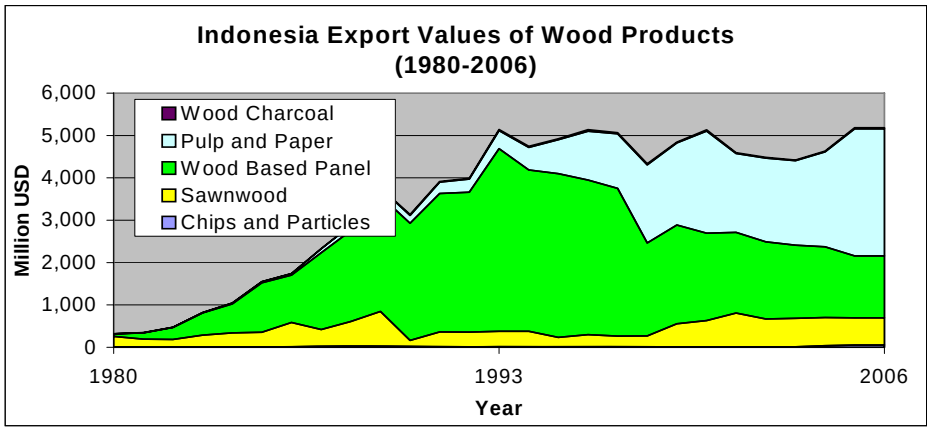


Figure 16. Indonesia export values of wood products, 1980-2006
Source: FAO (2008).

Up to 1997, total export values were mainly generated from plywood, veneer sheets, and sawnwood exports, but after the economic crisis at the end of 1997, their export shares sharply declined and were gradually replaced by woodpulp and paper and paperboard exports.

Although total export values increased more than sixteen times over the period 1980-2006, Indonesia's shares in world wood product export values were significantly decreased, particularly export shares of wood based panels and wood charcoal as shown in Figure 18. Export shares of wood pulp and paper and paperboard steadily increased during that period, although they were still below 3%.

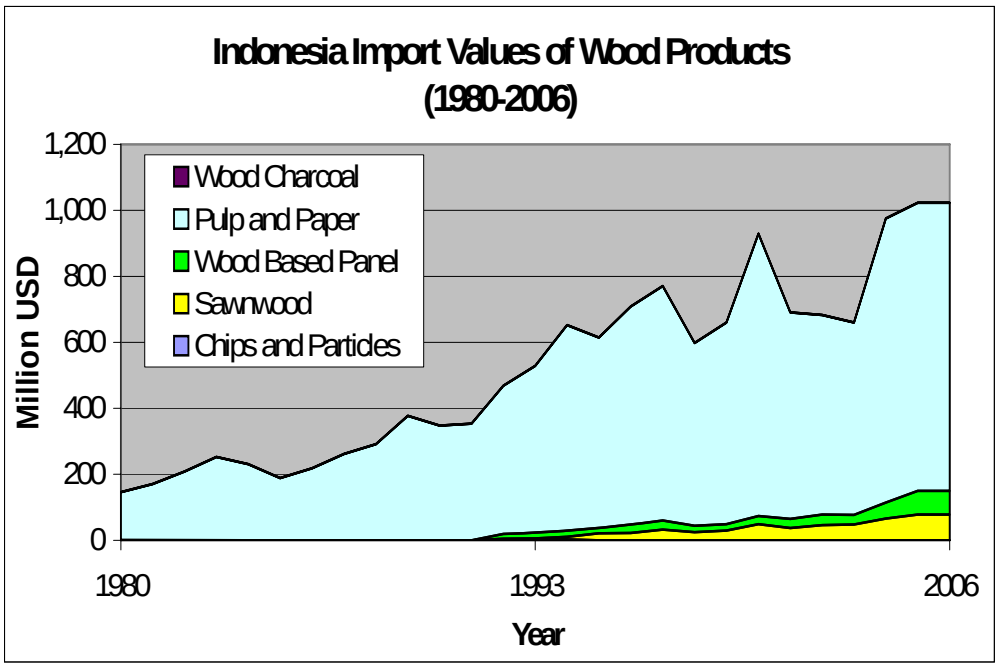


Figure 17. Indonesian import values of wood products, 1980-2006
Source: FAO (2008).

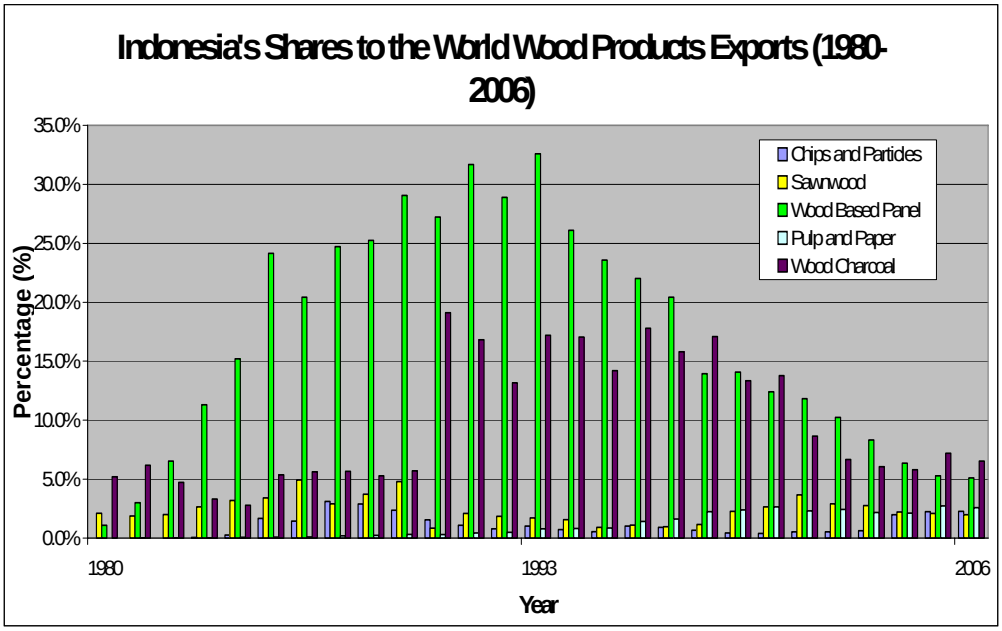


Figure 18. Indonesia's shares in world wood product exports, 1980-2006
Source: FAO (2008).

Wood as a source of energy

Extent of wood energy use

The contribution of biomass energy to the total final energy consumption of Indonesia in the last 15 years has been increased in quantity but its share has decreased from 43% to 31% (Statistics of Energy Economics, 2007). Biomass energy here includes wood and agricultural wastes. Wood energy consumption by industries in Indonesia is difficult to predict due to data scarcity. However, Sumarjani and Waluyo (2007) predicted the wood energy consumption by

multiplying the data from two industrial centers and concluded that total wood energy consumption by the tile making industry was about 3.516.980 m^3. While the prediction method is still debatable, this figure can be used as an entry point for further study.

The share of wood energy in total energy consumption was estimated in the range of 29-30% in 1995, while biomass energy consumption was in the range of 35-37% as shown in Figure 19. Further, wood energy stands for 80% of biomass energy consumption, where 1 tonne of firewood is equivalent to 2.2979 Barrels of Oil Equivalent or BOE (Siagian and Manurung, 1995; Statistic of Energy Economy, 2007; and RWEDP, 2007).

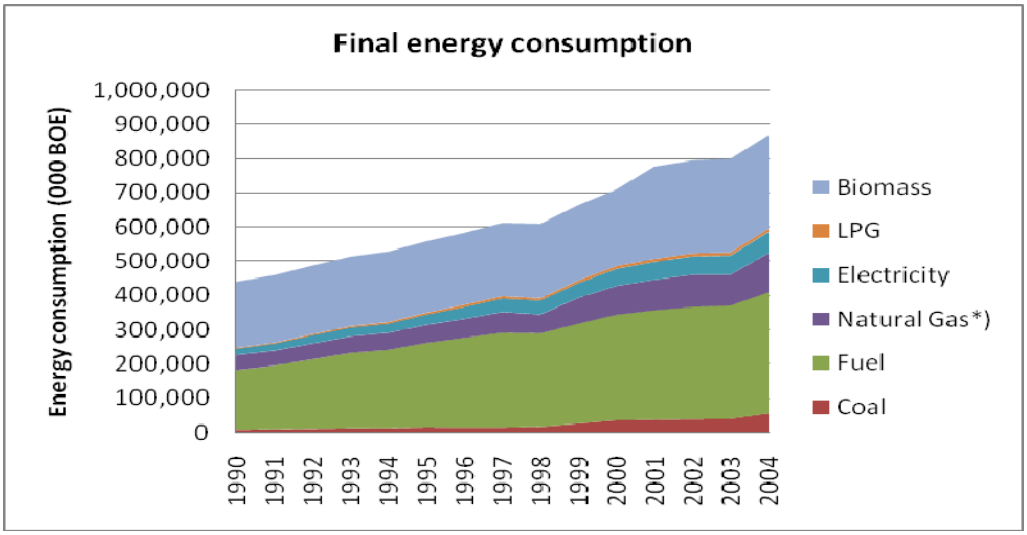


Figure 19. Final energy consumption in Indonesia
Source: Statistics of Energy Economics (2007).

The share of firewood in energy consumption by industry has increased sharply since 2001. The reason for the abrupt increase is the sharp increase in the fuel oil price index. Industrial use of wood energy is mainly via village industries such as charcoal, brick, ceramics and tile making, and lime burning (Figure 20). Moreover, firewood energy utilization in the commercial sector amounted to about 8% of the total energy consumption (Figure 21).

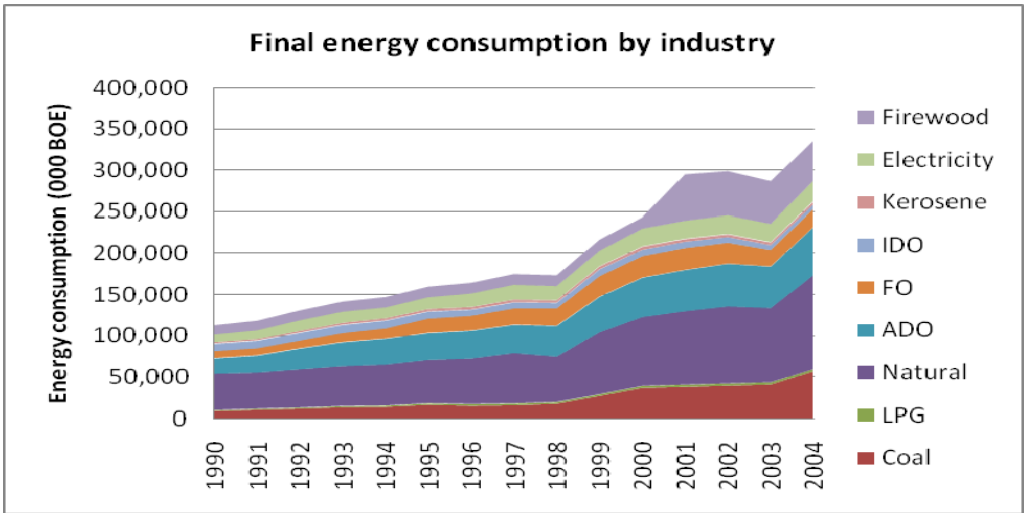


Figure 20. Final energy consumption by industry
Source: Statistics of Energy Economics (2007).

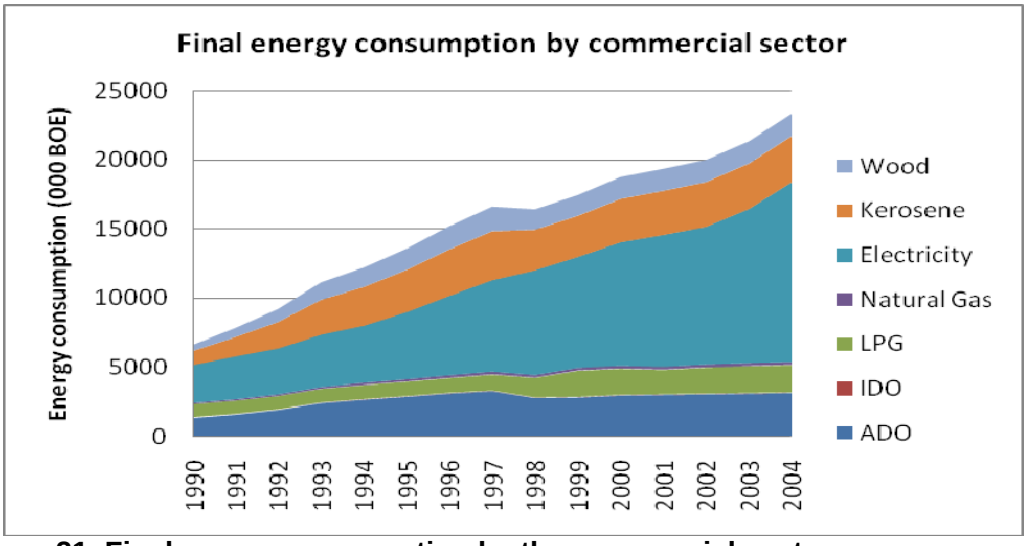


Figure 21. Final energy consumption by the commercial sector
Source: Statistics of Energy Economics (2007).

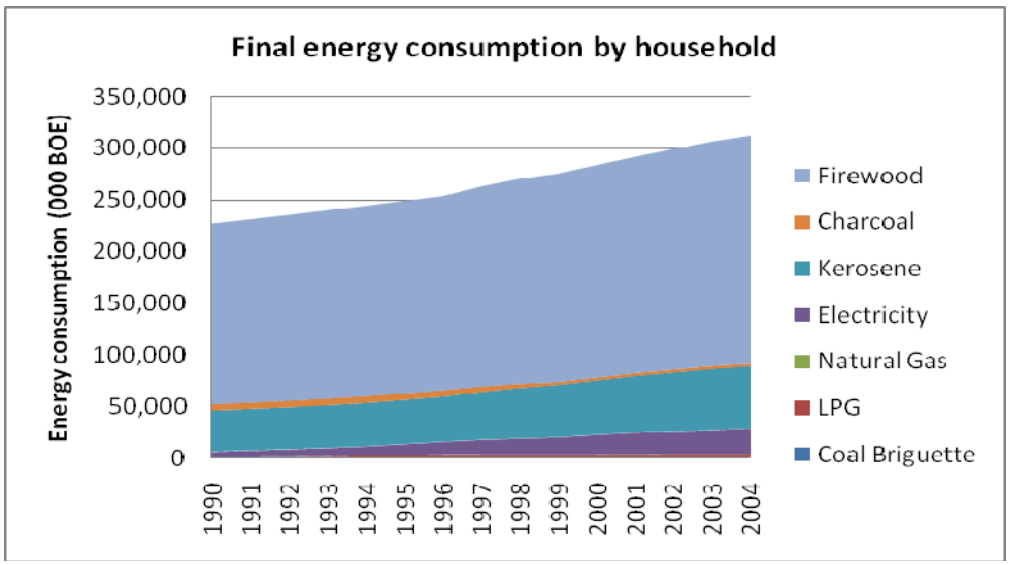


Figure 22. Final energy consumption by household
Source: Statistics of Energy Economics (2007)

Figure 22 shows that households remain the main users of firewood and charcoal as energy sources. Household consumption of wood energy is mainly for cooking by rural households, with some cases in urban households. According to Sumaryono and Waluyo (2005), the average consumption of wood energy for households was 2.4 m^3/capita/year. However, household utilization of wood energy differs widely by location, i.e. urban and rural areas, as well as Java and outside Java Island. Urban households in Java were estimated to consume 0.13 m^3/capita/year, while rural households consumed about 0.35 m^3/capita/year (survey in Bogor by Kamaruddin, 1977). Household consumption of wood energy outside Java (i.e. East Kalimantan) was estimated to be in the range of 5.4-6.6 m^3/capita/year (Kuspradini et al., 1999).

Sixty-three percent of household consumption (rural and urban households) in 1987 mainly came from home gardens and only 15% from natural forests. Moreover, most of the wood energy used by urban households in Java was collected from own land (43%) and only 6% from forest areas. On the other hand, in 1994, it was estimated that 37% of the total potential

supply of wood energy came from natural forest. This implies that wood energy consumption is not disturbing natural forest condition.

Policies and regulations impacting use of wood as a source of energy

In response to the soaring price of fossil fuel, the Indonesian Government released a Presidential Regulation (PP No.5, 2005), which is known as the National Energy Policy. Due to the subsidy policy on fuel in Indonesia, the increase in fossil fuel price has become a burden for the government's budget. The regulation demands relief of Indonesian dependency on fossil fuel by gradually shifting its energy mix. In 2006, Presidential Decree No.1/2006 regarding bio-fuel utilization was issued.

Based on Energy Economics Statistics (Ministry of Energy and Mineral Resources 2005), firewood and kerosene consumption by low-income households (lower than 150% poverty line) tends to increase, while the energy consumption by richer household tends to shift from firewood and kerosene (see Figures 23, 24 and Figure 25). Average household consumption tends to be constant at about 1 BOE/capita/year, while the average household consumption of kerosene tends to increase. Charcoal consumption by household, regardless of income level, tends to decrease (Figure 24). These figures also show that kerosene and firewood alternate as energy resources for households.

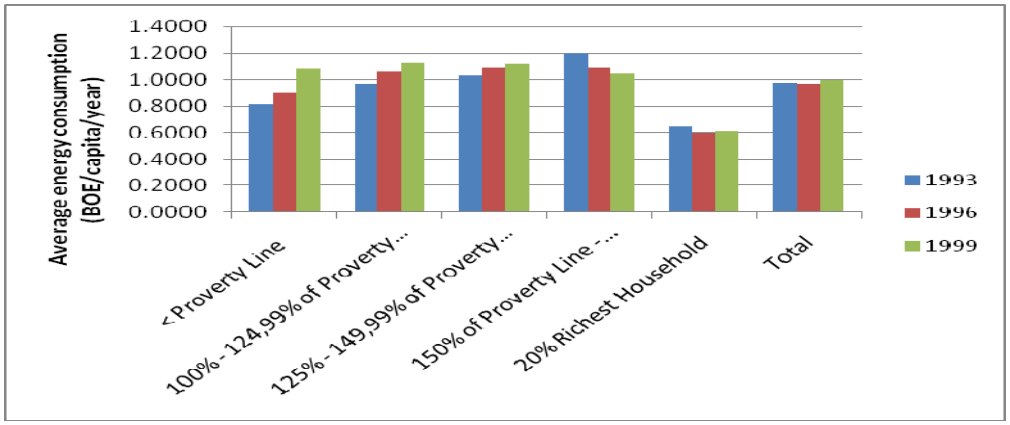


Figure 23. Average firewood consumption per capita per year in the household sector
Source: Statistics of Energy Economics (2007) and BPS (2007).

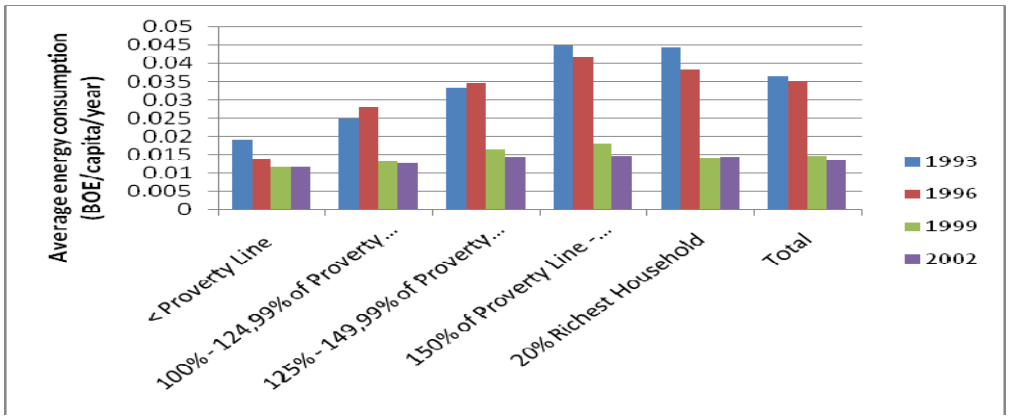


Figure 24. Average charcoal consumption per capita per year in the household sector (1 tonne charcoal = 4.9713 BOE)
Source: Statistics of Energy Economics (2007) and BPS (2007).

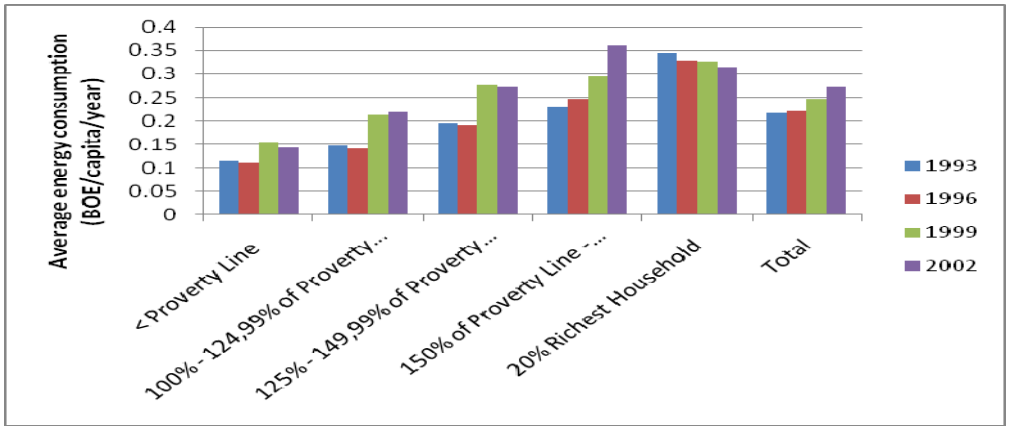


Figure 25. Average kerosene consumption per capita per year by the household sector
Source: Statistics of Energy Economics (2007) and BPS (2007).

In accordance with the national energy policy, in 2007 the government planned to convert the utilization of the subsidized kerosene to natural gas, especially for household energy use. However, due to the possible problem of distribution, especially to rural areas, and difficulties in accustoming people to the gas stove technology, the fuel conversion was predicted to be difficult to accomplish. This policy would probably fail, especially for low-income households, and finally would shift their kerosene consumption back to firewood.

Non-wood forest products

More than 90 NWFPs are traded in Indonesia, locally, nationally or internationally (FAO 2002), however most of their production data are lacking. Indonesia Forestry Statistics (2007) recorded production of only 16 NWFPs such as rattan (rotan), pine resin (gondorukem), turpentine (terpentin), Shorea resin (damar), copal (Agathis resin), Cajaput oil (minyak kayu putih), wood charcoal (arang kayu), gaharu, honey (madu), silk (benang sutera), fish (i.e Arowana), gambir, sago (sagu), cinnamon (kayu manis), fruit (i.e. tengkawang), and gum resin (jelutung). During the period 2001-2006, the total export value of NWFPs including wildlife (fauna and flora) and its derived products was around US$2.62 billion with varnish (sirlak), sap (getah) and resin (damar) accounting for 74% of total export values followed by wood charcoal at 10% (Figure 26).

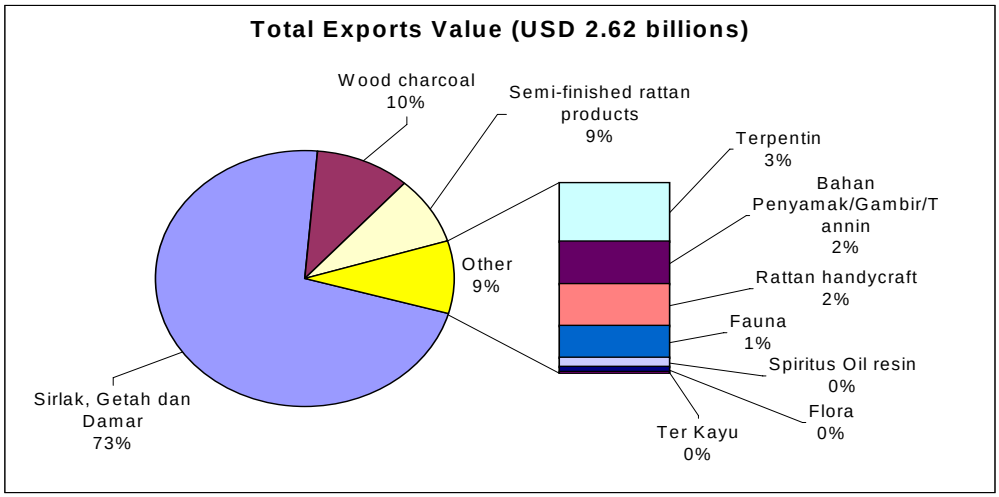


Figure 26. Total export values of NWFPs (2001-2006)
Source: Indonesia Forestry Statistics, MOF, various years.

The most substantial and least recognized aspect of NWFPs is their subsistence use, which allows people to meet basic needs when they lack cash and easy access to markets (Pierce et al. 2002). NWFPs are particularly suited to serve as social safety nets in times of household hardship or economic crises, as well as being sources of cash during periods when families have no other sources of income (Wollenberg and Nawir, 1998). They also provide substantial employment for rattan farmers, especially in Kalimantan (O'Rourke, 2004). Some NWFPs also play an important cultural or spiritual role in traditional practices. Much of the value added and profits from NWFP activities are in transport and marketing from which poorer households tend to be excluded. NWFPs are accessible to the poor due to their low market value, and as they become valuable, powerful interests generally appropriate the benefits (Dove 1993).

The service functions of forests

Forests produce both biodiversity protection benefits and environmental or watershed services at the same time. Indonesia's Protection Forests are designated to safeguard essential, locally important environmental services, particularly hydrology and erosion control. However, its legal and management framework is not well developed apropos conservation or production forests. Moreover there are also vast areas of critical lands inside Protection Forests due to weak forest management practices and illegal logging activities. Critical land is severely damaged land due to its loss of vegetation cover. Hence, its functions for water retention, erosion control, nutrient cycling, microclimate regulation, and carbon retention are completely depleted. Reforestation of protection forest has intended to rehabilitate the critical land inside protection forests or watersheds to improve ecological and hydrological functions; this was conducted with the active participation of local communities who lived nearby the target area. During the period of 2002-2006, about 708,424 hectares of protection forest were reforested (Forestry Statistics of Indonesia 2007).

On the other hand, although Conservation Forest produces most of the same environmental service benefits that protection forests do, they are especially set aside to protect biodiversity, as well as more intangible benefits or global public goods such as landscape beauty and existence or bequest values. To manage this Conservation Forest, it is divided into six categories: Strict Nature Reserve (Cagar Alam), Wildlife Sanctuary (Suaka Margasatwa), Nature Recreational Park (Taman Wisata Alam), Game Hunting Park (Taman Buru), National Park (Taman Nasional), and Grand Forest Park (Taman Hutan Raya). The distribution of Conservation Forest in 2006 is shown in Figures 27 and 28.

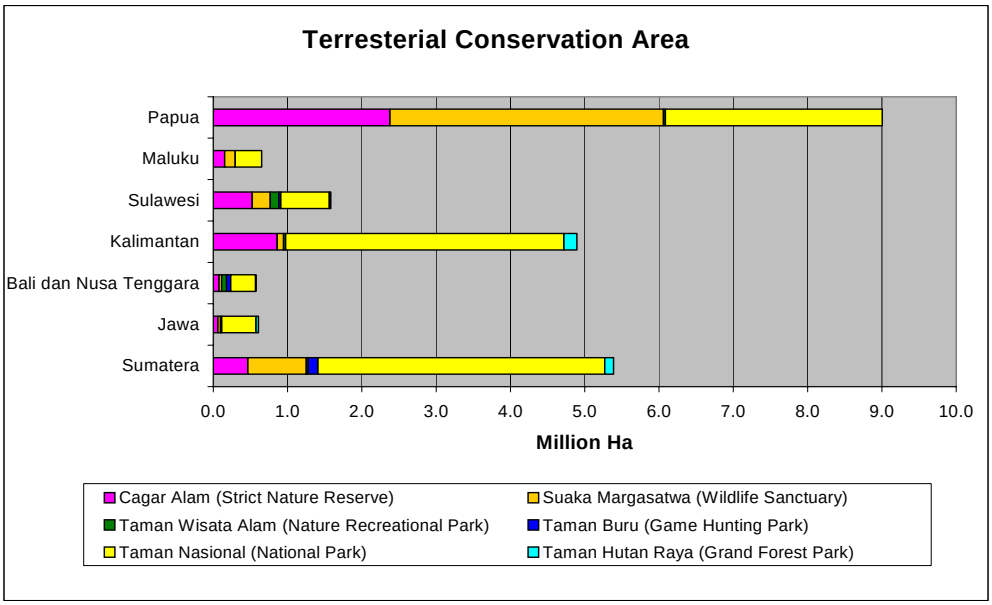


Figure 27. Distribution of terrestrial conservation area in 2006, by islands
Source: Indonesia Forestry Statistics 2006, MOF (2007).

There is also significant mangrove forest in Indonesia, a forest that occurs in a transitional zone between land and marine ecosystems and is important for protection of coastal regions; it serves as a sediment retainer and provides environmental balance between the two ecosystems. Activities related to mangrove forest development in Indonesia during the period 2001-2005 are the establishment of 369 units of the Mangrove Forest Model, replanting/rehabilitation of 19,918 ha, free distribution of 5.19 million seedlings for mangrove rehabilitation, field training for 918 field officers and 4,715 local community and NGOs.

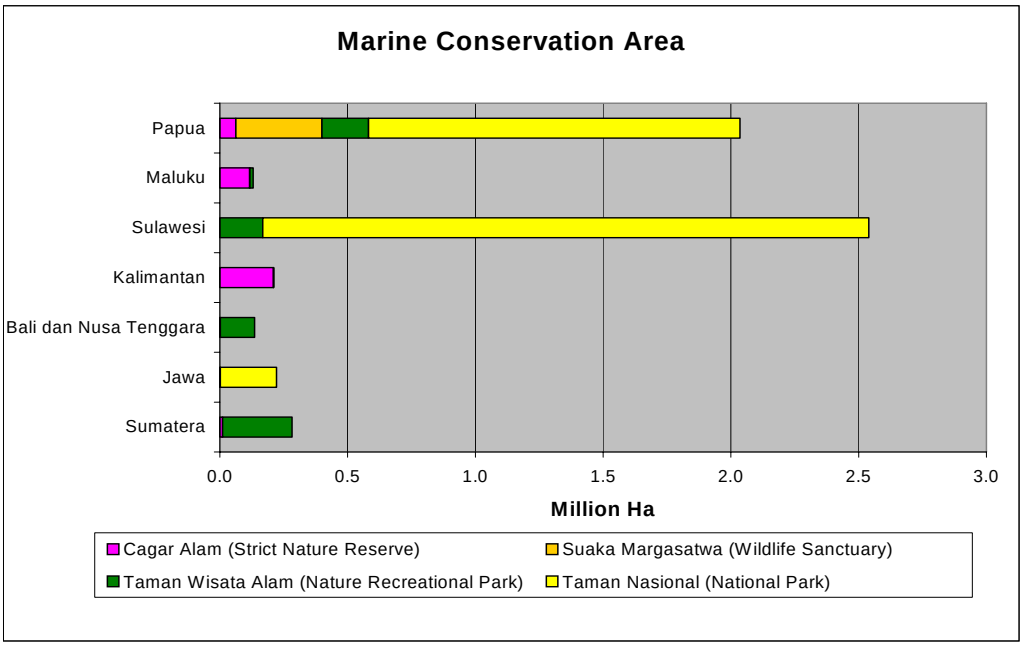


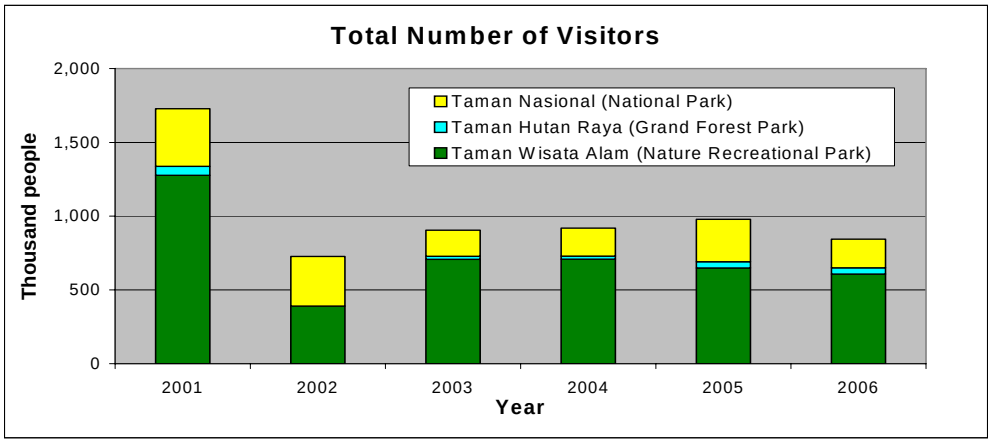
Figure 28. Distributions of Marine Conservation Area in 2006, by islands
Source: Indonesia Forestry Statistics 2006, MOF (2007).

Moreover, Indonesia is a recognized mega biodiversity country. Forestry Statistics (2007) reported that there are 515 species of mammals (12% of the world's mammals), 511 species of reptiles (7.3% of the world's reptiles), 1,531 species of birds (17% of the world's birds),

270 species of amphibians, 2,827 species of invertebrates and around 38,000 species of plants (of which around 1,260 species are medicinal plants). However, IUCN's Red List indicates an increasing number of Indonesian species that are threatened or endangered. In order to protect biodiversity, by the end of 2006, the Ministry of Forestry had managed to protect 127 species of mammals, 382 species of birds, 31 species of reptiles, 9 species of fish, 20 species of insects, 2 species of crustacea, 1 species of anthozoa and 12 species of bivalves. Moreover, the Ministry of Forestry has listed 1,053 species of flora and 1,384 species of fauna in CITES appendices I and II.

As mentioned above, forests produce some environmental services and protect others. Some of these services are not readily verified or marketed, but may impose costs when they are missing. Though environmental services are reasonably easy to describe, they are complex to quantify, measure, and attribute to specific sources or environmental or land management features.

Sunderlin (2003) identified that environmental services form part of the "safety net" function of forests. If institutional or market relationships can be developed where downstream or distant beneficiaries are willing and able to pay for the production of these services, then forest dwellers may benefit with direct cash payments. These payments for environmental services have some potential to improve the livelihoods of forest dwellers and help to eliminate poverty, but these schemes have not been widely practiced in Indonesia. Tourism is another way to provide a form of transfer payments or benefits to improve livelihoods in some areas. Over the period 2001-2006, total visitors to Conservation Forests amounted to about 6.1 million people. But only 9% of them were foreigners. The total number of visitors and foreigner visitors by Conservation Forest type is shown in Figure 29.



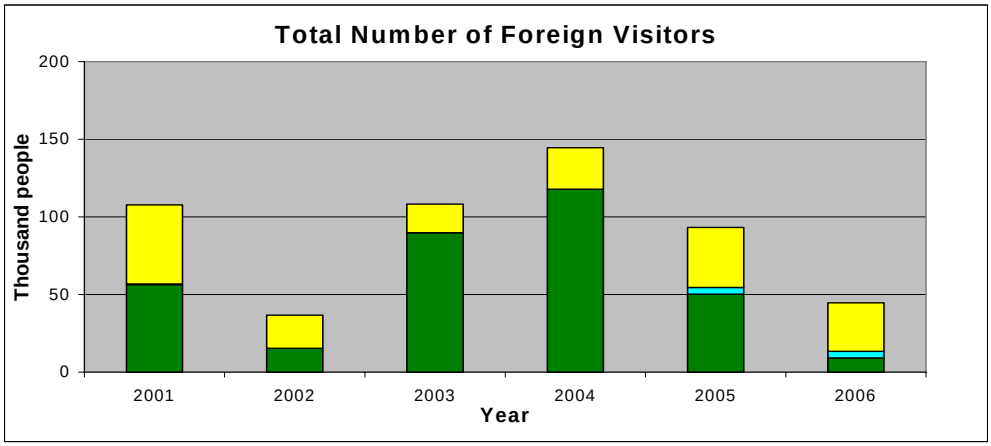


Figure 29. Total number of visitors and foreigner visitors by Conservation Forest type during the period 2001-2006
Source: Indonesia Forestry Statistics 2006, MOF (2007).

Policy and institutional framework

As the world's largest archipelago with thousands of islands, the third largest area of tropical forest resources with mega biodiversity, and the fourth biggest population with very diverse ethnicity and cultures, the management of Indonesian tropical forest has been facing many challenges. Dynamic forest policies and regulations have responded to these challenges.

The basic forestry laws as the legal framework for managing forestlands and the status of forest resources are: Indonesia's Constitution Article 33, which establishes the basis of state authority over land and natural resources; and Law No. 41 Year 1999 on Forestry, which states the basic principles and objectives of state forestry administration. The basic principles and objectives contained in these legal frameworks are, among others:

- Forest resources are controlled to provide multiple uses
- Forestry administration shall be based on benefits and sustainability, democracy, equity, togetherness, transparency and integration and shall be oriented for people's maximum welfare
- The Government is obliged to encourage people's participation through various effective and efficient forestry activities and to effect this participation through assistance from a stakeholder forum (to this end, the National Forestry Council was formed)
- As long as they exist and are recognized, customary law communities have the rights to: collect forest products for daily needs, undertake forest management under

customary laws (that do not contradict national laws), and be empowered for improving their welfare
- Communities can utilize forest and forest products and be informed about plans for forest allocation, forest product utilization and forestry information
- Communities have the right to compensation for losing access to their forests due to designation as forest area, in accordance with prevailing laws and regulations
- Communities are obliged to participate in maintaining and preventing forest areas from disturbance and damage and can seek assistance and guidance in this task even from third parties

With regard to forestry administration, its basic principle is achieved when the orientation of forestry administrations is to: ensure that forests are sufficient in area and evenly distributed; optimize the variety of forest functions, which cover conservation, protection and production functions in order to gain balance and sustainable benefits from the environment for society, culture and the economy; improve the carrying capacity of watersheds; improve the capacity to develop community potentials and empowerment through participatory, equal and environmentally-friendly ways so as to establish endurance against external change; and secure equal and sustainable distribution of benefits. This implies that sustainable forest management should accommodate community aspirations and participation, as well as customary, cultural, and social values. Therefore, it is clear that Indonesia's legal framework for forest management is based on the three broad goals of promoting economic growth, providing widespread and equitable benefits to society, and sustaining environmental services and benefits.

Many other laws and legislative decrees also have some influence on forest resource management. They are:

- MPR Decree No. IX/2001 on Agrarian Reform and Natural Resources Management, which contains principles and approaches that have some potential to reduce conflict both among the laws and the users of natural resources
- The decentralization laws,[7] which reallocate roles and responsibilities for forestland management and revenue between the central, provincial, and district governments
- The Basic Agrarian Law (No. 5 of 1960), which has some influence on the management of land and the process of designating land rights
- The National Land Policy Framework (NLPF), which was formulated by the government in 2004 and 2005 to review and renew land policy, to improve existing land laws and regulations (including the Basic Agrarian Law), to resolve increasing land problems, and to implement MPR Decree No.IX/2001
- Law Number 7/2004 on Water Resources, which integrates responsibilities across ministries (with primary responsibility under the Ministry of Public Works) to improve water resource management and allocation at the national level
- Presidential Instruction No. 4 of 2005, which directs the leaders of 18 government bodies to cooperate and coordinate to eradicate illegal logging
- Law No. 25 on Anti-Money Laundering, which includes forestry crimes and environmental crimes as predicate offences for prosecution for money laundering
- The Bali Ministerial Declaration on Forest Law Enforcement and Governance (FLEG) of 2001, which calls for national and multi-national efforts to address illegal logging, trade, and corruption and since then, many countries (including Norway, China, European Union, UK, Japan, and others) have developed bi-lateral agreements (MOUs or other mechanisms) with Indonesia to help combat forest crime and trade

[7] Law No. 22 of 1999 as subsequently revised by Law No. 32 of 2004 on Regional Administration and Law No. 25 of 1999 as subsequently revised by Law No. 33 of 2004 on Fiscal Balance Between the Central Government and Regional Governments.

Recently, the Ministry of Forestry has formulated Strategies and Plans for 2005-2009, which focus on fighting illegal logging and trade; revitalization of the forestry sector, especially forest industry; rehabilitation and conservation of forest resources; economic empowerment of communities around forests; and stabilization of forest areas and their boundaries. Some targets in the development of the forestry sector by 2009 are among others: establishing industrial plantation of 5 million hectares, developing community forest and industrial community forest of 500 000 hectares, certifying 59 forest concessionaires on sustainable forest management, establishing 29 national park models, rehabilitating 282 priority watershed forests and 5 million hectares, demarcating forest boundaries of 15 000 kilometres, establishing forest spatial planning of 12 million hectares, and developing 28 forest management units.

Key issues and an overview of the overall state of forests and forestry

Based on the current state of forest and forestry as explained before, there are many issues in Indonesia's forest sector. The poverty level of forest dwellers is high. The number of skilled labor in forest management is low, although the demographic has changed. The number of senior researchers and researchers in the Forestry Research and Development Agency is low as well so applied research is very limited.

Due to poor forest management practices, illegal logging, forest conversion to other land-use, and fires, the deforestation rate is high and estimated at more than 1 million ha per year. This also makes the development of sustainable forest management units difficult to realize. Indonesia's natural disasters are accelerating as well. Together with illegal trade, log smuggling, the huge log deficit facing the forest product industry, and the high cost of forestry licenses, the capacity of the forest sector to contribute to national development has been reduced.

Meanwhile, the rapid change of decentralization and democratization processes has generated various visions, missions, and priorities among provinces and districts, which are reflected in their various institutions and forest management regulations. These institutional arrangements and forest policies need to be harmonized, but the cost is not cheap. On the other hand, global concerns on greenhouse gases and climate change issues, which are linked to the production of forest products and to the implementation of sustainable forest management, demand fundamental changes in institutional arrangements and forest policies.

Good public and corporate governance is then needed. Reforming the structure of forestry institutions, regulations and management to create conducive environments for integration and collaborative empowerment of sustainable forestry development is also warranted. Strengthening human resource capacities to manage forestry development and balancing the role of public and private sectors to enhance global competitiveness are required. These strategies would improve the forest sector's contribution to gross domestic product (*pro growth*), enhance forest resource utilization to create jobs and livelihoods for forest dwellers (*pro job*), and support poverty alleviation of forest dwellers (*pro poor*).

There are at least 10 key issues that need to be addressed to achieve maximum social welfare: illegal logging and trade; revitalization of forest industry; deforestation and natural forest degradation; poverty alleviation of forest communities; land tenurial disputes; establishment of community forest; establishment of FMUs; improvement of forest governance; improvement of human resource quantity and quality in the forestry sector; and improvement of forestry research and development functions.

3. FACTORS THAT INFLUENCE THE FUTURE STATE OF FORESTS AND FORESTRY

Distribution of population, forestry and poverty[8]

Seventy percent of Indonesians live on thirty percent of its land. Although Indonesia is urbanizing, the rural poor still outnumber the urban poor 2 to 1. However, this also varies widely by region. Off Java the rural poor are a much higher share of the poor, up to 95% in Papua. More than half the poor (57%) and half the rural poor (52%) live on Java. About 12 million rural poor people live on the Outer Islands (along with 75 million other rural, urban poor, and non-poor people). Among rural dwellers, one in five is poor. In the eastern parts of Indonesia, an even larger share of the rural (and general) population is poor. Off Java, the vast majority of the poor are rural: over 85% in Papua, Sulawesi and Maluku (World Bank 2006).

Two studies of poverty and forest cover agree that 50-60 million Indonesians (about a quarter) live in the mostly rural, state-claimed "forest zone" (Brown 2004; Muliastra and Boccucci 2005). One analysis indicates that the great majority (>70%) of these people live in areas with no tree cover. Of the people living in the forest zone, about 20% are poor, slightly higher than the national average of 17% (in 2003). In areas with forest cover (a smaller area than the "forest zone"), the poor are low in overall headcount (3-6 million people), but relatively higher as a share of the total (22% in poverty vs. 17% for the country as a whole). Further, the highest incidence of poverty is in the Eastern Islands, in particular, Papua, which still has substantial forest cover. Figure 30 shows the highest numbers of poor people are in the West, especially on Java, which has the lowest share of remaining forest cover of all the major islands.

Related to sound forest management, equitable economic benefit, and good forest governance, gender and diversity issues are critical. These are not simply issues of fairness, but issues of strengthening the roles and ability of women to benefit from forests since half of forest sector stakeholders are women. Moreover, stores of indigenous knowledge (often held by women, the elderly, or marginalized tribal groups) are in fact assets that should be maintained and nurtured, not undermined, homogenized or destroyed.

On the other hand, men and women use and value forests and forest products differently and engage in different forms of management. Women may be more engaged in firewood collection, charcoal production, gathering and application of nutrient enhancements (manure, mulch, fertilizers, etc.) and collecting medicinal plants. While forest managers or economists may value forest areas based on a few commercial timber species, locally diverse stakeholders may value a wide range of goods and services. Non-wood forest resources, such as fish and water, may be critically important for certain indigenous groups, women, or families, especially seasonally.

[8] World Bank (2006) and Brown (2004).

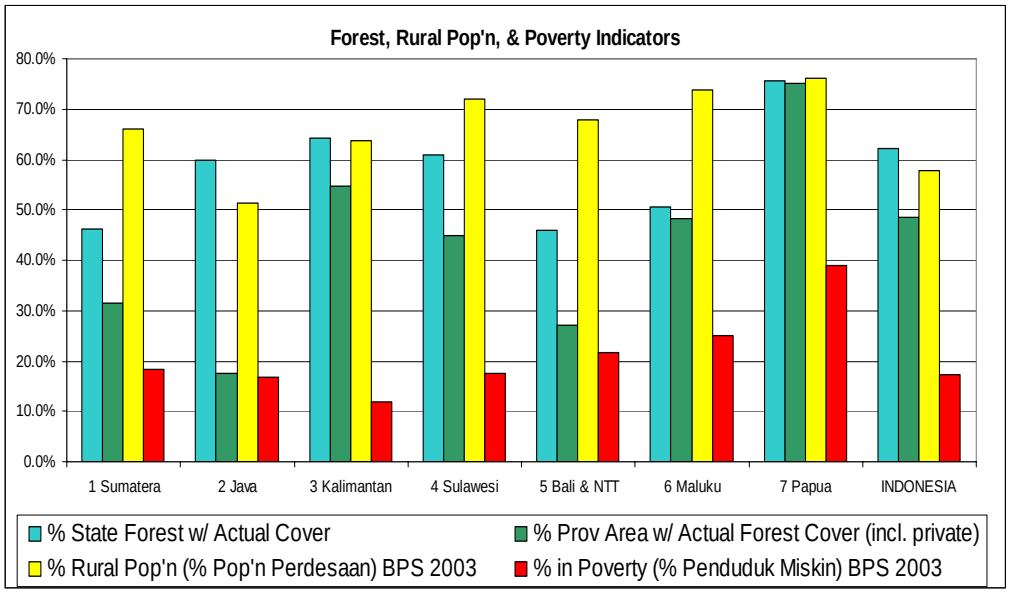


Figure 30. The proportion of forestland, rural population and poor population, by major island group
Source: World Bank (2006).

The political and institutional environment

The dynamic evolution of Indonesian society and politics creates opportunities for partnership and collaborative work with a wide range of institutions and groups. Ongoing domestic policy processes, such as the National Forest Programme (NFP), the Forestry Congress and the National Forestry Council recognize that the forestry policy environment is multi-sectoral in character and requires interdepartmental and multi-stakeholder approaches.

The Ministry of Forestry (MOF) has been launching an initiative, known as FOMAS (Forest Monitoring and Assessment System), to promote good governance and sustainable forest management by providing systematic, accurate, and timely information on forest and timber resources to all levels of decision-makers and to the general public. This will be a national system for monitoring changes in forest cover, rates of forest degradation, and progress of plantation and rehabilitation projects. Broad support for FOMAS has been secured from a wide array of stakeholders, including the MOF, other government organizations, industry, civil society, NGOs and the research community. Collaborating partners, including the World Bank, Forest Watch Indonesia, South Dakota State University, DFID's Multi-Stakeholder Forestry Programme (MFP), Wageningen Agricultural University, and the World Resources Institute (WRI), will assist in developing the initiative.

Since the President of Indonesia has issued a decree on illegal logging and formed a high level-working group under the Coordinating Minister for Political, Legal and Security Affairs, the MOF is becoming more forceful in prosecuting the campaign against illegal logging and corruption. For instance, the Ministry has referred the names of illegal timber barons to the Attorney General's office. International and donor organizations, and NGOs, are also engaging a range of law enforcement and financial agencies that have important roles to play in combating forest crimes. The World Bank and other partners, for example, are already working with the Coordinating Ministry for Political, Legal and Security Affairs which is bringing the Police, the Attorney General's office, PPATK and other concerned agencies together in the fight against illegal logging and trade.

In November 2001, the MOF established the Tenure Working Group to develop a discourse on forest management that is more just and sustainable. This Working Group aims to develop

mechanisms for resolving conflicts and building understanding among multiple stakeholders about land use conflicts. Meanwhile, BAPPENAS and BPN are engaged in developing a National Land Policy Framework that strives to develop institutions and mechanisms to resolve land use conflicts, in line with the principles in MPR Decree Number 9 of 2001. On the other hand, the MOF has a long-term capacity-building program that seconds staff to NGOs and international organizations for several years. As a result, constructive partnerships with several NGOs on critical governance issues (e.g., Indonesian Corruption Watch) have been developed.

As timber is becoming scarcer, relative to processing capacity, different segments of the industry now have to compete for access to timber. The EU's introduction of stricter measures against illegal timber trade and the potential for Voluntary Partnership Agreements make firms more aware of the need to differentiate their product and document their source of supply as a condition of access to markets. Some progressive firms are already making investments in plantations and retooling that will allow them to demonstrate sustainability and efficiency in global markets. Trade associations have also evolved: many are under new management, better represent the needs of their members – firms trying to do business in the global economy – and are more open to public consultation and transparency.

After the change in decentralization law in 2004, many local governments are experimenting with innovative forest, watershed, and community-based natural resource management approaches, often with the help of NGO networks and universities. International and donor organizations also support a wide range of efforts of this type using grants and technical assistance.

Civil society groups also are becoming more vocal and more skilled in investigative reporting and in focusing attention on key cases and key reforms needed. At the local level, civil society groups are increasingly successful in pointing out corruption and poor practice and encouraging the responsible authorities to take action. CIFOR, the World Agro-forestry Center and the Ford Foundation are supporting civil society organizations and wider dialogue processes through their technical analyses. Some NGOs (WWF and TNC) and the IFC have developed partnerships with more progressive elements of the private sector to work on issues such as certification of high conservation value forest. Most of the early partnership opportunities have already been founded. However, additional opportunities will arise as market forces and opportunism continue to differentiate various groups within the industry.

To sum up, since the end of the New Order Regime, there have been important and growing changes in regulatory structures, transparency, scrutiny and involvement of civil society in Indonesia. The spotlight on illegal logging has intensified. Anti-corruption forces in government forestry agencies, private industry, NGOs and the media are working together against the entrenched special interests of the past, which continue to wield great influence. New laws are being passed or considered on transparency, conflict resolution, agrarian reform, natural resource management and civil service reform. It is recognized that the forestry policy environment is multi-sectoral in character and requires interdepartmental and multi-stakeholder approaches.

Economic changes[9]

Forestry and the forest product industry played an important role in Indonesia's economy through significant contributions to gross domestic product, foreign exchange, government revenue, and employment in the period 1980-2006.

[9] Simangunsong (2004); Simangunsong and Setiono (2004); Brown et al. (2005).

During the period 1993-2005, the forest sector's (including wood and paper industries) share of national gross domestic product ranged from 3% to 4.3% (or 13% to 22.1% of the industrial sector, excluding petroleum and gas). Although those figures are higher than the Asian average of 1.1% (FAO, 2005), they misrepresent the importance of forestry and forest industries such as in rural areas.

The forest sector also became one of the major foreign exchange contributors in Indonesia during the period 1980-2005. The export value of forest timber products fluctuated during the 1980 to 2005 period and reached its peak of US$6.24 billion (17.8% of export value for industry goods or 11.7% of the total value of exports) in 1997 when the export value of plywood reached its peak as well, and there were significant contributions from pulp and paper and wooden furniture. The export value of forest products subsequently fell as a result of the economic crisis, and by 2005 the value had dropped to US$5.41 billion (9.7% of export value for industry goods or 6.3% of the total value of exports) (Central Statistics Agency, 2006).

Government revenue from the forest sector is based on collected levies such as forest licenses (IHPH/IHHT), reforestation funds (DR/DJR), and forest rent tax (IHH/PSDH). Total forest revenue sharply decreased from US$191 million (1% of total revenue) in 1980 to US$92 million in 1985 (or 0.5% of total revenue) due to the decrease in log production. Forest revenue then reached the peak of US$615 million in 1996 (or 1.5% of total revenue), and then sharply decreased to US$266 million (or 0.4% of total revenue) in 2006 due economic crises.

The number of people currently employed directly in the forestry industry is estimated at between 500 and 600 000. This figure would be far higher if all those employed in agro-forestry activity, and in the woodworking, small-scale sawnwood, particleboard, fibreboard and wooden handicrafts industries were taken into account.

There were three important trends during this period. First, even though the export value of forest products increased, forest exports as a share of industrial exports decreased after 1980 indicating faster growth of other industrial product exports. Second, in 2002, the export value of pulp and paper surpassed the export value of plywood for the first time, indicating a major change in the composition of Indonesia's wood-based industry sector. Third, the sector's rapid growth and structural change was mainly the result of government policies rather than market forces.[10]

The rapid growth and structural change of Indonesia's forestry sector has also caused many complex problems. The Indonesian forest industry faces a huge timber deficit. The Ministry of Forestry's "soft landing policy" has lowered the AAC from concessions in natural forests to about one-tenth the installed capacity of existing processing mills. Although some of the needed timber supply comes from plantations and other sources, there is still a large gap between sustainable, legal supply and industrial timber demand (RWE), whether demand is based on capacity or actual production in recent years.

Due to old machines used in processing mills, especially at plywood mills, the productivity of the Indonesian forest industry is low, while waste produced in processing mills is high. This leads to declining output and international competitiveness. Hence, wood-processing sector firms are heavily indebted and there are increasing lay-offs among factory workers.

[10] Policies that had important impacts were: the log export ban, first announced in May 1980 and totally imposed in 1985; the sawnwood export tax, imposed in November 1989; the prohibitive log export tax, enacted in June 1992 as a substitute for the lifted ban on log exports; and reducing the log export tax to the level of 10% before December 2000 and then to 0% in 2003.

Timber supply from plantation forests cannot meet current levels of demand because plantation lands are not being planted at sufficient rates to produce timber in the right time frame. Only a third of the lands allocated for plantations have been planted. Also, lands that are planted are not, on average, yielding timber at industry-recognized levels of performance.

Though the legal framework proposes to use forestlands to create economic benefits for the whole society, in practice, forestlands are allocated for productive uses through a system of concessions held by a few large, politically-connected conglomerates. Forest sector concessions and processing mills consume vast quantities of timber, far more than the forest can produce through sustainable harvesting.

The forestry industry is also undergoing a dynamic evolution in response to resource supplies and global market trends. Regarding forest resources, conversion of forested land to other uses has been the fastest growing source of supply in recent years. This is by definition an unsustainable approach to utilization of this renewable resource. As timber supplies in Sumatra and Kalimantan are depleted, timber harvesting pressure is moving from west to east with Papua increasingly a target for commercial exploitation.

Regarding the structure of the processing industry, pulp is the fastest growing sub-sector of timber consumption; plywood has been in decline for several years. Production of medium density fiberboard, oriented-strand board and other engineered wood products is growing in many other countries that compete with Indonesia in global markets for processed wood products. Market trends will reward firms (and countries) that can add value in downstream wood processing and more diversified products. Competitive advantage requires moving to quality and value, away from basic commodity production.

Environmental issues and policies and their impact on the forest sector[11]

Encroachment and poaching are two critical issues due to weak law enforcement. The former is a continuing concern, both at the village level and the level of local government decision-making. Where habitats are encroached, wildlife comes into closer contact with villagers and agricultural areas, triggering human-wildlife conflicts, e.g. elephants in oil palm plantations in Sumatra. The attraction of free land or timber due to minimal protection and no legal consequences is also an incentive for encroachment. Meanwhile, trade in endangered and threatened wildlife is an everyday occurrence in Indonesia. Although protected areas with proper monitoring and enforcement of boundaries are designed to prevent this trade, much more action is needed in markets, customs, borders, and international fora to raise these issues and stimulate action by multiple governments and agencies. On the other hand, the decentralization process even further complicates law enforcement issues.

With regard to management practices, forest conversion to agriculture or settlements is part of the issue of forest degradation. Although, forest conversion had been regulated through a licensing system authorized by the MOF, the decentralization process and various layers of policies resulted in an unclear status and an excess of conversion. Forest and land fires are also critical issues related to management practices. Fire is still used for land clearing on a regular basis for plantation development and by shifting agriculture. In addition to creating smoke and haze-related health effects in the short run, use of fire and poor agricultural practices can encourage the spread of alang alang grass (*Imperata cylindrica*), which dramatically alters the ecology and biodiversity of massive areas of Indonesia. During 1997-98, an estimated 10 million ha of land were burned and about half of this was non-forested and agricultural land. This released 700 million tonnes of carbon dioxide into the atmosphere and caused about US$9 billion in economic losses, including health impairment due to haze (ADB, 1999).

[11] World Bank (2006); IBSAP (2003).

Environmental awareness is an essential part of biodiversity conservation. Recent environmental disasters (e.g., floods, landslides, drought and pollution) have stimulated greater environmental concern among the public at large. However, even when awareness is better developed, public attitudes and desires still need to be translated into action. Problem recognition needs to be connected to manageable corrective actions that are visible and effective. Awareness is also needed as part of a broader mandate for conservation. IBSAP notes that lack of awareness "is aggravated by the greed of those possessing the means to exploit biodiversity." The issue of attitudes is closely linked to the undervaluation of natural resources and ecosystems. Although these ecosystems produce valuable, and sometimes marketable environmental services, local markets and government planning decisions do not usually place sufficient value on these resources or services. Natural resources are simply exploited as cheap commodities. Yet, as seen above, the loss of these services can impose costs and cause losses, such as the cost of fire damage.

IBSAP (2003) points to several underlying "structural" factors in the management of biodiversity, including: exploitative, centralistic, sectoral and non-participatory policy; economic growth and sector-based approaches; inefficient management of natural resources (compounded by legal inconsistency); the use of extra-judicial force in conflict management; and the lack of community participation in key decisions. IBSAP also cites weaknesses in institutional arrangements, legal frameworks and law enforcement, research, information systems and human resources. In addition, the development process itself can have an impact on forests, environmental services and biodiversity. Population growth creates pressure to open land for settlements and agriculture, as well as increased urbanization of upland and rural environments. However, macro-level institutional and structural changes are needed to address these concerns.

Related to global sustainable forestry management and climate change issues, inclusion of forestry as a major element of the clean development mechanism (CDM) or REDD would help Indonesia to manage its forests sustainably. Particularly, the REDD mechanism has great potential as an incentive for people to stay away from illegal logging activities. By preventing excessive timber production from natural forest, the REDD mechanism could also be an incentive for plantation development, which is a key to revitalization of forest industries.

4. PROBABLE SCENARIOS AND THEIR IMPLICATIONS

Rationale for scenario definition

There are many factors that can or may have an effect on Indonesia forestry. But only five of the most important factors have been selected and considered in the development of the Indonesia forestry outlook: population and labor changes, environmental threats, economic development, and governance issues.

To accomplish any of the objectives for improving management of forest resources, considerable work on governance issues including law enforcement, decentralization, conflict and inequity, is needed the most. Economic development to finance investment in the forestry sector is also needed. However, governance and economic development factors are two of the most uncertain and unpredictable variables in Indonesia. As discussed earlier, rapid change in decentralization and democratization processes caused various visions, missions, and priorities among provinces and districts, which were then reflected in their various institutions and forest management regulations. These institutional arrangements and forest policies need to be harmonized, but their costs are not cheap. Recent environmental disasters (e.g. floods, landslides, drought and pollution) have further complicated these efforts.

In this outlook, scenarios analysis is based on the governance and economic development factors. By doing this, policy measures can be developed that take the main risks to the sector into account. This also provides an opportunity to reflect on forestry as one of many sectors within a dynamic economy. Further, although many specific policy interventions could be examined individually, key sets of practices and policies into plausible future outcome states would be grouped and then called scenarios, as explained below. This is to focus on major alternative directions, rather than single policy choices.

Scenario analysis approach

Currently, the total degraded forest area (excluding Convertible Forest area) is around 33.4 million hectares. These degraded lands are a high priority for intervention because of the vast land area involved, the rapid rate of change of land status from forested to non-forested, and because of the relatively unmanaged status of much of this land. This is also a high priority because it is one of the most obvious and logical places to begin to think about rationalizing the forest estate and allowing more equitable and pro-poor access and activities. Thus rehabilitation and plantation development are of central importance to the forestry sector in Indonesia given the reduction in supply from natural forests. Scenarios developed in this outlook are based on these major policy objectives.

Rates of implementation of forest rehabilitation policy are seen as being dependent on government and, potentially, private sector funding. There is also the possibility that international pressure and market demand for carbon emission reduction will play an increasing role. Meanwhile, rates of plantation development are likely to depend on success in resolving land tenure disputes and, in relation, poverty reduction in focal areas, rates of infrastructure development and improvement of government administrative efficiency.

Given past experience, the key drivers of change for the forestry sector generally can be reduced to policy and economic factors, as shown in the diagram below. The two factors chosen were (a) effectiveness of policy implementation and institutions, and (b) economic growth rate. Within this framework, consideration was given to the two major forestry policy objectives: forest rehabilitation and plantation development. The four quadrants in Figure 31 relate to different levels of the two key drivers of change and are named according to the outcomes that changes in the drivers will result in.

Slow economic growth → Fast economic growth		
	S2. Unsustainable growth Forest rehabilitation unlikely Development of privately owned plantations possible but some government support needed. Little chance of development of community plantations although economic development may help resolve land disputes.	**S4. Sustainable development** Forest rehabilitation and plantation development proceed on the basis of effective policy implementation and sufficient investment.
	S1. Socio-economic development stalls Forest rehabilitation unlikely Plantation development unlikely.	**S3. Low-growth development** Forest rehabilitation still possible but only with policy measures based on allocation of land and rights rather than economic incentives.
	Poor policy implementation →	Effective policy implementation

Figure 31. Probable scenarios

In this scenario analysis, forest rehabilitation will be targeted on degraded areas of Natural Production Forest, Protection Forest, and Conservation Forest. The level of forest rehabilitation in each forest type is different. Further, the rehabilitation rate in S1 and in S2 is assumed to be the same within the forest type. The rehabilitation rate in S3 and in S4 is also the same, but is assumed to be twice as the rehabilitation rate in S1 or S2 due to an effective policy assumption implied by Figure 31. The target of forest rehabilitation for the period 2007-2020 in each forest type and each scenario is presented in Annex 1.

Meanwhile, plantation development will target establishment of pulpwood plantation, industrial timber plantation, industrial community forest plantation, and intensive silviculture (TPTII). The plantation target levels for each type of plantation in the period 2007-2020 are presented in Annex 2.

Due to the assumption of poor policy implementation, it is reasonable to assume that an illegal logging activity would be occurring in scenarios S1 or S2 to fulfill the timber gap faced by processed wood industries.

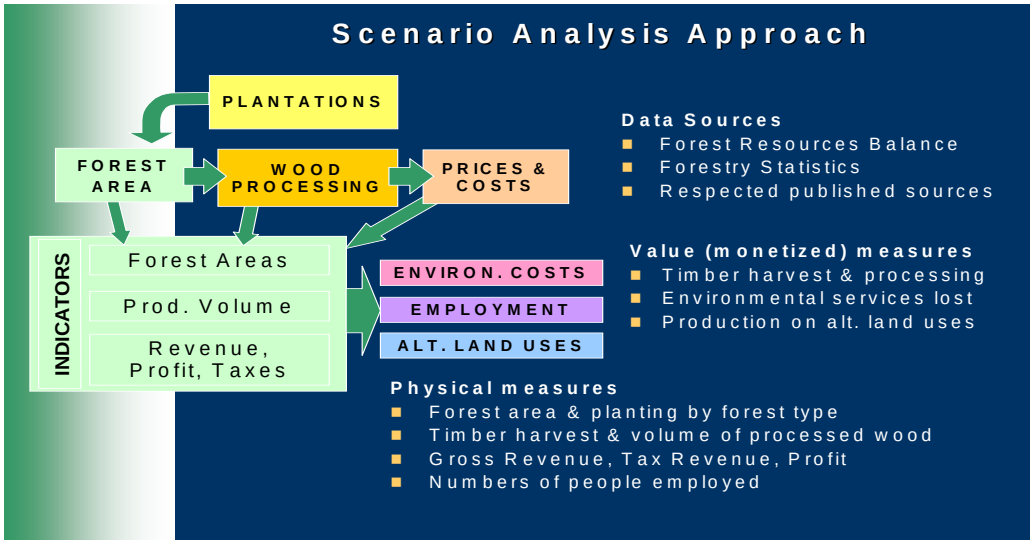


Figure 32. The scenario analysis approach

Many other variables could be used to develop scenarios. There can also be more than two variables although complexity increases significantly so a partial analysis may be more reasonable. For example, scenario 1 in the above diagram may be considerably modified by international events, such that even if economic growth is low, funding may be available to forestry in return for reduced carbon emissions.

Further, to allow policy makers to examine a range of options and scenarios over a medium-to long-term planning horizon, the analytical framework was designed to be general and interactive enough to consider a range of new options using simple projections and clear graphics. The interactive analytical framework that supports these results is a spreadsheet that shows all the assumptions, calculations, and projections. Future economic conditions such as inflation and interest rates are not projected to prevent complexity. To keep it simple, it is focused on a few key outputs of most concern to senior policy makers such as: forest area, planting by forest type, volume and value of timber harvest and processing, numbers of people employed, economic benefit and environmental costs (see Figure 32). Estimates of the total economic value of Indonesian forest resources (BAPPENA and USAID NRM 2005) as shown in Annex 4 were used in determining environmental costs as well as changes in the forest stock values in each scenario.

5. THE STATE OF INDONESIAN FORESTS AND FORESTRY IN 2020

Forest resources in the next two decades

Forest cover situation in the context of alternative scenarios

Based on the results of the scenario analysis in the previous chapter, the current and future state of forest resources in Indonesia over the period 2006-2020 is presented in Figure 33 and Table 10, trends of total non-forested area (or damaged area) during the period 2006-2020 in Figure 34, trends of total primary forest areas during the period 2006-2020 in Figure 35, and changes in environmental costs and forest stock value over the period 2006-2020 in Figure 36.

Figures 33 and 34 show that over the period 2006-2020, total non-forested area would sharply increase from 45 million ha to 59.1 million ha under S1, a 31% increase or to 52.7 million ha under S2, a 17% increase. Total non-forested area would significantly decrease to 34.8 million ha under S3, a 23% decrease or to 32.3 million ha under S4, a 28% decrease.

The increase in total non-forested area under S1 and S2 is mainly due to illegal logging to fill the log deficit faced by the wood-processing industry, as indicated by a sharp decrease of primary forest in Production, Protection, and Conservation forests and of secondary forest in Production forest (Table 10). On the other hand, a decrease in total non-forested area under S3 and S4 is mainly due to forest rehabilitation and plantation activities.

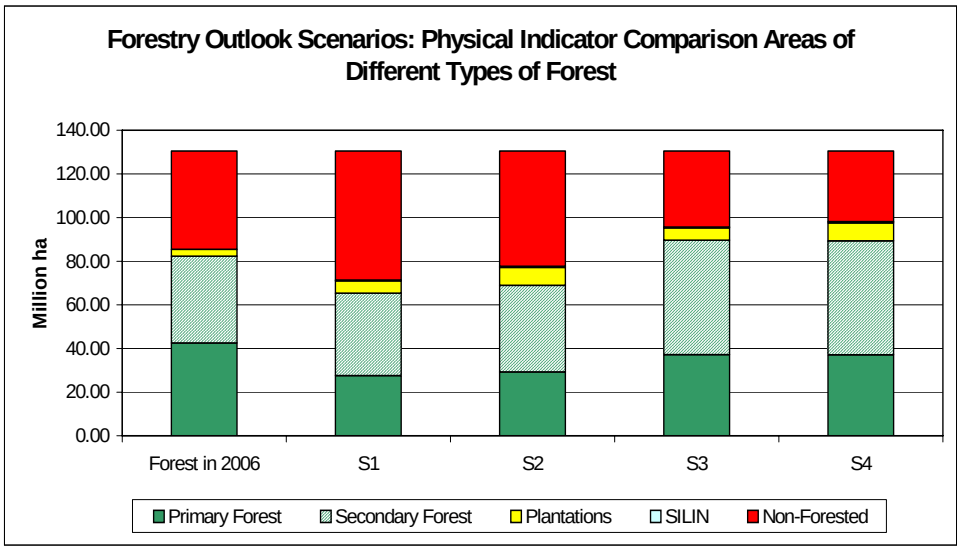


Figure 33. The current and future state of forest resources, by forest type and scenarios

Table 10. The current and future state of resources, by forest function, forest type, and scenarios

Forest function/type	Unit	Current state (2006)	Future state (2020)							
			S1	%Change	S2	%Change	S3	%Change	S4	%Change
Total Forest Area	mill. ha	130.4	130.4	0.0%	130.4	0.0%	130.4	0.0%	130.4	0.0%
Production Forest	mill. ha	59.0	59.0	0.0%	59.0	0.0%	59.0	0.0%	59.0	0.0%
Primary forest	mill. ha	13.9	8.6	-37.9%	8.5	-38.6%	8.6	-37.9%	8.5	-38.6%
Secondary forest	mill. ha	22.4	18.4	-17.6%	20.3	-9.2%	31.2	39.5%	31.0	38.6%
TPTII System	mill. ha	0.0	0.3	1907.3%	0.6	3814.6%	0.3	1907.3%	0.6	3814.6%
Not forested	mill. ha	19.5	25.9	32.7%	21.4	9.3%	13.2	-32.6%	10.7	-45.4%
Pulpwood Plantation	mill. ha	1.9	2.6	37.6%	3.3	75.2%	2.6	37.6%	3.3	75.2%
Community Timber Plantation	mill. ha	0.0	1.6		3.2		1.6		3.2	
Timber Plantation	mill. ha	1.3	1.5	13.8%	1.7	27.7%	1.5	13.8%	1.7	27.7%
Protection Forest	mill. ha	29.3	29.3	0.0%	29.3	0.0%	29.3	0.0%	29.3	0.0%
Primary forest	mill. ha	13.3	8.4	-36.3%	9.4	-29.4%	13.3	0.0%	13.3	0.0%
Secondary forest	mill. ha	8.2	9.3	13.6%	9.3	13.6%	10.5	27.2%	10.5	27.2%
Not forested	mill. ha	7.8	11.5	47.3%	10.6	35.6%	5.6	-28.7%	5.6	-28.7%
Conservation Forest	mill. ha	19.4	19.4	0.0%	19.4	0.0%	19.4	0.0%	19.4	0.0%
Primary forest	mill. ha	10.1	5.3	-47.8%	6.2	-38.7%	10.1	0.0%	10.1	0.0%
Secondary forest	mill. ha	3.9	4.7	19.9%	4.7	19.9%	5.5	39.8%	5.5	39.8%
Not forested	mill. ha	5.4	9.5	74.4%	9.5	74.4%	3.9	-28.7%	3.9	-28.7%
Convertible Production Forest (CPF)	mill. ha	22.7	22.7	0.0%	22.7	0.0%	22.7	0.0%	22.7	0.0%
Primary forest	mill. ha	5.3	5.3	0.0%	5.3	0.0%	5.3	0.0%	5.3	0.0%
Secondary forest	mill. ha	5.3	5.3	0.0%	5.3	0.0%	5.3	0.0%	5.3	0.0%
Not forested	mill. ha	12.2	12.2	0.0%	12.2	0.0%	12.2	0.0%	12.2	0.0%

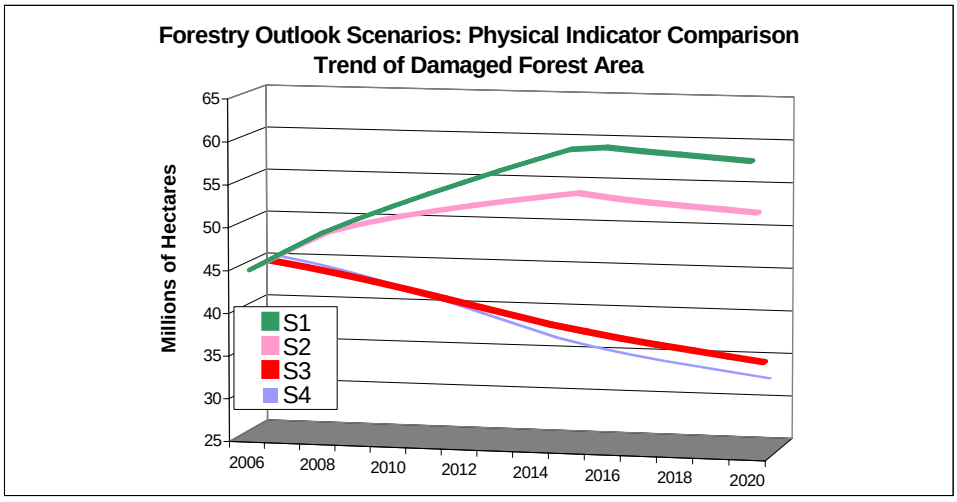


Figure 34. Trend of total damaged forest areas during the period 2006-2020

Figure 33 also shows that, over the period 2006-2020, the total secondary forest area would only decrease from 39.8 million ha to 37.7 million ha under S1, a 5% decrease or to 39.6 million ha under scenario S2, a 0.4% decrease. In contrast, total secondary forest area would significantly increase to 52.4 million ha under scenario S3, a 32% increase or to 52.2 million ha under scenario S4, a 31% decrease.

The small decrease in total secondary forest area under S1 and S2 is attributed to the increase of secondary forest in Protection and Conservation forests due to forest rehabilitation and a decrease of secondary forest in Production forest due to illegal logging. On the other hand, an increase in total secondary forest under S3 and S4 is mainly due to forest rehabilitation and to sustainable harvesting of primary production forest, which turns primary forest into logged-over areas or secondary forest.

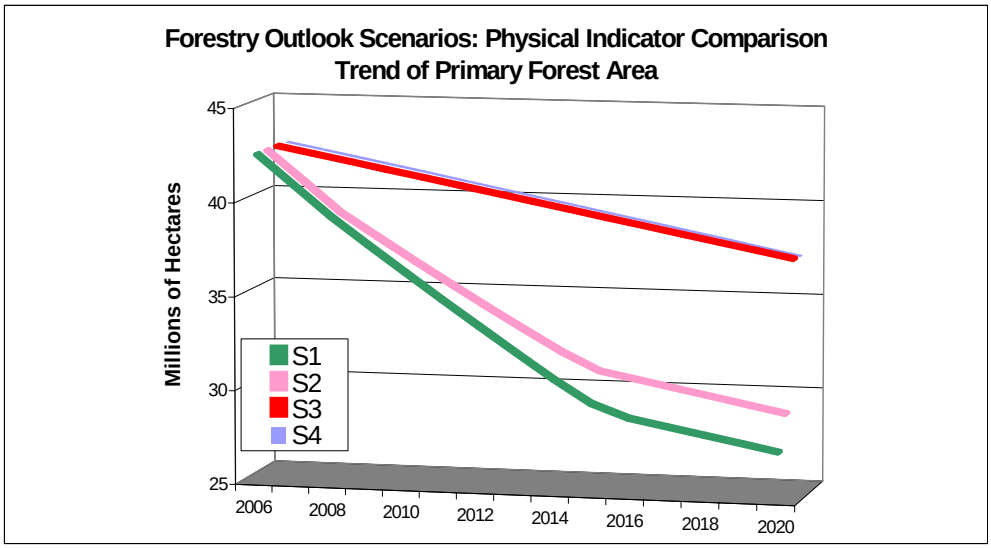


Figure 35. Trend of total primary forest areas during the period 2006-2020

Over the period 2006-2020, total primary forest area would decrease under all scenarios as shown in Figures 33 and 35. The decrease of total primary forest area under S1 and S2 is more than three times higher than that under S3 and S4. This is due to illegal logging as mentioned earlier.

Table 10 shows that over the period 2006-2020, total plantation under S1 is the same as under S3. That is about 5.68 million ha, which consist of pulpwood plantation of 2.58 million ha, community timber plantation of 1.62 million ha, and timber plantation of 1.58 million ha. Meanwhile, total plantation under S2 is the same as under S4. That is about 8.19 million ha, which consist of pulpwood plantation of 3.29 million ha, community timber plantation of 3.24 million ha, and timber plantation of 1.66 million ha.

Change in the area under production and protection

As shown in Table 10, over the period 2006-2020, primary production forest areas would decrease from 13.9 million ha to 8.6 million ha under S1 and S3 or to 8.5 million ha under S2 and S4. But, this sharp decrease in primary production forest areas is offset by increased secondary production forest area. In addition, a sharp decrease of non-forested production forest in scenarios S3 and S4 indicates a significant standing stock improvement of Production Forest (Figure 36). However, that is not the case as in S1 and S2. A sharp decrease of secondary forest and a sharp increase of non-forested production forest indicate unsustainable forest management practices. This implies that the levels of plantation and forest rehabilitation are not enough to produce logs and to restore the Production Forest.

At the end of the period 2006-2020, the future state of Protection Forest under S3 is the same as under S4 (Table 10). Compare this with the current state of Protection Forest: the primary protection forest area would not change, the secondary protection would increase by 27.2%, and the non-forested protection forest would decrease by 28.7%. Meanwhile, under S1 and S2, the primary protection forest area would, respectively, decline by 36.3% and 29.4%, the secondary protection would respectively increase by 13.6% and 13.6%, and the non-forested protection forest would respectively increase by 47.3% and 35.6%.

Extent of area under sustainable forest management

As seen in Table 10, only the future state of forest area achieved under S3 and S4 may be assumed as forest area under sustainable forest management since all their primary and

secondary forest areas have not declined over the period 2006-2020, excluding primary Production Forest area, which will be reduced when it is harvested. Further, if we compare the future state of forest area achieved under S3 with that achieved under S4, the future state of forest area achieved under S4 is much better, except for a slight difference in primary and secondary production forest areas.

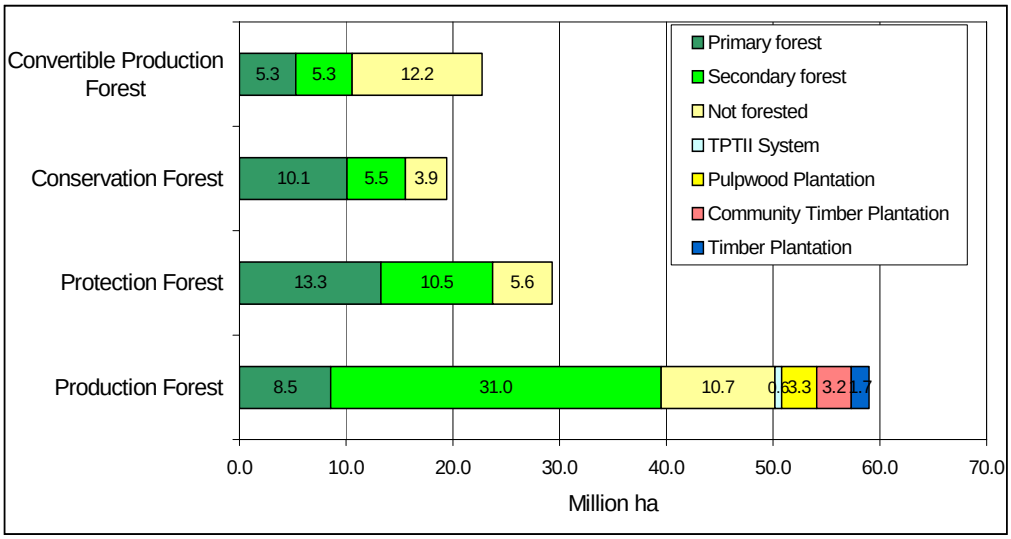


Figure 36. The future state of Indonesia forest resources in S4

The future state of Indonesian forest resources achieved under S4 consists of primary forest of 37.1 million ha (28%), secondary forest of 52.2 million ha (40%), SILIN/TPTII system of 0.6 million ha (0%), pulpwood plantation of 3.3 million ha (3%), community timber plantation of 3.2 million ha (2%), timber plantation of 1.7 million ha (1%), and non-forested areas of 32.3 million ha (25%). The future state of Indonesian forest resources under S4 is shown in Figure 36.

Growing stock and annual harvest of wood

Figure 37 shows changes in environmental costs and forest stock value over the period 2006-2020. Under S1 and S2, natural forest stock value decreases by US$1.59 billion and US$1.23 billion, respectively.

This indicates natural forest stock depletion under S1 and S2. Meanwhile, plantation stock value increases by US$4.41 billion and US$7.94 billion, respectively, indicating improvement of standing stock.

Under S3 and S4, natural forest stock value increases by respectively US$0.25 billion and US$0.29 billion, indicating natural forest stock restoration. Plantation stock value increases by US$4.4 billion and US$7.9 billion, respectively, indicating improvement of standing stock.

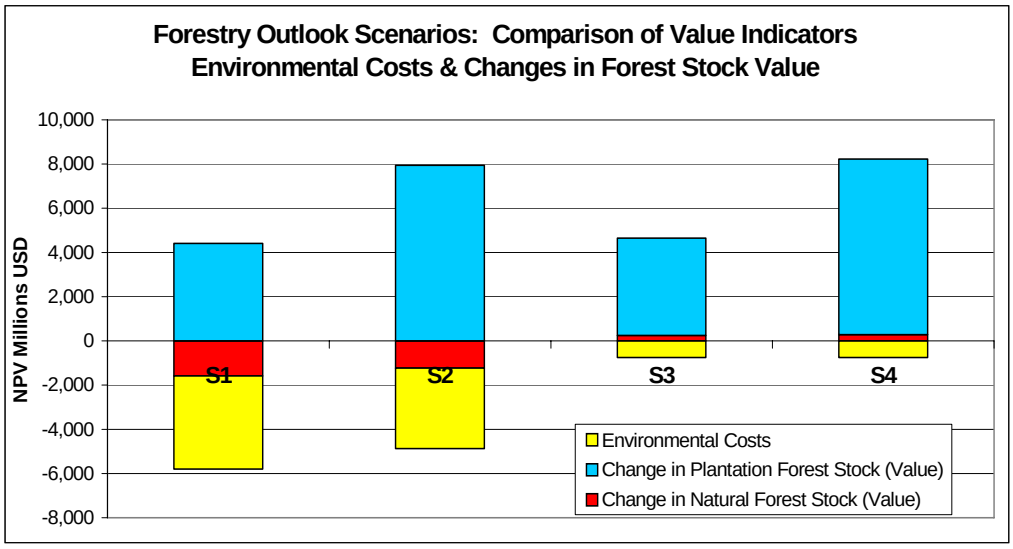


Figure 37. Changes in environmental costs and forest stock value over the period 2006-2020

In this scenario analysis, two categories of logs are projected: timber (or saw logs or veneer logs) and pulpwood. Timber is produced from natural production forest (TPTI and TPTII/SILIN), Industrial Community Forest Plantation (HTR), and Industrial Timber Plantation (HTI Kayu Perkakas), while pulpwood is produced from Pulpwood Plantation (HTI Pulp) and from land clearing activity (IPK) either in Production Forest or in Convertible Production Forest. The annual projection of timber production during the period 2007-2020 is presented in Figure 38 and annual projection of pulpwood production during the period 2007-2020 is presented in Figure 39.

Figure 38 shows that until 2015 legal timber production is less than or equal to 30 million m^3. The so-called legal timber here is the timber produced under S3 and S4, the scenarios where illegal logging is not allowed. After 2015, legal timber production would drastically increase to around 63 millions m^3 under S3 or to 117 millions m^3 under S4 in 2020 due to timber production from Industrial Community Forest Plantation (HTR). A huge difference in legal timber production at the end of the period is due to the different planting level. The planting level under S4 is assumed to be twice the level under S3 (see Annex 2).

On the other hand, until 2015, timber production under S1 or S2 is stable since a legal timber deficit would be supplied by illegal logging activity due to assumption of poor policy implementation. Similar to S3 and S4, after 2015, legal timber production under S1 and S2 would also drastically increase due to timber production from Industrial Community Forest Plantation (HTR).

Figure 39 shows that during the period 2007-2020, pulpwood production would increase from about 35 million m^3 in 2007 to 73-81 million m^3 in 2013, a more than twofold increase. Pulpwood production would then fluctuate due to fluctuation of the pulpwood plantation level as seen in Annex 2, and reach a peak of 81 million m^3 under S1 and S3 or 96 million m^3 under S2 and S4 in 2020.

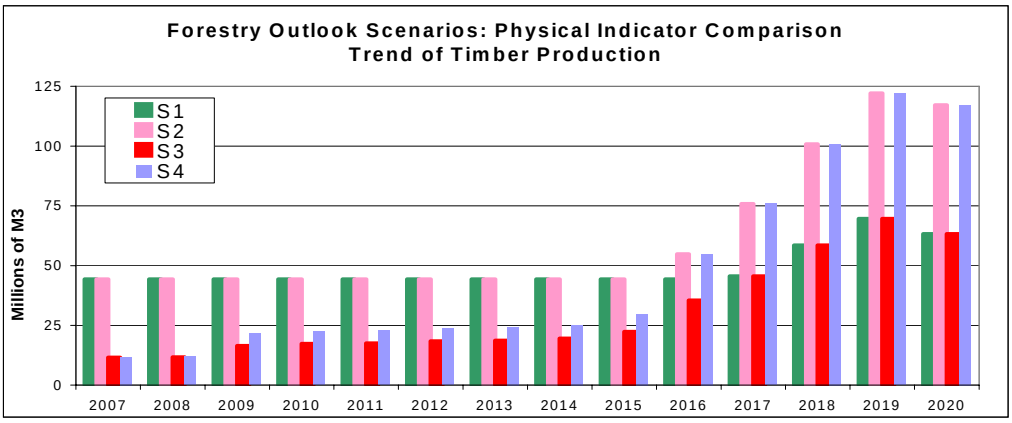


Figure 38. Annual projection of timber production from 2007-2020, by scenario

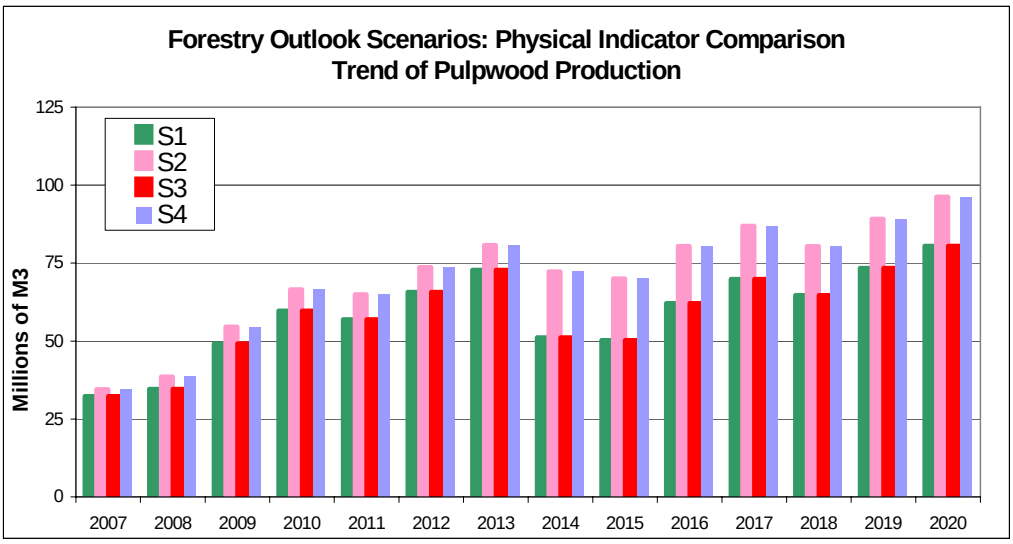


Figure 39. Annual projection of pulpwood production during the period 2007-2020, by scenario

In addition to the projected wood production above, there are many other sources of timber such as the state-owned forest plantation company (Perum Perhutani), community forests, and agricultural plantations (i.e. rubber plantation, palm oil plantation, coconut plantation).

Wood and wood products

Production, consumption and trade of forest products

Based on the timber and pulpwood production shown in Figures 38 and 39, the future production, consumption, and export of sawnwood, plywood, block board, and pulp were estimated and are presented in Table 10 and in detail in Annex 3. These figures assume that 56% of timber production is allocated for plymills (including block board mills) and 44% for sawmills; 100% of pulpwood is processed by domestic pulp and paper mills; the volume of timber per one cubic metre of plywood, block board, and sawnwood is assumed to be 2 m^3, 0.57 m^3, and 2 m^3, respectively, and for one tonne of pulp, 4.5 m^3; the percentages for plywood, block board, sawnwood, and pulp exports are, 84, 84, 22, and 39%, respectively.

Table 11 shows that over the period 2006-2020, the annual range of production and consumption growth of plywood, block board, sawnwood, and pulp would be the same,

ranging from 10% to 15%, from 28% to 34%, from 17% to 23%, and from 9% to 10%, respectively. Meanwhile, their annual export growth would range from 12% to 17%, from 28% to 34%, from 17% to 23%, and from 7% to 8%, respectively.

Given installed capacity of 23 million m^3 RWE in plywood, veneer, and block board industries and 21 million m^3 RWE in the sawnwood industry, these industries would still face a log deficit until 2017 (see Annex 3). But they could expand their capacities by 45% (for plywood, veneer, and block board industries) and by 32% for the sawnwood industry, if the timber production level in 2020 is achieved. On the other hand, given installed capacity of 29 million m^3 RWE, the pulp industry could expand its installed capacity after 2009. It could be even tripled if the timber production level in 2020 is achieved. However, this expansion opportunity is not an easy task as explained below.

State of forest industries in the future

The forestry industry is undergoing a dynamic evolution in response to resource supplies and global market trends. Conversion of forested land to other uses has been the fastest growing source of supply in recent years. Coupled with over-cutting, these are unsustainable approaches to utilization of forest renewable resources. Meanwhile, industrial forest crimes such as harvesting crimes (violations of silvicultural guidelines and illegal logging), processing crimes (sourcing illegal timber for processing and operating above licensed capacity), and transportation crimes (issuance of official transportation documents, SKSHH, for shipments of illegal timber) are high on the political agenda for prosecution.

At the same time, there has been a structural change in the wood processing industry. The pulp industry is the fastest growing sub-sector of timber consumption; plywood has been in decline for several years. Ironically, there are large debts among forestry firms, particularly in pulp and paper. This will hinder the revitalization of forest industry and impose a financial burden on the banking sector. This is also complicated by insufficient due diligence in private sector financing of the forest industry, which has contributed to the industry's over capitalization.

On the other hand, production of medium density fiberboard, oriented-strand board and other engineered wood products is growing in many other countries that compete with Indonesia in global markets for processed wood products. Market trends will reward firms (and countries) that can add value in downstream wood processing and more diversified products. Hence, competitive advantage requires moving to quality and value, away from basic commodity production.

It is clear then, in the future, the forest industry should produce wood products that can enter highly competitive markets and be supported by sustainable increasing wood supply. There should also be enough log supply from different sources, particularly from certified and sustainable managed production forests, and the production level of wood products should be in accordance with that of sustainable log supply in the next 20 years. Moreover, the Indonesian wood-based industry should operate efficiently and in an environmentally friendly manner with a high capacity utilization rate, focus on certified high value-added products, and enlarge its market share in domestic and foreign markets.

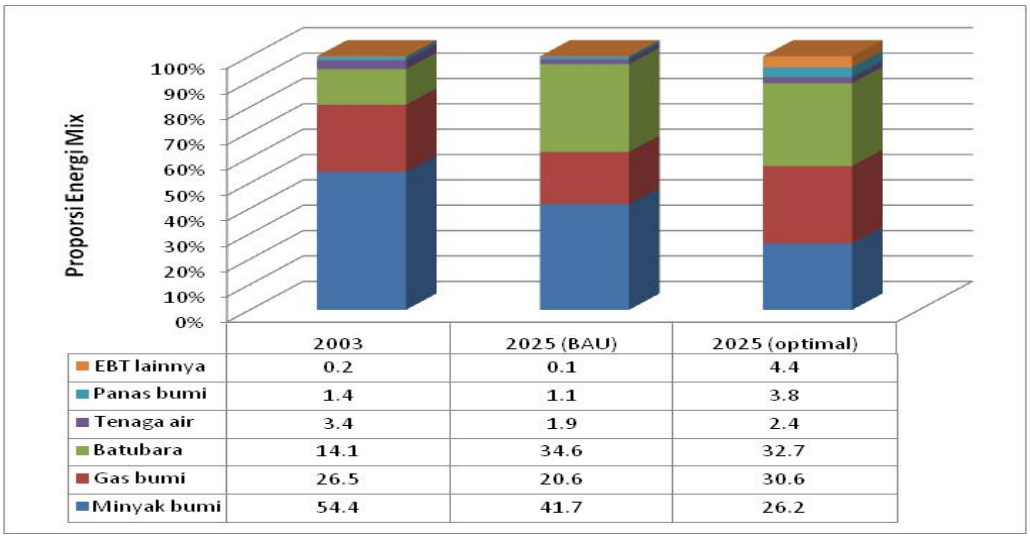
The Ministry of Forestry established the Working Group for Forest Industry Revitalization in June 2006, which consists of senior Forestry Ministry experts including representatives from each of the Department's main directorates, as well as the legal and planning bureaus, and outside academics with a mandate to advise the Minister of Forestry on key issues related to industry revitalization, including plantation acceleration and industry retooling/reform. As the result: "A Road Map for the Revitalization of Indonesia's Forest Industry" has successfully been developed.

Table 11. Products, consumption, exports, and growth of forest products, 2006-2020

VARIABLES	FOREST PRODUCTS	S1			S2			S3			S4		
		Volume (Mill M3)		Growth	Volume (Mill M3)		Growth	Volume (Mill M3)		Growth	Volume (Mill M3)		Growth
		2006	2020	(%/yr)	2006	2020	(%/yr)	2006	2020	(%/yr)	2006	2020	(%/yr)
Production	Plywood	4.07	16.05	10%	4.07	29.73	15%	4.07	16.05	10%	4.07	29.73	15%
	Blockboard	0.19	6.23	28%	0.19	11.53	34%	0.19	6.23	28%	0.19	11.53	34%
	Sawnwood	1.47	13.82	17%	1.47	25.60	23%	1.47	13.82	17%	1.47	25.60	23%
	Pulp	5.67	17.88	9%	5.67	21.38	10%	5.67	17.88	9%	5.67	21.38	10%
Consumption	Plywood	0.65	2.56	10%	0.65	4.74	15%	0.65	2.56	10%	0.65	4.74	15%
	Blockboard	0.03	0.99	28%	0.03	1.84	34%	0.03	0.99	28%	0.03	1.84	34%
	Sawnwood	1.16	10.85	17%	1.16	20.10	23%	1.16	10.85	17%	1.16	20.10	23%
	Pulp	5.12	16.13	9%	5.12	19.29	10%	5.12	16.13	9%	5.12	19.29	10%
Export	Plywood	2.91	13.51	12%	2.91	25.03	17%	2.91	13.51	12%	2.91	25.03	17%
	Blockboard	0.16	5.24	28%	0.16	9.71	34%	0.16	5.24	28%	0.16	9.71	34%
	Sawnwood	0.33	3.07	17%	0.33	5.69	23%	0.33	3.07	17%	0.33	5.69	23%
	Pulp	2.80	6.91	7%	2.80	8.27	8%	2.80	6.91	7%	2.80	8.27	8%

Wood as a source of energy

In response to the soaring price of fossil fuel, the Indonesian Government released Presidential Regulation (PP No.5, 2005), which is known as the National Energy Policy. Due to the subsidy policy on fuel in Indonesia, the increase in fossil fuel price has become a burden for the government's budget. The regulation demands relief of Indonesian dependency on fossil fuel by gradually shifting its energy mix. Figure 40 shows the expected energy mix in Indonesia by 2025. The share of oil would be reduced from 54.4% in 2003 to 26.2% in 2025, while the share of natural gas would increase from 26.5% to 30.6%, and other renewable energy shares would be lifted from 0.2% to 4.4%.



	2003	2025 (BAU)	2025 (optimal)
EBT lainnya	0.2	0.1	4.4
Panas bumi	1.4	1.1	3.8
Tenaga air	3.4	1.9	2.4
Batubara	14.1	34.6	32.7
Gas bumi	26.5	20.6	30.6
Minyak bumi	54.4	41.7	26.2

Figure 40. Projection of Indonesia energy mix (National Energy Policy, KEN)

Future of non-wood forest products

Because data for most NWFPs are scarce and often inconsistent, any future projections of NWFPs become unreliable. Nevertheless, change in NWFP value due to forest activities such as forest rehabilitation, plantation development, and illegal logging, could be estimated by estimating a change in natural forest stock values. The reason is this: change in natural forest stocks implies change in natural forest capacity to provide NWFPs. For instance, if forest rehabilitation succeeds in restoring damaged (non-forested areas) forests, the restored forest is expected to provide more NWFP values in the long run. Therefore, in this outlook, the future of NWFPs was addressed through estimating changes in natural forest stock values. Changes in natural forest stock values over the period 2006-2020 are given in Figure 37. Figure 37 also reflects change in NWFP values under different scenarios analyzed in this outlook since it is based on Total Economic Valuation, which has NWFP value as one of its components.

Further, Figure 37 shows that over the period 2006-2020 changes in natural forest stock value under S1, S2, S3, and S4 would be -US$1.59 billion, -US$1.23 billion, +US$0.25 billion, and +US$0.29 billion, respectively. A negative value of changes in natural forest stock value under S1 and S2 is due to natural forest stock depletion occurring under S1 and S2. Table 10 shows that over this period, under S1 and S2, the primary production forest area would, respectively, decline by 37.9% and 38.6%; the secondary production forest area by 17.6% and 9.2%; the primary protection forest area by 36.3% and 29.4%, and the primary conservation forest area by 47.8% and 38.7%.

Sunderlin (2003) notes that although NWFPs are available in open-access circumstances and provide more direct benefits to the poor, they can also be seen as a poverty trap due to low

extractible benefits caused by high transport costs, few buyers and exploitive marketing chains (in relation to remoteness of forest areas).

Service functions of forests

Similar to the future of the NWFP issue, in this outlook, forest services were addressed through estimating changes in environmental costs and forest stock values. Environmental costs were related to forest service loss due to illegal logging, whereas environmental benefits were related to forest service gains due to forest rehabilitations. In addition, change in forest stock values will reflect change in forest resource capacity to provide forest services. Changes in environmental costs and forest stock value over the period 2006-2020 are presented in Figure 37.

Figure 37 shows that over the period 2006-2020, total changes in environmental costs and forest stock value under S1, S2, S3, and S4 would be -US$1.39 billion, US$3.07 billion, US$3.91 billion, and US$7.48 billion, respectively. The negative value of total changes in environmental costs and forest stock value under S1 is due to higher environmental costs (forest service loss) and lower natural forest stock value (natural forest stock depletion) occurring under S1, which together offset the value gain from plantation forest stock improvement. Under S4, although changes in environmental costs and forest stock value are positive and even the highest, there is also environmental cost incurred in this scenario due to sustainable harvesting of primary forest.

Further, biodiversity problems are deeply rooted in public attitude issue, which are in turn linked to the under-valuation of natural resources and ecosystems. Although natural resources and ecosystems produce valuable and sometimes marketable environmental services, local markets and government planning decisions do not usually place sufficient value on these resources or services. Local government acceptance and environmental awareness are then essential parts of successful biodiversity conservation in protected areas to ensure and maintain linkages into a larger matrix of wildlife and habitat corridors for the preservation of species and ecosystems.

Social functions of forests

In this outlook, an estimation of a direct employment in forestry-related activities (logging, pulpwood and timber plantation establishments) and forest industry (sawnwood, plywood and veneer, and pulp industries) is used as one indicator of social functions of forests and presented in Figure 41.

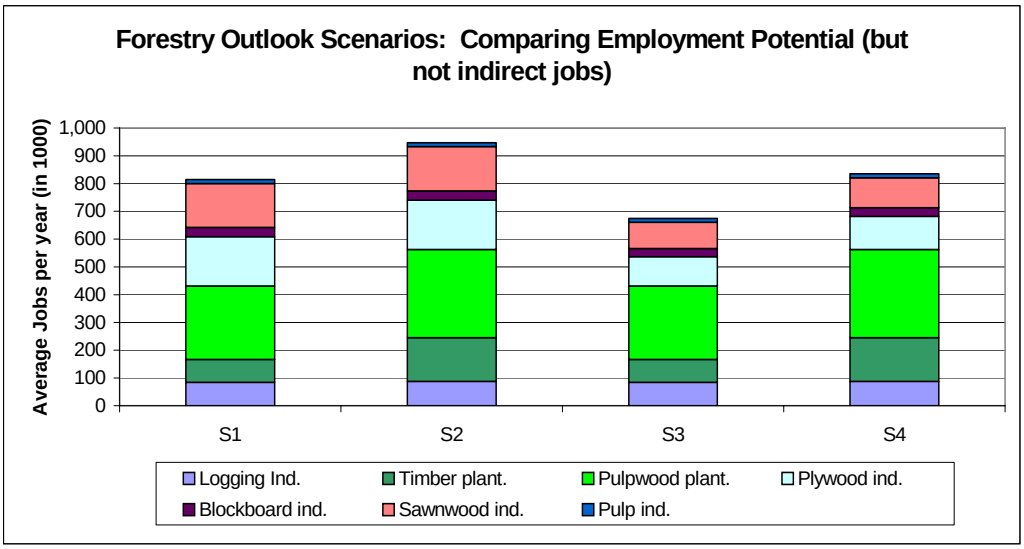


Figure 41. Direct employment generation over the period 2006-2020

Figure 41 shows that over the period 2006-2020, direct employment generation under S1, S2, S3, and S4 would, respectively, be 814 000, 947 000, 675 000, and 836 000 employees. Establishment of pulpwood and timber plantations creates more direct employment in the forestry sector followed by plywood and sawnwood industries.

As mentioned earlier, the number of employees in the forest sector would be much higher when people who work in small-scale sawmills and other processed wood industries such as furniture, particleboard, and fiberboard are also taken into account. In addition, there may be substantially larger numbers of people who are "forest dependent" or who are "vulnerable to poverty," but more detailed analysis would be needed to identify them.

An overview of the future of forest and forestry in 2020

Based on analysis of S1, S2, S3 and S4, it is found that only under scenarios S3 and S4, can Indonesian forest resources be assumed to be under sustainable forest management. All primary and secondary forest areas have not declined over the period 2006-2020, excluding the primary Production Forest area, which will always be on the decline even when it is harvested sustainably.

Refer to Figure 31, the characteristic of S3 is determined by the combination of the two most uncertain and unpredictable variables, particularly by the combination of effective policy implementation and slow economic growth. This implies forest rehabilitation is still possible but only with policy measures. Meanwhile, the characteristic of S4 is determined by effective policy implementation and faster economic growth, which implies forest rehabilitation and plantation development proceed on the basis of effective policy implementation and sufficient investment. By doing this, policy measures can be developed that take the main risks to the sector into account. The difference between these two scenarios in the forestry outlook simulation is reflected only by the difference of plantation level, given the forest rehabilitation. All performance indicators that have been discussed earlier are summarized in Table 12. Although S4 in almost all areas that count is better than S3, the latter is the most likely situation facing Indonesia in 2020.

To ensure effective policy implementation, some essential pillars of good governance should be improved include transparency, rule of law, law enforcement, conflict resolution, decentralization, and dialogue-decision processes. Some opportunities have been identified in relation to good governance improvement. For instance, central government is re-orienting

basic natural resource policies; local governments are becoming more responsive and accountable; civil society and business are repositioning for more constructive relationships; policy-making is more consultative and transparent; local governments and parliaments are better informed about forest and land issues; companies are more aware of the importance of partnerships and community engagement; and civil society groups are more engaged in development processes, government operations, and resource allocation decisions.

On the other hand, there are also some threats have been identified in achieving the future state of forest resources: the political economy of rent seeking; weak incentives for sound and sustainable land and forest management; inadequate enforcement of the legal framework on holders of forest use rights (mainly large corporate interests); fire; roads through forested areas that open the way for secondary impacts such as encroachment, illegal logging, wildlife trade, and land conversion; large-, medium- and small-scale mines that have different levels and potential for environmental impacts, including habitat loss, tailings, and water pollution; political-economic change such as China's rapid growth in recent years as a competitor for sources of foreign direct investment.

Table 12. Indicator performance of the forest sector under S3 and S4, 2006-2020

ITEM	Unit	Low-growth development scenario (S3)	Sustainable development scenario (S4)
POLICY INTERVENTION			
Total Forest Rehabilitation	1000 Ha	7,661	7,661
Total Plantation	1000 Ha	2,611	5,222
CHANGE IN FOREST CONDITION			
Primary Forest	%	-12%	-13%
Secondary Forest	%	32%	31%
Plantations	%	79%	158%
Non-Forested	%	-23%	-28%
NET ENVIRONMENTAL VALUE AND FOREST STOCK CHANGE	Million US$	3,907	7,479
Change in forest stock	Million US$	4,652	8,224
Change in Natural Forest Stock	Million US$	247	288
Change in Plantation Forest Stock	Million US$	4,405	7,936
Environmental Costs	Million US$	-745	-745
EMPLOYMENT	1000 employee	675	836
Logging industry	1000 employee	84	88
Timber plantation	1000 employee	83	157
Pulpwood plantation	1000 employee	264	318
Plywood industry	1000 employee	106	119
Blockboard industry	1000 employee	29	31
Sawnwood industry	1000 employee	95	108
Pulp industry	1000 employee	14	14
CHANGE IN PRODUCTION			
Plywood	% per year	10%	15%
Blockboard	% per year	28%	34%
Sawnwood	% per year	17%	23%
Pulp	% per year	9%	10%
CHANGE IN CONSUMPTION			
Plywood	% per year	10%	15%
Blockboard	% per year	28%	34%
Sawnwood	% per year	17%	23%
Pulp	% per year	9%	10%
CHANGE IN EXPORT			
Plywood	% per year	12%	17%
Blockboard	% per year	28%	34%
Sawnwood	% per year	17%	23%
Pulp	% per year	7%	8%

6. RECOMMENDED STRATEGIC ACTIONS AND POLICIES THAT CREATE A BETTER FUTURE

The three main objectives for managing forestland identified in Indonesian are: supporting economic development, improving rural livelihoods and reducing poverty, and producing environmental services and benefits. Improving governance to achieve these objectives is another important underlying concern. Indonesia's four primary classifications of forestland are based on the functions of production, conversion, protection, and conservation. Forest cover provides a simple measure of forest resource status and quality, even though there may be some definitional issues related to quality and cover.

For each combination of objective and forest classification, different policies and interventions will be most appropriate to better align practices with goals. Also, different types and numbers of people may be using the forests in these various zones and these groups will have different responses to policies and interventions in these areas. For example, Production Forest is compatible with supporting economic development as well as with improving rural livelihoods and reducing poverty, whether they are forested or not. But it is not intended or managed primarily to produce environmental services even though some environmental services will be achieved.

Meanwhile, on Protection Forest and Conservation Forest, the goal of protecting environmental services converges with assigned functions and status, whether they are forested or not. However, these forests are not intended primarily for producing economic development, improving livelihoods or reducing poverty, though some economic benefits will be achieved. Although degraded Protection Forest and degraded Conservation Forest are less capable of producing or protecting the full range of environmental services, these forests may be able to provide some benefits if managed or rehabilitated. Thus there is convergence between goals, allocated forest functions, and environmental conditions in some cases and discord in other cases. This, in turn, provides the basic elements of a prioritization scheme for proposed activities or options to improve forest management.

With regard to scenario analysis, the prioritization scheme that will be discussed here focuses on economic development and poverty alleviation options in degraded Production Forest, and promotion of environmental service delivery in degraded Protection Forest and Conservation Forest. Moreover, governance and management improvement are also discussed, but rather cut across all geographic areas and objectives.

Options for economic development and poverty alleviation

Degraded Production Forest was estimated at about 19.5 million hectares in 2006. Many options such as management, models, cross-learning, and incentives, and promoting community-company partnerships to open new kinds of benefit sharing, as well as new lands, for timber production are needed to plant more trees for production/timber uses in degraded lands. However, this tree planting will succeed only if better incentives for long-term investment, management, stewardship and production are also provided.

Community forestry, social forestry, cooperatives and Small and Medium Enterprises (SMEs) can also be promoted on degraded production forests. These options have the advantage of creating more jobs than large, concentrated, capital-intensive industrial firms. But some flexibility and creativity is needed in the designation of land uses and the establishment of use and access rights. In the end, alternative access and stewardship arrangements will be needed to promote investment and smallholder economic productivity on this land. In the long run, these activities will improve land cover, which should provide a range of environmental services, as well as market opportunities and livelihoods. Some pilot projects and test cases

can be built on existing examples to identify reliable models for general application and scaling up.

New rules and interpretations within the MOFR are opening space for communities and smallholders to be involved in forest utilization and management with longer time horizons. Communities, smallholders, and disadvantaged groups will need assistance and improved capacity to deal with the application, licensing, and monitoring requirements that come with use and access rights. There is a need for service providing organizations (e.g. universities, NGOs, or GOI agencies at the field level) to bridge the needs of communities with regulatory requirements so that these new opportunities are more accessible and available to communities. Technical services and skill development efforts could include legal aid, extension services, marketing and business management services, land rights registration and mapping assistance, license facilitation services, and conflict resolution mechanisms. There may also be a need for central or regional institutions producing general training programs and information clearinghouse services to allow sharing of information and approaches across regions. Many existing civil society organizations may not have the institutional structure and wide reach necessary for a nationwide effort.

Options for producing environmental services and benefits

Degraded conservation and protection lands were estimated at about 13.2 million ha in 2006. These lands are currently not delivering the full range of environmental services for which they are intended. This can be a burden on downstream urban dwellers or the poor, who rely on water, soil and fertility services that may be an important part of their livelihoods. The GOI is already spending rather large amounts to rehabilitate lands through the GERHAN program, and about 30% of this investment is in protection forests. Unfortunately, protection forests are also among the least well-managed categories of forestlands and rehabilitation investments may not pay off in this open access situation, until management frameworks are clarified and strengthened.

Since it is not possible to return these lands to a fully natural state, activities may be considered to rehabilitate/manage these areas to a state where they can produce more of the services for which they are allocated. Rehabilitation should focus on steep slopes and riparian land. Land re-classification that harmonizes slope/condition with function should be supported. For example, steep areas should be reconfirmed as watershed protection forests, in collaboration with local stakeholders and governments. High conservation value forests within the protection forest areas might be good candidate areas for reallocation into conservation areas, especially if they are part of critical wildlife corridors or within the range of endangered or endemic species.

While these activities are primarily aimed at preserving or restoring environmental functions, they also have the (potential) advantage of producing some livelihood benefits and economic opportunities for smallholders and the poor. These groups can be actively involved in rehabilitation efforts and can be invited/encouraged to conduct environmentally compatible activities. These activities could be designed with more emphasis on economic development and poverty alleviation.

Options for improving governance and management

In Indonesia, some pillars of forest governance that need improvement are, among others: transparency, rule of law, law enforcement, conflict resolution, decentralization, and dialogue-decision processes.

With regard to transparency and rule of law, Forest Monitoring and Assessment System (FOMAS) should be supported, implemented and used widely since it promotes transparency,

independence, and accountability in the use and management of data on forestry land and production. However, it should be accompanied with effective disclosure mechanisms so that the public and affected stakeholders can access the information in ways that are effective and useful to them in interacting with forest sector decision-makers.

In efforts to curb illegal logging, actions such as building capacity to carry out law enforcement; amending national laws and regulations to strengthen law enforcement efforts; and prosecuting those behind major forest harvesting, processing and transportation crimes could help to improve law enforcement. On degraded Production Forest, enforcement efforts could usefully focus on reducing impacts of land clearing and the risks of fire. On Protection Forest and Conservation Forest, beyond efforts to curb illegal logging, enforcement could usefully focus on defining and marking boundaries to prevent encroachment and allow community self-policing. Also, increased efforts to curb the illegal wildlife trade could be recommended.

A mechanism should be developed and implemented in all levels of government to address concerns, resolve conflicts, process grievances, settle claims, and compensate for losses. However, this will need to be a national and broad-based effort, similar to that envisioned under the process and framework established in MPR Decree No. 9 of 2001.[12]

Options for interventions to improve the decentralized governance framework could begin with institutional development support to help clarify roles and responsibilities for district/province governments in management, implementation, licensing, and monitoring activities on forestlands. There is also a great need for capacity building in regional government forestry bureaucracies. Coupled with this, it may be useful to consider the institutional structure of the central MOFR and how it could be made more responsive to the needs of decentralization.

To promote, establish, support and sustain dialogue and decision processes on the future organization and management of the forestry sector, community-oriented and collaborative management approaches are increasingly being developed and tested and legal frameworks may be emerging that would allow more widespread application.

[12] MPR Decree No.IX/2001 on Agrarian Reform and Natural Resources Management, which contains principles and approaches that have some potential to reduce conflict both among the laws and the users of natural resources.

7. SUMMARY AND CONCLUSIONS

The results show that only under S3 and S4, Indonesian forest resource may be assumed to be under sustainable forest management. Secondary forest and plantations areas are significantly increased, while non-forested areas drastically decline over the period 2006-2020. Primary forests also decline, but this is due to sustainable harvesting.

The state of Indonesian forest resources in 2020 achieved under sustainable forest management would be as follows:

- Production Forest: primary forest ranging from 8.5-8.6 million ha, secondary forest from 31-31.2 million ha, TPTII/SILIN system from 0.3-0.6 million ha, pulpwood plantation from 2.6-3.3 million ha, community timber plantation from 1.6-3.2 million ha, timber plantation from 1.5-1.7 million ha, and non-forested areas from 10.7-13.2 million ha
- Protection Forest: primary forest, secondary forest, and non-forested areas are, respectively, 13.3 million ha, 10.5 million ha, and 5.6 million ha
- Conservation Forest: primary forest, secondary forest, and non-forested areas are, respectively 10.1 million ha, 5.5 million ha, and 3.9 million ha
- Convertible Production Forest: primary forest, secondary forest, non-forested areas are, respectively 5.3 million ha, 5.3 million ha, and 12.2 million ha

Given the future state of Indonesian forest resources forecast for 2020 the annual production and consumption growth of plywood, block board, sawnwood, and pulp would be increased in the range of 10-15%, 28-34%, 17-23%, and 9-10%, respectively while, their annual export growths would be increased in the range of 12-17%, 28-34%, 17-23%, and 7-8% respectively.

Moreover, the plywood, veneer, and block board industries as well as the sawnwood industry would still face a log deficit until 2017 given their capacities of 23 million and 21 million m^3 RWE, respectively. These industries would even increase their capacities by 45% and 32%, respectively, if the timber production level in 2020 was achieved.

On the other hand, given installed capacity of 29 million m^3 RWE, the pulp industry could increase its installed capacity after 2009. It could even triple its capacity if the timber production level in 2020 was achieved. However, this expansion opportunity is not as easy as it looks due to the many critical problems facing Indonesia's forest product industry. To this end, the Ministry of Forestry has successfully developed "A Road Map for the Revitalization of Indonesia's Forest Industry."

Given the future state of Indonesian forest resources in 2020, there would be also direct employment generation in the range of 675-836 000 people even though there may be substantially larger numbers of people who are "forest dependent" and people who work in small-scale sawmills and other processed wood industries.

Because data for most NWFPs and forest provided services are scarce and often inconsistent, their futures were addressed through estimating changes in environmental costs and forest stock values instead. Over the period 2006-2020, total changes in environmental costs and forest stock value range from US$3.91 billion to US$7.48 billion, respectively. Of which, +US$0.25 billion to +US$0.29 billion is due to changes in natural forest stock value.

Recognizing that there would be convergence between goals, allocated forest functions, and environmental conditions in some cases and discord in other cases, and considering that forest rehabilitation and plantation development will be targeted on degraded forest areas, strategic actions and policies should focus on economic development and poverty alleviation options in

degraded Production Forest, and promotion of environmental service delivery in degraded Protection Forest and Conservation Forest.

Many options for economic development and poverty alleviation such as management, models, cross-learning, incentives, and promoting community-company partnerships to open new kinds of benefit sharing, as well as new lands, for timber production are needed to plant more trees for production/timber uses in degraded lands. However, this tree planting will succeed only if better incentives for long-term investment, management, stewardship and production are also provided.

Since it is not possible to return degraded Protection Forest and Conservation Forest lands to a fully natural state, options for producing environmental services and benefits should focus on management and rehabilitation of these areas to a state where they can produce more of the services for which they are allocated. Rehabilitation should focus on steep slopes and riparian land. Land re-classification that harmonizes slope/condition with function should be supported. High conservation value forests within the protection forest areas might be good candidate areas for reallocation into conservation areas, especially if they are part of critical wildlife corridors or within the range of endangered or endemic species.

Options for Improving Governance and Management focus on promoting transparency, independence, and accountability in the use and management of data on forestry land and production. But, this should be accompanied with effective disclosure mechanisms so that the public and affected stakeholders can access the information in ways that are effective and useful to them in interacting with forest sector decision-makers.

In efforts to curb illegal logging, actions such as building capacity to carry out law enforcement; amending national laws and regulations to strengthen law enforcement efforts; and prosecuting those behind major forest harvesting, processing and transportation crimes could help to improve law enforcement.

On degraded Production Forest, enforcement efforts could usefully focus on reducing impacts of land clearing and the risks of fire. On Protection Forest and Conservation Forest, beyond efforts to curb illegal logging, enforcement could usefully focus on defining and marking boundaries to prevent encroachment and allow community self-policing. Also, increased efforts to curb the illegal wildlife trade could be recommended.

A mechanism should be developed and implemented at all levels of government to address concerns, resolve conflicts, process grievances, settle claims, and compensate for losses. Options for interventions to improve the decentralized governance framework could begin with institutional development support to help clarify roles and responsibilities for district/province governments in management, implementation, licensing, and monitoring of activities on forestlands. There is also a great need for capacity building in regional government forestry bureaucracies.

Finally, to promote, establish, support and sustain dialogue and decision processes on the future organization and management of the forestry sector, community-oriented and collaborative management approaches are increasingly being developed and tested and legal frameworks may be emerging that would allow more widespread application.

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Annex 1. Forest rehabilitation schedule up to 2020 (in 1000 ha)

Year	Production forest				Protection forest				Conservation forest				Total forest rehabilitation			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
2007	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2008	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2009	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2010	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2011	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2012	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2013	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2014	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2015	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2016	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2017	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2018	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2019	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547
2020	138	138	276	276	80	80	160	160	56	56	111	111	274	274	547	547

Notes: S1 = Socio-economic development stalls scenario ; S2 = Unsustainable growth scenario, S3 = Low-growth development scenario, S4 = Sustainable development scenario

Annex 2. Plantation schedule up to year 2020 (in 1000 ha)

Year	Pulpwood Plantation				Industrial Timber Plantation				Industrial Community Forest Plantation				Intensive Silviculture (TPTII)			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
2007	75	150	75	150	23	45	23	45	0	0	0	0	2	3	2	3
2008	90	180	90	180	23	45	23	45	60	120	60	120	3	6	3	6
2009	90	180	90	180	23	45	23	45	120	240	120	240	5	9	5	9
2010	90	180	90	180	23	45	23	45	180	360	180	360	6	13	6	13
2011	90	180	90	180	23	45	23	45	231	462	231	462	8	16	8	16
2012	90	180	90	180	23	45	23	45	231	462	231	462	9	19	9	19
2013	90	180	90	180	23	45	23	45	231	462	231	462	9	18	9	18
2014	90	180	90	180	23	45	23	45	231	462	231	462	9	18	9	18
2015	0	0	0	0	0	0	0	0	171	342	171	342	9	18	9	18
2016	0	0	0	0	0	0	0	0	111	222	111	222	9	18	9	18
2017	0	0	0	0	0	0	0	0	54	108	54	108	9	18	9	18
2018	0	0	0	0	0	0	0	0	0	0	0	0	9	18	9	18
2019	0	0	0	0	0	0	0	0	0	0	0	0	9	18	9	18
2020	0	0	0	0	0	0	0	0	0	0	0	0	9	18	9	18

Notes: S1 = Socio-economic development stalls scenario ; S2 = Unsustainable growth scenario, S3 = Low-growth development scenario, S4 = Sustainable development scenario

Annex 3. Projection of production, consumption and trade of forest products

SCENARIO	VARIABLE	PRODUCT	YEAR													
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S1	Production	Plywood	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.6	14.8	17.7	16.1
		Blockboard	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.5	5.8	6.9	6.2
		Sawnwood	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.9	12.8	15.2	13.8
		Pulp	7.2	7.7	10.9	13.3	12.6	14.6	16.2	11.4	11.2	13.8	15.5	14.4	16.3	17.9
	Consumption	Plywood	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.4	2.8	2.6
		Blockboard	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.9	1.1	1.0
		Sawnwood	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.8	10.0	11.9	10.9
		Pulp	6.5	6.9	9.8	12.0	11.4	13.2	14.6	10.2	10.1	12.4	14.0	13.0	14.7	16.1
	Export	Plywood	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.7	12.5	14.9	13.5
		Blockboard	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.8	4.8	5.8	5.2
		Sawnwood	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.8	3.4	3.1
		Pulp	2.8	3.0	4.2	5.1	4.9	5.6	6.2	4.4	4.3	5.3	6.0	5.6	6.3	6.9
S2	Production	Plywood	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	13.9	19.2	25.6	31.0	29.7
		Blockboard	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	5.4	7.5	9.9	12.0	11.5
		Sawnwood	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	12.0	16.6	22.0	26.7	25.6
		Pulp	7.7	8.6	12.1	14.8	14.4	16.4	17.9	16.0	15.5	17.9	19.3	17.9	19.8	21.4
	Consumption	Plywood	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.2	3.1	4.1	4.9	4.7
		Blockboard	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.9	1.2	1.6	1.9	1.8
		Sawnwood	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	9.4	13.0	17.3	20.9	20.1
		Pulp	6.9	7.7	10.9	13.3	13.0	14.8	16.2	14.5	14.0	16.1	17.4	16.1	17.9	19.3
	Export	Plywood	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	11.7	16.2	21.5	26.1	25.0
		Blockboard	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	4.5	6.3	8.4	10.1	9.7
		Sawnwood	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.7	3.7	4.9	5.9	5.7
		Pulp	3.0	3.3	4.7	5.7	5.6	6.3	6.9	6.2	6.0	6.9	7.5	6.9	7.7	8.3

Annex 3. Projection of production, consumption and trade of forest products (continued)

SCENARIO	VARIABLE	PRODUCT	YEAR													
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
S3	Production	Plywood	2.9	3.0	4.2	4.4	4.4	4.7	4.7	5.0	5.7	9.0	11.6	14.8	17.7	16.1
		Blockboard	1.1	1.2	1.6	1.7	1.7	1.8	1.8	1.9	2.2	3.5	4.5	5.8	6.9	6.2
		Sawnwood	2.5	2.6	3.6	3.8	3.8	4.0	4.1	4.3	4.9	7.7	9.9	12.8	15.2	13.8
		Pulp	7.2	7.7	10.9	13.3	12.6	14.6	16.2	11.4	11.2	13.8	15.5	14.4	16.3	17.9
	Consumption	Plywood	0.5	0.5	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.4	1.8	2.4	2.8	2.6
		Blockboard	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.6	0.7	0.9	1.1	1.0
		Sawnwood	2.0	2.0	2.8	3.0	3.0	3.2	3.2	3.4	3.8	6.1	7.8	10.0	11.9	10.9
		Pulp	6.5	6.9	9.8	12.0	11.4	13.2	14.6	10.2	10.1	12.4	14.0	13.0	14.7	16.1
	Export	Plywood	2.5	2.5	3.5	3.7	3.7	3.9	4.0	4.2	4.8	7.6	9.7	12.5	14.9	13.5
		Blockboard	1.0	1.0	1.4	1.4	1.5	1.5	1.6	1.6	1.8	2.9	3.8	4.8	5.8	5.2
		Sawnwood	0.6	0.6	0.8	0.8	0.9	0.9	0.9	0.9	1.1	1.7	2.2	2.8	3.4	3.1
		Pulp	2.8	3.0	4.2	5.1	4.9	5.6	6.2	4.4	4.3	5.3	6.0	5.6	6.3	6.9
S4	Production	Plywood	3.0	3.0	5.4	5.7	5.8	6.0	6.2	6.4	7.5	13.9	19.2	25.6	31.0	29.7
		Blockboard	1.2	1.2	2.1	2.2	2.2	2.3	2.4	2.5	2.9	5.4	7.5	9.9	12.0	11.5
		Sawnwood	2.6	2.6	4.7	4.9	5.0	5.2	5.3	5.5	6.5	12.0	16.6	22.0	26.7	25.6
		Pulp	7.7	8.6	12.1	14.8	14.4	16.4	17.9	16.0	15.5	17.9	19.3	17.9	19.8	21.4
	Consumption	Plywood	0.5	0.5	0.9	0.9	0.9	1.0	1.0	1.0	1.2	2.2	3.1	4.1	4.9	4.7
		Blockboard	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.9	1.2	1.6	1.9	1.8
		Sawnwood	2.0	2.0	3.7	3.8	3.9	4.1	4.2	4.3	5.1	9.4	13.0	17.3	20.9	20.1
		Pulp	6.9	7.7	10.9	13.3	13.0	14.8	16.2	14.5	14.0	16.1	17.4	16.1	17.9	19.3
	Export	Plywood	2.5	2.5	4.6	4.8	4.9	5.1	5.2	5.4	6.4	11.7	16.2	21.5	26.1	25.0
		Blockboard	1.0	1.0	1.8	1.9	1.9	2.0	2.0	2.1	2.5	4.5	6.3	8.4	10.1	9.7
		Sawnwood	0.6	0.6	1.0	1.1	1.1	1.2	1.2	1.2	1.4	2.7	3.7	4.9	5.9	5.7
		Pulp	3.0	3.3	4.7	5.7	5.6	6.3	6.9	6.2	6.0	6.9	7.5	6.9	7.7	8.3

Annex 4. Total economic value of Indonesia's forests (US$/ha/yr)

Type of value	Production forest		Conservation forest	Protection forest
	Primary forest	Logged over forest		
Total economic value	**209.43**	**203.07**	**269.47**	**269.47**
Use value	**199.84**	**195.48**	**251.55**	**251.55**
Direct use value	**109.73**	**93.02**	**135.09**	**135.09**
Timber	60.97	53.67	0.00	0.00
Fuelwood	0.16	0.16	0.00	0.00
Non-wood forest products	48.17	38.76	28.47	28.47
Water consumption	0.43	0.43	106.61	106.61
Indirect use value	**90.11**	**102.46**	**116.46**	**116.46**
Soil and water conservation	41.58	40.12	41.58	41.58
Carbon sink	6.57	27.38	5.48	5.48
Flood protection	25.82	24.52	53.26	53.26
Water transportation	5.80	5.80	5.80	5.80
Biodiversity	10.35	4.64	10.35	10.35
Non-use value	**9.59**	**7.59**	**17.93**	**17.93**
Option value	3.40	2.95	7.58	7.58
Existence value	6.19	4.64	10.35	10.35

Note: All figures are in US$ at 2002 prices