FINAL REPORT

Feasibility Study of
CONSERVATION CONCESSION
Reconciliatory effort between the demand of increasing local revenue and ecosystem protection in the process of power devolution

A Case Study From Siberut Island, Sumatra

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A. GENERAL DESCRIPTION

Siberut with the area of 4,030 km^2 is the biggest island in Mentawai Archipelago. Geographically this island lies on the latitude of 0^0 80' to 2^0 00' South and longitude of 98^0 60' - 99^0 40' East, with nearest distance of 128 km from west coast of Sumatra island. Since 1999 Siberut has been included on the administrative group of Mentawai District, West Sumatra Province, inline with the application of state autonomy policy and regulation -UU No.9 Year 1999- in regard of the development of Mentawai District. Before 1999, Siberut was included within administration area of Padang Pariaman District. This island consists of two sub districts (*Kecamatan*), namely South Siberut Sub District with the capital of Muara Siberut and North Siberut Sub District with the capital of Muara Sikabaluan.

Geographic condition and base physics of the island have character of heavy field and relatively isolated, so giving influence to the deficiency of the community accessibility to development, transportation difficulties and communication.

The island still has the biggest tropical forest area remaining and relatively undisturbed in Mentawai Archipelago. This area has high conservation value, due to its uniqueness and its endemism. It is also categorized as one of the hotspot area in Sunda Land because it is not only has important value from conservation aspect, education, scientific and main support for life continuation of native community, but also, this region has ecologic fragility and its tropical forest existence is being threatened due to influence of human activities.

Due to its unique characteristic, Siberut Island has been formally designated as one of 6 Biosphere Reserves in Indonesia by UNESCO and the Indonesian Government under the MAB (Man and Biosphere) Program in 1981. In this concept, strong commitment of harmonization of natural conservation interests, the economic development and culture continuation of the local community are required.

About 47% of Siberut island area was established as Siberut National Park (TNS) with area of 190,500 hectares, based on Forestry Minister Decree No. 407/Kpts/II/1993. Before that (in 1982), conservation area was only 132,900 hectares in. To support national park management,

in 2001, Directorate General of Nature Conservation and Forest Protection issued the decree No.14/Kpts/DJ-V/2001 to establish zoning of Siberut National Park, which consists of core zones, jungle zones, intensive uses, and traditional uses.

Figure 1. Map of Mentawai Islands in Indonesia

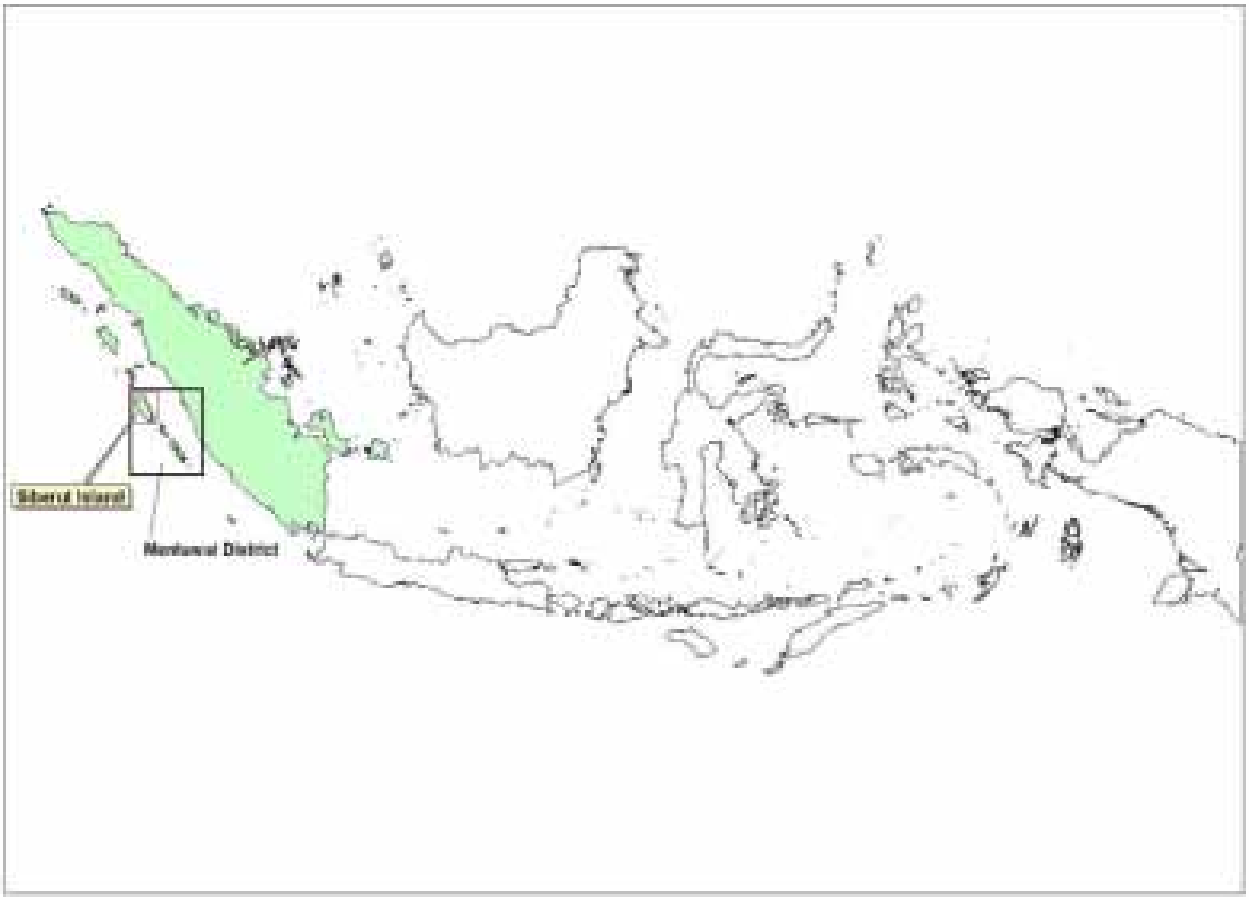


Figure 2. Map of Mentawai District

B. THE PROFILE OF SIBERUT ISLAND

B.1. Biogeography of the Island

In the during mid- Pleistocene or 500,000 years ago, Siberut Island was separated from the Sunda Shelf, leading to the specific ecological conditions of the Mentawai Archipelago, including Siberut Island. From a biogeographically point of view, fauna and flora in Siberut Island have been undergoing a separated evolution process from the evolution on the Sunda Shelf (Sumatra). The species on Siberut have a more primitive character, compared to species on Sumatra

Although Siberut has a high level of endemism, its ecosystem supports fewer species compared with big islands. According to the theory of small islands, a reduction of island area or native habitat amounting 10 factors will subtract the amount of species by 2 factors. This explains why the Mentawai Islands do not support any large carnivorous mammal species, which need a wide range area with a low population.

B.2. Ecosystem Variety, Biodiversity and Charismatic Species

B.2.1. Ecosystem Type and Spatial Sensitivity

Mentawai Archipelago is one of the 8 (eight) sub biogeography area exist in Sumatra, which consists of terrestrial ecosystem with highest peak of 384 meters above sea level and ocean ecosystem. In general, the forest type can be divided into 2 (two) main ecosystems i.e. Tropical Lowland Rain Forest and Mangrove Forest. Based on the result of satellite interpretation map in 1995, the remaining primary tropical forest was 314,418 hectares or 78 % of the island area; the rest were secondary forest ex-exploitation (6.5%), mangrove-swamp forest (6%) and lowland shrub forest (5.97%). However, result of satellite interpretation map in 2002 showed that the remaining primary tropical forest is 62.67% of the island or about 241,721 ha, mainly located in the center and western part of the island (in the National Park area). Following this, Swamp Forest and Secondary Dryland Forest cover 7.85% and 7.26% of the island respectively. If we use this satellite interpretation than it is

noticed that the primary forest in Siberut Island has been degraded by about 15% during seven years. The completed vegetation cover type data based on Satellite Imagery Analysis in 2002 can be seen on the table 1 below.

Table 1. Vegetation Cover Type in Siberut Island based on Satellite Imagery Analysis 2002

No.	Vegetation Cover Type	Size (Ha)	% Size
1.	Primary Dryland Forest	241,721.28	62.67 %
2.	Secondary Dryland Forest	27,992.16	7.26 %
3.	Swamp Forest	30,294.72	7.85 %
4.	Mangrove Forest	8,640.00	2.24 %
5.	Bush	6,465.60	1.68 %
6.	Swamp Bush	4,127.04	1.07 %
7.	Grassland	12,186.72	3.16 %
8.	Dryland Agriculture	4,540.32	1.18 %
9.	Dryland Agriculture mixed with Bush	17,189.28	4.46 %
10.	Bareland	3,532.32	0.92 %
11.	Settlement Area	525.60	0.14 %
12.	Water body	694.08	0.18 %
13.	Nodata (cloud, cloud shadow)	27,797.76	7.21 %
		385,706.88	

Source: CI (2002)

Meanwhile, the virgin tropical forest type in Siberut Island can be divided into:

1. **Primary Dipterocarpaceae Forest,** this type of forest found in hilly area up to the highest peak of 384 meters above sea level. There are many wood types with high economic value found in this forest type as *Dipterocarpus sp*, *Shorea sp* and *Hopea sp*. The emergent trees as *Palaquium sp* are also commonly found in this type of forest. Beside its commercial value, this ecosystem also contains various endemic flora species as *Mesua catharinae* and *Horsfieldia macrothyrsa*.

2. **Mixed Dipterocarpaceae Forest**, this forest type found in river valleys to hilly area below Primary Dipterocarpaceae Forest. This type has widest coverage in Siberut. Various Dipterocarpaceae still dominates forest types and contain higher biodiversity compared with other type due to variation of its microenvironment. Five of six

endemic types in Sumatra Island are found in this type of forest, as *Aporusa quadrilocularis, Diospyros brevicalix, Drypertes subsymmetrica, Mesua cathairinae and Horsfieldia macrothyrsa*.

3. **Fresh Water Swamp Forest**, this type of forest commonly found in lowland areas which are flooded with the water. This type is dominated by *Terminalia catappa* and sometime other endemic as *Horsfieldia macrothyrsa*.

4. **Mangrove Forest**, this type is found in east coast of the island. It is estimated to contain 54 mangrove flora species. From 43 of mangrove trees, 63 % out of it represents mangrove species found in Indonesia.

5. **Sago Swamp Forest**, this type of forest is dominated with sago trees (*Metroxylon sagu* and *Metroxylon rumphii*) that grow naturally in natural swamp area. Sago tree in Siberut has extraordinary growth and may reach 12 meters in 8 years time; the density varies from 175 to 300 groups per hectares. This type becomes main supplier to carbohydrate requirements for native community.

6. **Barringtonia Forest**, this type is commonly found in the west coast of the island. Species of *Casuarina equisetifolia, Barringtonia sp, Pandanus sp and Eugenia grandis* can be found in this area. Sometimes, endemic species *Drypetes subsymmetrica* emerges in this forest area.

The Mentawaian communities have divided the ecosystem in the island according to its use and functions into the following micro ecosystems:

1. Home gardens (*Bebet Uma*), located in the close surroundings of the dwellings, containing crops and plants used for human consumption and medicinal and ceremonial purposes.

2. Wet taro field (*Pugettekat*), used to grow various species of taro tubers. Also provides fresh-water fish.

3. Sago field (*Mone sagu*), providing sago starch as staple food.

4. Forest field:

   Tinunggulu : Newly opened forest field, containing banana plants, yams, etc.

   Pumonean : Forest field, containing of fruit trees as durian, *rambutan*, etc.

5. River and Swamp (*Batoinan*), providing cockleshells, fish, prawns, etc.

6. Hill and Mountain Forest (*Leleu*), providing game, wood for dugout canoes and construction materials, rattan, medicinal plants, etc.

7. Sea (*Koat*), providing fish, shellfish, sea turtles, dugong, etc.

Considering its uniqueness and biodiversity as an island, the land use analysis becomes very important. By understanding the land use, ecological disaster, which is normally unpredictable, might become avoidable. The spatial planning has to be made based on the biophysical fragility. Based on zoning sensitivity analysis conducted by LIPI in 1994, Siberut Island consists of:

Sensitive Zone I: This zone has highest sensitivity value. This area has high biodiversity and uniqueness value, has the slope of more than 26%, the low land water availability, non productive and high erosion sensitive. This area should not be developed to become agricultural area. The first sensitive zone area is about 187,683 hectares or 45.56% of the Siberut island.

Sensitive Zone II: This area has high biodiversity and uniqueness value, land condition cannot be developed, and erosion sensitivity is low and moderate water availability. The second sensitive zone covers 144,350 hectares or 35.8% of the total island area.

Sensitive Zone III: This zone has high biodiversity with low erosion sensitivity. It has a possibility for limited development based on its fitness. The area of third sensitive zone covers 51,999 hectares or 12.9% from island area.

Sensitive Zone IV: This area covers 16,809 hectares or 4.17% of the island. This zone has characteristics of original bio-diversity destruction and good water availability. The land is considerably productive and can be developed for agriculture with consideration of land

viability and Mentawai communities have inhabited it.

The description above shows that more than 50% of island area is considered to be very sensitive for land conversion. In order to preserve the intactness of Sensitive Zone I, the supports from zone II and III are needed. Zone IV also contributes to Zone I, II, and III through various continuative developments, i.e. developments that consider social balance, economic, and living environment.

Disobedience of the biophysical fragility based land use could cause the big consequences for island ecosystem. Compare with big islands, ecosystem of the small islands like Siberut Island has more fragile ecological condition to changes in its ecosystem. Small islands have more closed ecosystem than the big islands. They also have less ecosystem and species diversity. So if the island ecosystem is disturbed by natural habitat fragmentation, then endemic native germ plasma destruction rate will be faster with longer ecological recovery time, compared to bigger islands.

B.2.2. Biodiversity and Endemism

Siberut Island has appreciably high biodiversity, although its value is lower than the bigger island as Sumatra Island. However, Siberut Island has additional value due to its species localism and endemism. It has been recorded that more than 65% of mammals and 15% of fauna species in Siberut Island are endemic or cannot be found somewhere else in the world.

In term of flora richness, the data shows that at least 896 plant species found in Siberut, consisting of consisting of trees, bushes, herbs, climbers, epiphytes and parasites. Biodiversity in Siberut Island becomes important with the existence of 6(six) Siberut endemic plants, namely 1) *Aporusa quadrilocularis; 2) Diospyros brevicalix; 3) Baccaurea dulcis; 4) Drypertes subsymmetrica; 5) Mesua cathairinae* and 6*) Horsfieldia macrothyrsa.*

There are about 34 terrestrial mammal species and 4 sea mammal species in Siberut Island. Nineteen species of mammals are known as endemic species in Sumatra Island.

There are 17 endemic species at taxon-level, which means that those taxons mentioned cannot be found somewhere else in the world.

The most interesting fact in mammals of Siberut is the 4 endemic species of primates. There is no island in the world that has endemic density as high as Siberut Island. The primates' community in Siberut consists of *Bilou* or kloss gibbon (*Hylobates klossii*), *Simakobu* or snub-nosed monkey or pig tail langur (*Simias concolor*), *Joja* or Mentawai leaf monkey (*Presbytis potenziani*), and *Bokkoi* or Mentawai macaque (*Macaca pagensis*). Three of those primate species with exception of *bokkoi* are divided into sub species (one in Siberut Island and the other one in South Mentawai Archipelago, which are Sipora and Pagai). Those facts show that there was a long separate evolution between Siberut and other islands in Mentawai Archipelago. Each primate species can be found in limited quantity in various forest types, normally with low-density value. *Bilou* and *simakobu* are only found in the deep primary forest. *Joja* can also be found in slightly disturbed forest, while *bokkoi* more easily adapts to secondary vegetation. *Simakobu, bilou* and *joja* are arboreal, while *bokkoi* is not. This density value depends on hunting intensity conducted by native community to fulfill their ritual needs. However, biggest factor defining density is the conversion of forest for agricultural needs and ecosystem degradation due to logging.

At least there are 108 bird species identified, among of them, 15 species or 10 % has undergone evolution creating different sub-species and one endemic species, namely Mentawai owl bird (*Otus mentawi*). About 70% of bird species relies on the integrity of their natural habitat, which is primary forest. It is interesting to be noted, that 27 birds family exist in Sumatra land are not found in Siberut Island, such as seagull and tropical forest bird families. The family of Argusianus pheasant, Barbet, Trogon, Babblers and Woodpecker do not exist in Siberut while these 5 bird families are prominent family from Sumatra forest birds.

Although variety of reptiles and amphibians are less known, 1 species of alligator, 2 species of land turtles, 3 species of sea turtles, 34 species of snakes, 22 species of lizards and 3 species of frogs have been recorded in Siberut, including the following endemic species: 1 typical frog species, *Rana signata siberu* (subspecies level), 2 typical snake species,

Calamaria klossii (species level) and *Oligodon sp* (species level), and 1 boigine viper, *Boiga nigriceps breyicauda* (subspecies level).

Three species of sea turtles, protected by the CITES and included in the Red Data Book of IUCN, due to threat of extinction, are found in Siberut Island. Those three species include the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretochelys imbricata*) and leatherback turtle (*Dermochelys coriacea*).

In Siberut Island, coral reef and mangrove ecosystem, found on the eastern coast, are important habitat for marine species like dolphin and dugong (*Dugong dugon).* Since early eighties, a marine area named Saibi-Sarabua with the area of 160,000 hectares had been proposed by regional authorities to become marine reserve area, but until now they have not got any special protection status from central government.

The mangrove forest area in Siberut Island is about 2,750 hectares extending to 100 to 150 meters into the inland containing of 3 mangrove forest zones. From this area, 830 hectares of Saibi-Sarabua has been proposed as conservation area.

Although the coral reef ecosystem in Saibi-Sarabua has been disturbed by human activities, this area still offers a good prospect for preservation. This is due to the presence of a green seaweed community dominated by *Padina australis* with an area of 2.3 hectares and an area of 15 hectares occupied by a single sea grass species (*Thallasia hemprichii*). Both communities are main components in corral reef ecosystem development.

B.2.3. Flagship species and the threat of extinction

There are 4 flagship species of Siberut namely *Bilou* or kloss gibbons (*Hylobates klossii*), *Simakobu* or snub-nosed monkey, pig tail langur (*Simias concolor*), *Joja* or Mentawai leaf monkey (*Presbytis potenziani*), and *Bokkoi* or Mentawai macaque (*Macaca pagensis*). The existence of this species can support eco-tourism development, National Park management or research development in the long term.

Based on IUCN Red Data Book, the four primate species have different level of extinction. The following is the list of those four primate species begun from the most

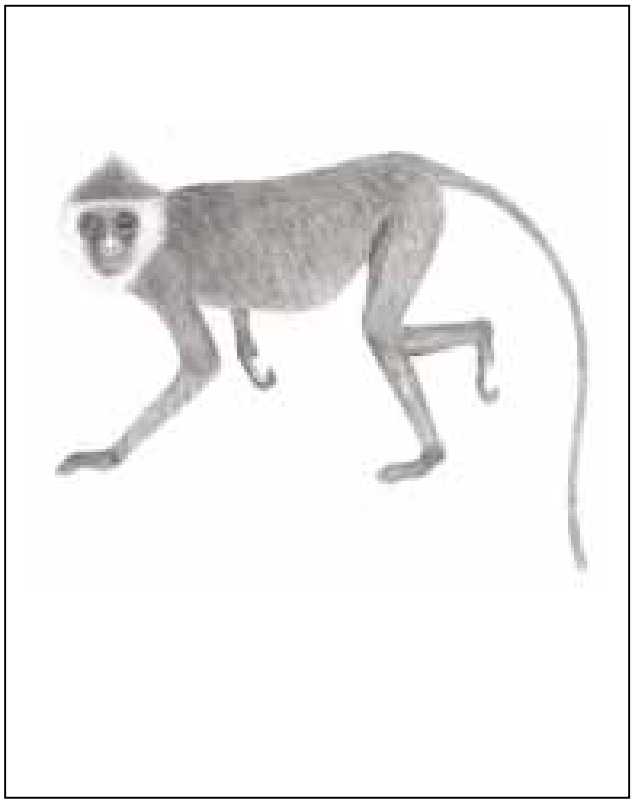
endangered one: 1) *Simakobu* (*Simias concolor*); 2) *Joja* (*Presbytis potenziani*); 3) *Bilou* (*Hylobates klossii*) and 4) *Bokkoi* (*Macaca pagensis*). The loss of natural habitat, the decrease of habitat quality, hunting and forest conversion for agriculture are main factors and most important threats for the long-term survival of Siberut's primate species. Normally all primate species are found in *primary dipterocarpaceae* and *mixed dipterocarpaceae* forest and they live in forest layer at 20-40 meters above sea level. Those ecosystems provide more food sources and more shelter, including sleeping or resting trees.

Hunting is an important socio-cultural activity for Siberut's indigenous communities, as it is closely related to the traditional belief system and strengthens the social ties within the *Uma* (extended family). Hunting involves strong taboos and needs to be done after each ceremony (*punen*). Game is never sold and always divided equally amongst all members of an Uma. In certain areas hunting has been declining due to outside influences as formal education, monotheistic religions and increased participation in market economy. However, the decline in hunting in certain areas has not decreased the overall hunting pressure as many people have exchanged their traditional bow and arrow for more lethal air guns.

The biggest current threats for the extinction of Siberut primates comes from large-scale economic activities involving the conversion of natural forest as commercial logging, HPH (Logging Concession Right) and IPK (Timber Utilization Permit) and also oil palm plantation.

Figure 3. Simakobu (*Simias concolor)*

Figure 4. Joja (*Presbytis potenziani)*



B.3. Physical Condition of the Island

Siberut climate is characterized by a hot and humid equatorial climate with high rainfall, without an extended dry season. Rainfall in the interior is higher compared to east coast. Heavy rainfall with an average magnitude of 70 mm within 24 hours will cause short time flood.

Siberut is a sedimentary island, dominated by shales, silts and marls of relative young age. Most of the island is covered with steep low hills and ridges, with a maximum elevation of 384 m. Siberut soil analyses have shown that the soil originated from hardened mud sediments and is therefore extra-vulnerable to erosion. Jungle paths tend to become slippery and one's feet could sink down in the mud up to the ankles after fifteen minutes of rainfall,

showing the danger of unsustainable land-use.

The hydrological system of the island makes the village and agriculture areas in the valleys and along the coast depend on hillside forest as water resource and provider.

Forest-soil analysis show that Siberut soil contains less humus and has lower fertility level compared to other tropical forests. Humus elements are stored in the forest biomass, characterized by the existence of large trees as Dipterocarpaceae, with height up to 70 meters. Loss of big trees due to the conversion of forest will decrease the continuous release of humus on Siberut Island.

In short, the physical condition of Siberut Island is very fragile. Uneven natural spans and geological forms are constituted of young and muddy sediment. This combined with the high level of annual rainfall makes the island vulnerable to erosion and soil infertility.

B.4. Demography, Economy, Cultures, Social and Politics

B.4.1. Primary School Graduate and Richness of Traditional Knowledge

The origin of Mentawaian is not clearly defined, but they are classified as a proto-Malayan ethnical group. Based on anthropologist research, it is assumed that they migrated some 3,000 years ago to Siberut from the mainland of Sumatra through Nias and then South through the Batu islands.

In 1977, 31,827 people or 7,762 households with a population growth of 3.7% per year and with density of 7 people per km^2 inhabited Siberut Island. The in-migrant (non-Mentawaian) population in 1977 was estimated to be around 3,000 or 10% of the total population on Siberut. Total population in the year 2003 is projected to become 40,000 peoples. The population of the residents spread into 20 villages and 76 sub-villages, among of them, 36 sub-village lie in the fringe or inside of national park area.

The estimated amount of working or productive residents between 15 to 55 years old is about 61.89% of the total population, meaning that at least 2 working people carry the burden of 1 unproductive person. The general education level among the indigenous community is quite low, with as average education level primary school graduate.

However, indigenous communities possess a much-extended knowledge concerning the management of natural resources, as their knowledge of herbal medicine. This is the result of the environmental adaptation, in which the native community has learned how to use their natural environment. The Mentawaian community in Siberut Island has knowledge of 223 species from 69-plant families, which can be used as an effective medicine to cure 129 various diseases. This knowledge is the most extended if compared to other native communities in Indonesia. The traditional land use (*tinunggulu, pumonean*), based on slashes and mulch method, is still practiced until now. It was noted that in 1.25 hectares of *pumonean,* 134 useful tree species and 22 useful shrub species are found. Mentawaian have started to make innovations to the *pumonean* by introducing cash-crops within the *pumonean* such as *nilam* (patchouli oil), coffee, cinnamon and nutmeg or even plants or trees found in primary forest such as rattan, sandal wood or gaharu, etc.

Other aspects distinguishing the indigenous knowledge include their view and attitude to manage natural environment wisely, which is reflected in various customary ceremonies and the complex taboo system.

B.4.2. Traditional Economic Practices

In 1997, 80% of total population work as farmers/wild harvest collectors and 2.3% work as fishermen with an average income per capita of Rp 1,149,000.- per year or about US 120/year (with exchange rate of 1 US$=Rp 9500,-). The main income of the local community comes from forest-products such as rattan, sago and sandalwood and from agricultural products such as cloves, patchouli oil or nutmegs. Until now, the local economy has still a very strong subsistent character, in which the natural environment plays the role as their storehouse.

Based on the technical survey with questionnaires done in 1998, covering 28 sub - village with 1,886 households in the fringe area of the National Park, 14% of the families could be classified as wealthy, 15% as poor and 71% as relatively wealthy. Wealth in the local perception is measured by the amount of land, fields and livestock a family owns. The Mentawaian community's current economic activities include *nilam*, patchouli oil

processing, sago, clove, nutmeg and betel nut production, copra processing, rattan collection, and fishing.

The Mentawaian communities sell the forest products harvested and collected in Siberut Island to in-migrant traders, who export the products to markets in the mainland. The demand of the products has been showing a steady increased as can be seen on the Table 2 below.

Table 2. Prediction of increases of market demand of natural resource products from Siberut Island

Products	Unit	Year 1998	Year 2003	Year 2008
Sago	tons/year	4,288	4,383	4,736
Cloves	tons/year	219	293	365
Copra Coconut	tons/year	12,871	16,247	20,965
Shrub	tons/year	31.6	34.9	38.5
Construction Woods	M^3/year	900,000	1,148,650	1,466,000
Large Rattan	pieces/year	955,600	1,219,615	1,556,600
Tabu Rattan	pieces/year	1,150,000	1,467,724	1,873,200

Source : Saiful Rahman (1999)

Trade relationships have in time become more important as they enable the communities to earn cash money needed to buy goods, which are not locally produced as tobacco, sugar, iron goods, clothes, etc. The increasing participation in cash economy allows the communities also to purchase new emerged needs as radios, TVs, chainsaws, outboard motors, etc. Trade in Siberut is dominated by in-migrants, belonging to the Minangkabau ethnic group. Although native people have tried to build their businesses, the indigenous social structure and limited market skills and knowledge have hampered local trader's success in developing a market network.

B.4.3. Customary System: The Accentuation to Traditional Community Rights

The traditional culture and beliefs of the Mentawaian ethnic group are still practiced in some parts of Siberut Island until now. The traditional belief, which has an objective to live in balance with the natural environment, still plays a significant role in the daily life of Siberut people. This belief supports partially the modern conservation concept. Elements of the Mentawaian adat as taboos play an important role in the protection of natural resources.

Another important element in natural resource management is the role of the *Parurukat Punutubut Uma*, or a meeting including all *Uma* members, which function is to resolve social conflicts and regulate land use and the use of natural resource.

The natural environment does not only have an economic importance for the Mentawaian communities of Siberut Island, but also closely related to the indigenous animistic belief system, *Arat Sabulungan*. Although there are influences from monotheistic religions as Islam and Christianity, *Arat Sabulungan* still plays a significant role in the daily life of the native communities, particularly for those communities still living in the interior of the island.

In *Arat Sabulungan*, all living beings (people, animals, trees), material objects (stones, knifes, houses) and natural phenomena (earthquakes, rainbows, clouds) possess a soul (*simagere, ketcat*) or force fields (*bajou*). There are also spirits, also called *Tai* in the forest (*taikaleleu*), in the sky, controlling rain and heat (*taikaulou*), in the earth (*taibaga*), and in the sea (*taikakoat*). Another important spirit is the spirit of the crocodile or *sikaoinan, sikamainan*. It is very important for the human being to preserve harmony with all these spirits in order for the human souls not to leave the body. This would cause sickness and eventually death. The harmony between humans and the environment, consisting of spirits regulated by a various religious ceremonies or rites such as *punen, panakia,* etc, which are still conducted today and often involve shaman (*kerei*), as mediators between the real world and supernatural world. The constant quest for harmony between humans and their environment is reflected in the complex taboo system, imposing restrictions on human behavior. As the natural environment is composed of spirits, a lot of taboos are related to the management of natural resources, as farming, hunting, fishing and collecting forest products.

The taboo system is directly and indirectly related to the goals of modern environmental conservation. For example, some of the taboos imposed to the husband of a pregnant woman, directly support conservation. The husband is not allowed to perform cutting and stabbing movements, including the opening of new fields, make a dug-out canoe, collect rattan, hunting, etc.

Figure 5. Traditional religious ceremony in Siberut Island

The harmony between humans and the environment, consisting of spirits, is regulated by a various religious ceremonies or rites such as **punen**, which are still conducted today, and often involve shaman (kerei), as mediators between the real world and supernatural world.

The social organization in Siberut is a heritage of the egalitarian socio-political structure of Neolithic time. Mentawaians are organised in the *Uma*, a landowning patrilineal family group, representing an autonomous political unit. Members of the Uma are dwelling in a communal longhouse, which also referred to as *Uma*. The *Uma* has a patrilocal rule of residence, meaning that married couples live within the man's family. The *Uma* is traditionally located in a valley, on the border of a river and surrounded by houses (*sapou*), belonging to each family in the *Uma*. Each *Uma* contains 5 to 10 monogamous families[1], referred to as *lalep*, and related to one nuclear family, which resides permanently in the *Uma*

[1] An Uma exists out of 30 to 60 members

(Meyers, 2001). Currently it is estimated that there are around 350 to 400 *uma* communities in Siberut Island.

Land tenure on Siberut is communal and based on the social structure of the *Uma* or extended family. Historically and customary, all land on Siberut has been claimed by *Uma*s, leading to a current condition where there is no empty or governmental on the island. Accordance to customary law, the landowning *Uma*, also possesses the ownership over all natural resources on the land. The land tenure system is related to the patrilineal structure of Siberut society, allowing only male descendents of the *Uma* to inherit ownership over land. This system prevails and is respected until now.

Every individual member (*Sikauma*) of a distinct *Uma* knows exactly the land and natural resources belonging to his group. A *Sikauma* has the owner and user right to exploit and use natural resources as opening a field, collect rattan, hunting, etc. The management and use pattern are determined by the respective *Uma* community, more specifically during a *Pararukat Punututbut Uma* .

The right to use land and natural resources is not only a limited to the respective members of an *Uma*, and can on request be used by different *Uma*s as well. If a member of different *uma* wishes to collect food, hunt, build a pig farm, collect rattan or open a field in area owned by another *uma*, then it is mandatory that he has to ask for permit. Without approval, the intruder will receive a customary fine (*tulou*). If a dispute emerges concerning the ownership over land and natural resources between two *Uma*s, the problem will try to be solved by mediation of a third *Uma*. If this fails, the problem will be solved through rattan cutting (*tipu sasa*), in order to detect the lying party. *Tipu sasa* will end the conflict as it results in the mystical dead of one member of the *Uma* that lied over the ownership.

Although Siberut Island is relatively small, it has an unexpected high amount of socio-cultural variations, reflected in different dialects, life-styles, and methods to manage the natural environment. Regional variation is related to the autonomous socio-politic and socio-cultural status of the *Uma*. It is further pronounced by the limited mobility of people and of the result of bad relationships in the past between *Uma*s of different valleys. For example, a number of *inter-uma* wars and competitions in the past have been causing the

distrust between *Uma*s until today.

The social structure in Siberut shows that the island hides high potential horizontal conflicts related to natural resources utilization. The horizontal conflicts could result in a more open conflict, affecting a wider segment of the Siberut society.

B.4.4. The Political Absence (Status-Quo) and the Discontinuation of Local Development

Before 1999, Siberut Island was administratively under Padang Pariaman District. The statute, UU No.9/1999 was promulgated, inline with state autonomy. This policy includes Siberut Island within administrative coverage of Level II Government of Mentawai District and Level I Government of West Sumatra Province.

As normally happens in Indonesia, lack of preparation from central government and regional government directing autonomy has given uncertainty condition in managing regional natural resource. Good governance principles i.e. transparency, public accountability and public participation, are not well taken of as it should be in the state autonomy era. So new apprehensions between central – regional in managing natural resource becomes more and more. Central government reluctantly transfers power and authority to regional government. In the other side, regional government who before as milk cow for central government makes this autonomy situation becomes a chance to exploit natural resources with the reason of District Revenue (PAD) increase. Not all these reasons are appropriate, as in economical and political uncertainty before General Election (Pemilu) in 2004; a lot of powerful parties make this uncertainty to take economical advantage for private interest or certain group interest.

The general situation also happens in Mentawai District. Since the promulgation of the policy, which made Mentawai became a new district (Kabupaten), political problem is never ended. The political problems include the district parliament (DPRD) seat competition, the delay of DPRD member inauguration, competition to become caretaker of Mentawai Archipelago to the inauguration delay of definitive Head of District (Bupati). This political drama took three years, so political absence (the political status-quo) instigated

decision making process related to strategic planning and development activity in Mentawai District was taken over by Level I Regional Government of West Sumatra Province, although nowadays Mentawai District has already has definitive Bupati and DPRD.

It is clear that the success of continuative development in Siberut Island is indicated by economic advancement balanced with a solid social condition and better environmental quality. But, the fact showed that the current conditions are the opposite or 180 degrees different from ideal condition of continuative development in Siberut Island. Horizontal and vertical social conflicts start to appear in Siberut Island. There is lack of economic infrastructures and public services. Environmental damage of the island starts to expand and become intense. Meanwhile customary community and farmers as dominant elements in Siberut Island becomes marginalized in social, politic and economic. Natural resource policy in regional government becomes worse and not sustainable oriented, centralistic, sectioned and full of ambitions of 'fast harvesting and sell as low as possible'.

C. NATIONAL PARK MANAGEMENT

Designated as Biosphere Reservation, Siberut Island has gained international recognition, but unfortunately this has not been translated into an improved management of the island and the National Park in particular. In contrary, the Siberut management after the completion of PKAT project funded by ADB in the end of 1999 had bad performance. PKAT project did not leave a continuative program. What is seen today, is remaining building of National park office compound, visitor center, some boats and other equipments which are not well taken care, and they even do not function any more.

The policy to move National Park management from Siberut Island to Padang was the beginning of even worse performance of this national park management. Directly, it had impact to the declining of the staff's motivation and productivity, which made management system became worse. This condition gave bad impression in the eye of the community in regard of national park management role and function. The community considered National Park management activity was based on the existence of the project. Since this policy applied, there was not any National Park activity effective enough and had ability to minimize National Park problems in community level. In contrary, discrepancy between National Park staffs and the community became wider. This should not happen in the decentralization era, where community participation in every aspect should be encouraged.

The selection of annual program of National Park Management seemed to be very different from the ground level needs. Activities conducted under National Park management do not give solution to the real problems in community level. The management should handle activity based on recommendation and long-term framework from the result of PKAT project. But management declared that the staffs could not understand and executed the propose activities in National Park management, with the reason that they were too difficult and too complex to be implemented.

Other problems in faced by Siberut National Park management at community level also include:

- **Compensation Issue:** the increasing of compensation issue as main issue in the community, spread by HPH party who tries to influence local community pattern of thinking, will give bad impact to the existence of National Park, because the community will demand compensation for the existence of National Park in Siberut.

- **Trauma in community level:** trauma from various government program as resettlement, the failure and bad management in PKAT program, also gives trauma to community, and weaken conservation activist position in Siberut, because they are considered to be unable to give direct advantage in short-term to the community.

In the new era of National Park leadership, they started to make joint and cooperation with conservation organization as UNESCO, Yayasan Cipta Mandiri (YCM) and local community in the activities sponsored by UNESCO known as Co-Management Team. This activity, at least, changed the community view in some locations toward the importance of National Park. Patrol activity design was conducted in one after the other. It was still in trial test and expected to uplift the sprit of the staffs, which had not in proper duty. National Park staff capacity was still limited and needed an upgrading in conservation understanding and its management.

Figure 6. Discussion among Co-Management Team in Siberut Island

D. THREATS TO THE LOWLAND FOREST OF SIBERUT ISLAND

All logging concession or HPH have been stopped operating in Siberut Island since 1994, based on Presidential Decree Year 1992. Before the decree, since 1972 Siberut Island had become operation area of 3 (three) HPH companies namely PT. Cirebon Agung, PT. Carya Parmin Pulau Siberut and PT. Kayu Siberut. These three concessions had area of 30,650 hectares and until 1993 had logged 1.7 million m^3 of timber. Other data showed that lowland tropical forest area logged in Siberut has exceeded the designated concession area with the area of over 57,700 hectares.

But after IPAS –Asian Development Bank Project in Siberut National Park in 1992-1999, lowland wet tropical forest in Siberut Island, again, faces pressure from various large-scale natural forest exploitations. Until now, there are 11 applications proposing for HPH (timber concession) and oil palm plantation covering area of about 274,500 hectares or nearly 70% of total island area. Out of all of applications, there are only 2 applications that have got approval and one of them is up to the stage of Principle Agreement and AMDAL (Environmental Impact Analysis).

One of the HPH, Koperasi Andalas Madani (KAM) has got the HPH license from Minister of Forestry that gives them the rights to do logging in 45,650 hectares in southern part of the island in March 2001. In the field, Koperasi Andalas Madani (KAM) in cooperation with PT. Sinar Minang Sejahtera has started logging operation. PT. Maharani Puricitra Lestari and Koperasi Kosum, also in the southern part of the island, have been conducting logging operation after timber utilization permit (IPK) right were granted, with area of 2,000 hectares from the proposed area of 17,500 hectares. In the northern part of the island, PT. Salaki Summa Sejahtera (PT SSS) had been granted principle license of HPH from Minister of Forestry with area of 49,440 hectares in January 2001. Level I Regional Government of West Sumatra has approved the AMDAL (Environmental Impact Analysis) in July 2001.

The current activities or planned activities mentioned above could cause the habitat fragmentation in Siberut Island, especially in HPH concession location of Koperasi Andalas Mandiri (KAM) and PT. Salaki Summa Sejahtera (PT SSS), which are in direct contact with

core zone of Siberut National Park that still has high endemic primate population density.

Figure 7. Map of Siberut National Park, Koperasi Andalas Madani (KAM) and PT Salaki Summa Sejahtera (SSS) in Siberut Island

Source : LANDSAT 2001

These small, fragmented and isolated habitats could inevitably cause the decrease of habitat quality especially for the primates. It is well known that one of the important factors of primate habitat in Siberut is the prominence of various plantation and family of light banyan or *Ficus spp*. About 19 species of *Ficus spp* have been identified as physiognomic composer of Siberut tropical forest. This family plantation is known also as keystone species, as it becomes the important food source for common primates in tropical forest, due to its full of proteins and carbohydrates and its availability along the year and during fruit scarcity.

Habitat fragmentation also will make primate population become uneven, isolated, and divided by sub-population spread in limited area. This will make remaining sub-population primates extinct quickly, because habitat fragmentation will create obstruction for spreading process, colonization and wandering. In the end, breeding viable population quality will be less. This will speed up species extinction rate.

Large-scale forest extraction activities in Siberut Island have the equal law power with Siberut National Park because they were originated from the same Government policy source i.e. Forestry and Plantation Minister Decree Letter No. 422/Kpts-II/1999 in regard of Forest Area Establishment in West Sumatra Province with area of 2,600,286 hectares. This decree stipulates that all forest areas in Siberut Island have been divided based on their function i.e. Fixed Production Forest, Limited Production Forest, Natural Sanctuary Forest, Conservation Area and Convertible Production Forest. The above issue shows the inconsistency in forest management policy and spatial utilization to support Biosphere Reserve in Siberut Island, which requires the fulfillment of continuative development principles.

E. FINDINGS AND ANALYSIS FROM THE FEASIBILITY STUDY

E. 1. The Concept of Conservation Concession Approach: an Initial Exploration

There are not many references explaining about Conservation Concession concept in the world. The mechanism of Conservation Concession is natural conservation management tool with the objective of combining more directly between natural conservation activities with the development. The principle is to make compensation settlement or cash payment to special rights or concession to manage natural area granted by state government or public, to grantee(s) as replacement of loss of incomes or jobs, under agreement prohibiting exploitation of certain natural resources continuously.

This approach was implemented for the first time in the world by Conservation International (CI) in tropical forest in 8 countries, for example Guyana, Namibia, Cambodia and Peru and not always to develop national park area or new conserved national park (www.conservation.org, 2001 and www.cabs.org, 2001).

This mechanism is expected to assist in creating market, which enables conservation activity to make direct competition with extraction industry to get natural resources management rights. Meanwhile it will increase natural resources assets in a country in the form of tropical forest, which have important value, whether in global, national or local scale.

As an illustration of Conservation Concession concept implementation, in Guyana, CI was given the rights of tropical forest management with area of 80,000 hectares thru contract leasing with local authority, based on market value. In this concession area, native community (Amerindians) was still allowed to practice their land usages, which were not in violation to the objective of conservation and conservation concession. Guyana Forest Authority Commission put into effect the model conservation concession management in the form of regulations in natural forest area utilization and management, as amount tax levied, size of area and its utilization. The difference was, that forest area concession was not damaged as with traditional natural forest timber exploitation. CI had paid application fee amounting US $ 20,000 and US$ 0,15 per-acre or US$ 30,000 for 80,000 hectares per year to local state

government during three years trial period, before making decision on how much CI had to pay for 25 years leasing in the future. The value paid was stable because it used US dollar currency; it was not influenced by timber price fluctuations in the world market and exchange rate of local currency. (www. cutter.com, 2000; Guyana Chronicle, 2001).

Based on Guyana Country experience, it can be outlined here, that general principles of conservation concession implementation are:

- Conservation Concession area has high conservation value and beneficially in global, national and local scale.
- The main purpose is to reduce damages in natural area by expanding reserved area beside current conservation areas, which have been established by the state government.
- Opening access to local community to utilize conservation concession area with continuative natural resource utilization methods.
- Giving cash compensation to the government or public as replacement of losses of incomes or jobs, under the agreement that prohibits exploitation to certain natural resources continually.
- Payment to be done with contract leasing agreement based with relatively stable currency, less influenced by local exchange rate, and fluctuations of commercial wood prices.
- Giving support funds for conservation and hiring local people in concession area utilization.
- To help creating new market so that the conservation activity investment is able to compete with extraction industry investment.

Conservation Concession concept resembles with conservation management right in Indonesia that was granted to Yayasan Leuser International (YLI) to manage Leuser Ecosystem in 1995, based on Forestry Minister Decree No.227/1995. With huge support funds

from Union Europe and high-level political support, especially from Republic of Indonesia president, had made YLI as the most powerful party in Leuser Ecosystem, including in taking care of the development and involvement with vested interest holders in the fringe area of Leuser Ecosystem. These problems created various conflicts between YLI, local government, National Park Management Authority, HPH or HGU concession holder from civil community organizations and emplacement community. That conflict was also due to no transparency of management authority and jurisdiction crossover of the concession rights; lack of social support at the base level and at civil society groups. The other conflict reasons were the inadequacy of the compensation and direct loss of incomes or jobs of some parties for the loss forest utilization access in Leuser Ecosystem; so there were parties, which suffered financial losses. From this point of view, conservation activity in Leuser Ecosystem was still a cost center for development budget; it still could not give a real economical favor in the form of significant economic income to the government and local community. Indirect compensation was given in the form of micro projects, which were less meaningful to regional state income, central government, and local community. Besides, it had less impact in reducing forest damage rate in Leuser. HPH concession holders who were ruined by Leuser Ecosystem utilization expansion, were not given any compensations, so this possibility might become one of the trigger of the increasing illegal logging in Leuser Ecosystem.

But in 1998, based on Presidential Decree No. 33 Year 1998, the exclusive rights given to YLI, was transformed only up to cooperation relationship between the government and YLI in Leuser Ecosystem management. In this Decree, all plans and conservation activity implementation had to be approved by Forestry Minister. Direct compensation was only given to local residents in South Aceh District and Singkil, when project manager tried to release the inhabited land for wild animal corridor in Leuser Ecosystem. Government fund was used for that purpose, and it was presumed to tie with Collusion Corruptions and Nepotism problem (KKN).

E.2. Conservation Concession Support Policy Analysis

E. 2.1. Forest Area Management Policy

Concession can be understood as granting the rights or license to certain party to conduct certain activity, normally limited to certain period of time and to certain location. In the context of conservation concession in Indonesia, the rights is given from the party who is authorized in forest area management, the government, to certain party to manage a certain area to attain natural conservation objectives.

Today, the State Government is issuing the latest regulation to a party in certain area and period of time, in the form of exclusive concession rights for forest utilization through licensing mechanism, whether it is in production forest area or natural conservation forest. In accordance to Government Regulation No.25 year 2000 about the Authority of Government and the Authority of the Province as Autonomy Area, the authority is still under the Central Government, as stipulated in Section-2 below:

The First Part
The Authority of Government and the Authority of the Province as autonomy area
Section 2

(2) Government Authority ……..

(3) The Authority as stipulated on article (2) is categorized to sectors as follow:

1. Forestry and Plantation Sector

   a. ……..
   b. ……..
   c. ……..
   j. Implementation of enterprise license hunting park business, hunting business, reserved flora and fauna sanctuary, conservation institution, implementation of natural conservation area management, hunting park natural conservation area, including flow river stream area.
   k. Implementation of enterprise license of production forest products, utilization and implementation of inter-province natural tourism business.
   l. ……..

Besides, the Central Government still have the authority to establish certain forest area for special objectives as stipulated in UU No.41 Year 1999, Section 8 and Section 34, as far as not converting forest basic functions, which are conservation, protection, and production functions.

Second Part
Forest Status and Functions
Section 8

(1) State Government may establish certain forest area for special purposes.

(2) Forest area establishment for special purposes, as stipulated in this article, are for:

(1) Needed for public functions as:

a. Research and developments,
b. Education and training, and
c. Religion and culture.

(3) Forest Area with special purpose, as stipulated in Article (1), is not converting basic function of forest area as stipulated in Article 6.

Section 34

Forest Area Management for special purposes as stipulated in Section 8 may be granted to:

a. Customary law community,
b. Education institutions,
c. Research institutions,
d. Religion and Social institution.

Implementation of Concession policy for special objective had been given to customary community Krui in Bengkulu to take care of Kucing Damar Forest (rempong damar) with area of more than 10,000 hectares thru Forestry Minister Decree. The similar case was also implemented for proximity of customary community Manggamat in South Aceh to utilize forest area named ‘conservation dwelling forest’ with area of 12,000 hectares, which comprised of limited production forest and protected forest in Leuser Ecosystem.

Customary Community was given authority to manage the area for conservation purposes, utilize non-wood forest products and obliged to pay Re-plantation Funds. The establishment of this area was based on the initiative and the Decree of Forest Department Area Office in 1998 due to pressure of the local community. In Kerinci District, long before autonomy area, based on The Decree of Bupati, regional authority had given the rights to local customary community, to manage primary forest area in the fringe of Kerinci Seblat National Park, for conservation purposes. That Customary Forest is known as Temedak Customary Forest in Keluru Village, Ulu Air Lempur Forest, and Hoang Customary Forest in Hiang Village, with total area amounted more than 2,500 hectares.

Nowadays, the Policy to grant the right and the authority to customary community to manage forest area as mentioned above, have been more accommodated thru UU No 41 Year 1999 on Forestry in Section 67 and Section 68 , which stipulates as follows.

Customary Law Community
Section 67

(1) Customary Law Communities, who, de facto, are exist or admitted their existence have the rights:

a. To levy forest products for their daily life consumptions of the corresponding customary community;
b. To do utilization activity based on the traditions, as long as they are not against to the prevailing laws. And;
c. To have opportunities in order to get reinforcement for increasing their prosperity levels.

Besides, there are differences between Conservation Concession and Natural Forest Utilization Rights (HPHA). HPHA clearly causes loss of access of the local community to forest resources. In Conservation Concession, compensation replacement to local community should be done, as stipulated in UU No. 41 Year 1999 on Section 68, which describes community rights in compensation replacement due to loss of access to forest resources as follows:

Community Involvement
Section 68

(1) …….

(2) ……..

(3) The community inside and in the nearby forest area has the right to receive compensation due to loss of access with the forest nearby, as working area, to fulfill their life needs, as the result of forest area establishment, in accordance with prevailing laws and regulations.

(4) Everybody has the right to receive compensation due to the loss of his/her land ownership as the result of forest area establishment in accordance with prevailing laws and regulations.

Following up the policy of UU No. 41 Year 1999 on Section 8 and Section 34, Forestry Minister had issued Decree No. 465 /Kpts-II/1999 for Forest Utilization for Education, Training and Research. These rights may be applied to protected forest areas, national land utilization zones, and production forests which has not been granted with the rights. Forest Utilization Right for special objectives that located in production area may be given to state and private research institutions with area of maximum 100,000 hectares for 35 years.

According to Section 28 UU No. 41 Year 1999, see below, forest production area is permitted not only for utilization and taking wood or non-wood forest products but also for utilization area and environmental services utility. The license or environmental service business may be granted to individuals, cooperation, Indonesian owned private company, state owned company and regional state owned company.

Third Part
Forest Utilization and Forest Area Usage
Section 28

(1) Forest utilization of production forest may be in the form of area utilization, environmental service utilization, wood or non-wood forest product utilization, and to collect wood and non-wood forest products.

(2) Forest utilization of production forest may be accomplished by granting business license for area

utilization, business license for environmental service utilization, business license for wood or non-wood forest product utilization, and business license to collect wood and non-wood forest products.

Forest utilization of production forest may be accomplished by granting business license for area utilization, business license for environmental service utilization, business license for wood or non-wood forest product utilization, and business license to collect wood and non-wood forest products.

This policy is clarified by the Decree of Forestry Ministry No. 07.1/Kpts-II/2000 in regard of Criterions and Business License Standard for Utilization Area (IUP-K); Production Forest Environmental Services. The businesses permitted are various natural tourism, water utilization, challenging sports, carbon trading, and research. Allowable business area is between 10 to 1000 hectares with time period between 3 years to 10 years. This policy is only a guideline for drafting regional regulations, so that later, the authority for license formalities will be under regional government. Business license for Production Forest Environmental Services may be granted for individuals, cooperation, Indonesia owned private company, State owned company or Regional government owned company.

Beside that, Forestry Minister had also issued The Decree No.06.1/Kpts-II/2000 Criterions and Business License Standard in Production Forest Utilization Area which cover cultivation of food crops, cultivation of herb base medicine plantations, cultivation of honey-bees, cultivation of mushroom and cultivation of wild crops with area of 5 to 50 hectares in period of maximum 5 years. The formalities of this business licenses is fully under authority of regional government.

Some groups of interest holders foresee that conservation area or forest resources in autonomy era and fiscal decentralization will be used as the base of PAD income source extension to cover state autonomy expenditures. This is in turn, will shrink tropical forest in Indonesia. In the frame of law, it is possible due to the existence of Section 11 UU No.41 Year 1999, State Regulations, The Decree of Minister, which gives authority to the Governor and Bupati to grant Forest Utilization Right (HPH) under a certain area size. In the other side, Central Government has obligation to execute 8 (eight) tropical forest commitments as part of policy from CGI donors, in undertaking of the loans and granting new loans for

Indonesia. This condition makes Indonesia position in difficult choice, between saving state autonomy or tropical forest existence.

Application of utilization through Conservation Concession concept in relatively undamaged production forest area has high possibility to become an alternative to save both problems. Because if Conservation Concession is applied correctly, especially in production forest which contains primary forests, then the decrease of primary forest can be minimized, and Central and Regional state income are still filled from the compensation given by conservation concession right holders.

Beside that, utilization of conservation concession area still opens possibility for forest area utilization by emplacement community via continual land usage practices. In addition to strengthen ecological supporting power, it also increases sociological supporting power of the National Park. So the realistic choice now, is to establish Conservation Concession Area in Siberut Island as expansion of new buffer area of National Park Siberut, instead of developing a new national park. In short, conservation concession area can be arranged to become other-zone or exclusive-zone in national park utilization with its function as buffer zone, as stipulated in Government Regulation No.68 in regard of Natural Sanctuary Area and Natural Conservation Area as follows:

Section 31

(1) An area may be established as National Park Area, if it is accomplished the following criterions:

a. Constitute an area which can be divided into core zone, utilization zone, jungle zone, and other zone, which in regard of area rehabilitation requirements, dependency of the resident in the fringe area, and in order to support bio resources continuation effort and its ecosystem, is established as an exclusive zone.

Section 56

Buffer zone has function protecting Natural Sanctuary Area and/or Natural Conservation area from any form of pressures and disturbances from outside and/or inside of the area, which may change the integrity and/or area functions.

(2) Establishment of buffer zone as stipulated in Article-1 is based on the following criterions:

a. Geographically, it lies in the border of Natural Sanctuary Area and/or Natural Conservation Area;
b. Ecologically, it still has influences whether from inside or from outside of the Natural Sanctuary Area

and/or Natural Conservation Area;

c. Fuctionally, it has ability to protect from any form of disturbances whether from inside or from outside of the Natural Sanctuary Area and/or Natural Conservation Area.

The development expansion of buffer zone of Siberut National Park, of course, does not mean the restriction faced in national park utilization will be lighter. From law side, for example, serious restriction will show up, described in regulation of buffer zone management in both UU No.5 Year 1990 in regard of Bio Natural Resources and its Ecosystem and PP No.68 year 1998. Although in that UU or PP, it is mentioned as area outside of conservation area, which its ownership and its authority are still under previous right owners, but there is no further operational procedure, which gives clear law status, mechanism, and executive institution in buffer zone utilization. It is still to be resolved whether joint utilization institution based on local interest holders must be formed, to manage buffer zone with local government, community and with other non-government organization.

E. 2.2. Acquisition of Conservation Concession Area Policy

As the result of existing regulations and policies, it is clear that appointment from forest neighborhood to Conservation Concession area or conversion from production forest function to conservation forest area or protection forest only can be obtained in accordance with Central Government policy. It can be shown under Section 15 Article 19 UU No. 41 year 1999 in regard of Forestry and Section 2 Article 3 point 4c in Government Regulation PP No.25 year 2000 in regard of The Authority of the State and the Authority of Province as autonomy state. In those two policies Central Government has the authority to establish forest area, status conversion and forest area functions. It is further described in The Decree of Forestry Minister No.70 year 2001 in regard of Forest Area appointment, Status Change and Forest Area Functions. Conversion in forest function area can be interpreted as partial alteration or all forest functions in certain forest area from its role as conservation function, protection function or production function.

Section-3 describes clearly that one of the objective of forest area function

conversion arrangement is to preserve and to secure the existence and the integrity forest area as a motor of local, regional, and national economic and also as life buffer in local, regional, national and global scale.

Based on Government Regulation No.68 in regard of Natural Sanctuary Area and Natural Conservation Area; Establishment and Conservation Concession reinforcement, if assumed as buffer area expansion of national park or forest area, implicates that the Forestry Minister still holds the authority in establishment of national park as buffer zone, as explained below.

Section 56

(1) ……

(2) ……..

(3) The Forestry Minister shall decide for establishment of Country Free Land, or Land Granted Right (Title Based) as buffer zone, after hearing the proposal and justification of corresponding Governor Head of Provincial Level Government.

(4) Establishment of buffer zone is conducted with the respect to the rights belong to right holder.

(5) Utilization of buffer zone, which is not in the form of forest area, still belongs to the right holder with the respect of Article (2) point b.

The Decree of Forestry Minister No. 70 Year 2001 on Section 17 to Section 20 clearly describes the procedure to make conversion of forest area function.

Section 17

(1) The conversion of forest area function can be done only if the area altered fulfills the criterions and standard of forest function establishment.

(2) Forest Area Function that will be converted in its function shall be in accordance with Appointment Map of Province Forest Area and Irrigation, which is established by the Minster.

(3) The Conversion of forest area function shall be based on the research conducted by integrated team.

Section 18

The Requisition of Alteration of forest area function shall be forwarded to the Minister with attachments of:

a. Technical suggestion and justification from Forestry Department of Kabupaten/City or Province for inter-city/kabupaten.

b. Bupati/City Mayor or Governor Recommendation for inter-kabupaten/city.

c. DPRD Kabupaten/Kota Approval and DPRD Province for inter kabupaten/City.

d. Map with scale of 1:100.000 minimum.

Section 19

Based on requisition as in Section 18, corresponding Echelon I in Forestry Department shall give opinion and technical justification to the Minister.

Section 20

Based on the opinion and technical justification stipulated on Section 18, The Minister may reject or approve the requisition of the alteration forest area function.

Let the option in acquiring Conservation Concession area is chosen such not to make any alteration in the forest function area. Then for example, if the same procedure may be established for obtaining Conservation Concession Right or Natural Forest Utilization Right (HPHA), concession right may be obtained through application to Forestry Minister or through bidding tender conducted by the Government. HPH bidding policy can be studied from Government Regulation No.6 year 1999 in regard of Forest Utilization and Collection of Forest Products in Production Forest, or in Minister Decree No. 731/Kpts-II/1998 in regard of Forest Utilization Right Bidding Procedures. These policies are expected to give opportunity to community to implement forest utilization. Normally, in HPHA bidding, the Government will appoint a team for Bidding Preparation and a Committee to carry out the bids. In Government Regulation No.6 year 1999 Section 7, Bidding Procedures are fully described as follows:

Section 7

(1) Bidding in Forest Utilization Right as stipulated on Section 6 Article (1) is arranged as follows:

a. The Government shall establish production forests criterions, which are included in invitation for bid, area status, and criterion of the bidders.

b. The Government shall announce widely the amount of forest areas under invitation for bid;

c. The interested party(s) shall forward application letter to become bidding participant. The bidding participants shall be given opportunity to make field observation and to acquire the data as needed;

d. The Government shall establish the winner of the auction based on incoming bids.

(2) The Requisition of Forest Utilization Right (HPH) as stipulated on Section 6 Article 2 is arranged as

follows:

a. The interested party shall forward an application letter to the Government;
b. The Government may approve or reject the application of Forest Utilization Area.

(4) The Minister shall further establish bidding procedures in auction or application as stipulated Article (1) and Article (2).

Based on policy analysis described above, the parties allowable to obtain Conservation Concession Right are regional government owned company, state owned company, customary community groups, foreign, private and state owned research institution, educational institution, social institution, and religion institution. As Conservation International Indonesia Program in essence, is only activity implementer from international conservation institution of Conservation International, which is based Washington DC, then CI is not allowable to have conservation concession right in Indonesia, except by looking for strategic alliances (partnership) with similar institutions allowable to have concession right as mentioned above or to make conversion on organization status in accordance with prevailing laws in Indonesia.

E.2.3. Public Accountability and Community Involvement Policy

Will the other problem arise, if conservation concession mechanism is applied, is the area under concession run correctly to attain conservation objectives? Or the other question; is part of concession holders income utilized for local community in order to carry out non-extractive support economic development activities and at the same time, is it utilized to upgrade their appreciation to protect conservation concession area? There will be no answer without implementation of community involvement through broad, effective public consultation and public supervision of the plan and implementation of conservation concession and local development.

It should be understood in this context, that conservation concession mission in state autonomy era is intended to empower the autonomy state, politically, economically, and

culturally by making the state as facilitator and community protector; instead of strengthens the state government position (state instrument) with their full of KKN (Corruption, Collusion and Nepotism) behavior and centralistic oriented; with interest content of businessman and army who practicing politics and their involvement in the business. It means that planning process and/or public policy establishment has to involve interest holders from the village, so that policy products and conservation concession implementation are in accordance with the aspiration of local community. In its implementation and control, it has to forward and to accentuate community involvement in the real sense. The community or the people must have critical thinking to empower themselves, while state instruments have to realize their position to service and to protect the community. In short, Conservation Concession in autonomy era, in its essence, has to be considered as momentum where community in tropical forest owned areas, getting back their rights in relation with ownership and spatial utilization, economic resources, politics and culture.

The possibility of divergences from the conservation concession objectives are not impossible in this state autonomy era. The first, the state bureaucrat instruments, in central or regional level, are still inherited cadres from the past, who are expert in divergences and KKN, and/or they still like to get something from their strategic positions in various state level line. The autonomy era is a golden chance for them to realize their expectations. The Second, the existence of Regional State Legislative (DPRD); although their position, based on UU No.22/1999, relatively as a decision maker, it is clear that we still cannot expect too much. Beside of the human resource quality in DPRD from Pemilu 1999 are not adequate, it is suspected that they have not had orientation toward the interest of local community.

The emerging evidences show a reality of regional legislative member's moral fragility in relationship with material interest when opposing executive instruments. Money politics practices happened in various states involving some legislative members is a solid prove. The Third, the community or people in general have not had awareness to empower themselves and or, including controlling the state and DPRD legislate members. The existence of the community or people in false consciousness is the product of two inter-supporting conditions i.e. New Order state corporations and paternalistic cultured

community. The result, if when any new state autonomy policy is issued, the community has not been in pschycologically fit to actively participate in state autonomy implementation processes. The last one, based on the research of investigation and KKN removal (KP2KKN) Jateng, State Autonomy Law contains at least 171 law loopholes, which can be used for executives and legislative to commit in corruption, collusion and nepotism. The 171 loopholes are divided to 103 loopholes for executives and 68 loopholes for legislative.

It is clear that public control plays important role at wider scope on UU No.51 year 1999, and under Section 68 and the base of the law is described, that the right of the community in forest utilization control as follow:

Community Involvement
Section 68

(1) ……..

(2) ……..

c. To give information, suggestions, and justification in forestry development; and
d. To supervise forestry development implementation, directly and indirectly.

E.2.4 Fiscal Decentralization Policy

Based on Conservation Concession experience in Guyana country, there is requirement of cash payment to the Government from concession owners for replacement of the absent of extractive exploitation in forest area in large scale. If it is assumed that location of Conservation Concession lies in production forest area, then based on UU No.41 year 1999 in regard of Forestry Policy, the conventional production forest utilization concession holders have to pay business license contribution (IHPHH), forest resource provision (IHH), reforestation fund (DR) and performance bonds to provide investment for forest conservation expenses.

The other scenario, if conservation concession area is intended to become education, training and research which is located in production forest, and it is not right granted area,

then based on Forestry Minister Decree No. 465/Kpts-II/1999, then concession holders have to provide only forest resource provision (IHH) and reforestation fund (DR).

In the context of state autonomy nowadays, conservation concession application will give double advantages for district as the owner of tropical forests. The continuous economic advantage is accomplished with the absent of tropical forest logging. The other advantage is the income from forest resource provision (PSDH) and Forest Utilization Right Contribution (IHPH) from the concession owners through the mechanism of balancing funds. Based on UU No 25/1999 ad Government Regulation No 104/2000 in regard of Revenue Sharing, 80% of state income from forest natural resources sector will be given to local government. The completed revenue sharing system on forestry sector can be seen on Table 3 below.

Table 3. Revenue sharing for central, provincial and district government from fees/royalty/taxes from forestry sector based on Autonomy Law (UU No. 25/99) and Government Regulation no 104/2000

Type of fees	Rate (source: Effendi, 2002)	Revenue sharing		
		Central	Local government	
			Provincial level	District level
License fee (IHPH)[1]	Rp 22,500/ha	20%	80%	
			16%	64% : to producing district
Timber royalties (IHH)[2]	Shorea sp : Rp 64,000/m^3	20%	80%	
	Mixed species : Rp 36,000/m^3		16%	32% : to producing district 32% : to other districts in the province
Reforestation Fund (DR)[3]	Shorea sp : US$ 14/m^3	60%	40%	
	Mixed species : US$ 12/m^3			
Tax on land and property (PBB)	Rp 2,700/ha	10%	90%	
			16.2%	64.8% : to district 9% : collection fee

Note:
1 : Rate per ha for HPH extension or ex-HPH in Sumatra and Sulawesi based on Government Regulation number 59/98
2 : Rate per m^3 in Sumatra and Sulawesi based on Minister of Forestry Decree No. 858/Kpts-II/1999
3 : Rate per m^3 in Sumatra and Sulawesi based on Government Regulation number 92/99

In the fiscal decentralization system, Central Government still plays a dominant role in controlling Balanced Funds mechanism. Finance Minister and corresponding Technical Ministry play significant role in calculation procedure and channeling regional shares from natural resource revenue, although this policy also provides consultation mechanism to some parties in regional government level.

The mechanism to reduce divergences in channeling balanced funds to regional government relies on Government Regulation No.105 year 2000 in regard of Management and Responsibility of Regional Finance. One other objective is to increase efficiency and effectively regional finance management. It stresses the importance of decentralization, democratization, transparency and accountability in regional finance management implementation. The ground base looks very ideal because of its admission of good governance. In this regulation, DPRD plays important role in planning, responsibility, and supervision of the Regional Revenue Budget and Expenditures (APBD). But in this regulation, it is not said the importance of public accountability to RAPBD and APBD responsibility, so practically, transparency cannot be attained. There will be opening chances of negotiation in political and economical interests between executive and legislative parties, which direct the course of creating new corruption, collusion and nepotism (KKN) practices. And pubic interests will be marginalized again. So it is important that public supervision role has to become prominent to avoid new KKN in any form.

E. 3. Justification for Conservation Concession in Siberut Island

E.3.1. High Conservation Value but Ecologically Fragile

As described above, it is very clear that Siberut Island has high conservation value but ecologically fragile that needs to be managed carefully in such a way that can maintain its biological importance and in the same time can improve the welfare of local community living there. Followings are some justifications why Siberut Island's tropical forest deserved the serious and specific management system:

1. The existence of endemic primates, which only live on Siberut Island, namely *Simakobu* (*Simias concolor*), *Joja* (*Presbytis potenziani*), *Bilou* (*Hylobates klossii*) and *Bokkoi* (*Macaca pagensis*). *Simakobu, Joja, Bilou,* and *Bokkoi*. Besides, more than 65 % of the mammal species and 15% of the fauna species in Siberut Island are endemic at some taxonomic level.
2. The presence of a specific ecosystem, including the habitat of many endemic species.
3. The existence of a unique indigenous culture, including conservation practices. For example, the native communities still practice a method for clearing forest based on slash and mulch-technique and the planting of fruit trees, allowing the field to quickly regain its forest character.
4. Ecosystems of small islands like Siberut have an ecological condition that is more susceptible to changes. This is due to the fact that small islands have a lower ecosystem and species diversity than larger islands.
5. Siberut Island with its high hills, steep ridges, low soil fertility and high rainfall is sensitive to erosion. In addition, the hydrologic system of the island providing water to the valleys, where the local communities practice agriculture, is heavily dependent on the dense forest coverage and the island's biodiversity.

In the need for conserving the whole Siberut ecosystem, a conservation concession will support the concept of ecosystem approach, as it will guarantee the protection of natural forest adjacent to the National Park. So directly, it will also upgrade the biodiversity and in

the National Park, because a larger area of natural forest supports a wider habitat, and accommodates more species. Aside from providing a larger spatial diversity, the availability of the food for wildlife is guaranteed and thereby also the ability of the breeding.

E. 3.2. Conservation Concession Preserves Life Continuation and Culture Identity of Native Community

The development, occurring on Siberut Island during the last decades, had a big impact on the reconstruction of the landscape and environment, and the strong interdependent socio-cultural behavior of the indigenous communities. The introduction of logging, the growing market demand for non-timber forest products and other outsiders-driven socio-economic changes, endangers the traditionally existing synergy between the indigenous communities and the environment, resulting in deteriorating environmental, social and cultural conditions. The introduction of large-scale logging will erode locally developed wise management practices, which include strategies to secure the sustainable use of forest resources (Meyers, 2001).

In the case of Siberut, where people are still dependent for their survival on the forest and where the ecological system is extremely vulnerable for changes, there is an urgent need to protect the livelihoods of the local communities from large-scale destructive economic development, adding to the ecosystem degrading of the island. Commercial logging and plantations will evoke a direct impact on the local food and material resources and will erode the socio-cultural system of Mentawai communities, especially the local knowledge and taboo system. With the current increasing pressure on the natural environment, alternative solutions have to be sought in order to secure the protection of the natural environment.

The Conservation Concession concept, with as objective to enhance the overall protection status of the island, will support the protection of food and material resources, local knowledge and practices and the sustainable use of resources.

E. 3.3. Conservation Concession and Tenurial Conflict Mitigation Options, Today and in The Future

Commercial large-scale logging and plantation concessions on Siberut have been appointed without prior consultation of the Siberut communities. Traditionally, decisions on land use respect and involve all members of the community (*Uma*) on an equal basis. This has not been the case with the current concessions, leading to an increase of inequality and competition within and between *Umas*. The social fragmentation and conflicts, which have increased over the last years, are related to the inequity in wealth and resource distribution, inherent to logging activities.

Open conflict started over again in the end of IPAS Project – Asian Development Bank, at Siberut National Park in 1999. At that time when the project was going on, it was forbidden to make forest exploitation in the large scale as HPH and Large Plantation. Nowadays Siberut Island receives pressures from various natural forest exploitation and large-scale extraction development, in the form of IPK concession (Timber Utilization Permit), HPHA concession (Natural Forest Utilization Right) and development of oil-palm plantation.

Inconsistency in Central Government and Regional policy in spatial management at Siberut Island have made open conflict, either horizontal or vertical. This indication was shown with the protest of native community to Government plan for timber extractions by granting IPK license and HPHA to private parties. The manifestation of the protests started from protest letters, the action of making land demarcation between community owned and HPH, guarding the border line, the eviction of logging heavy duty equipment belonged to a businessman, up to raid action and burning the base camp of wood business KAM (Koperasi Andalas Madani), and oil-palm seeding owned by PT. Maharani Puricitra Lestari by masses.

Actually the community protests toward logging industry was an accumulation of inability of the native community to drive out the operation of 3 HPH in Siberut Island in the period 1972 – 1993, accompanied by trauma as the result of HPH operation. In repressive New Order regime, businessmen had full support for Central and Regional Government, local military and police to conduct their operation. Violations used to happen at that time,

no compensation for fruits and sago field lied in logging area, commotion people transportation along the river; violations to their rights against inherited land, the right to the forests where their ancestors live and where the spirits becomes damaging forest mosaic, and also the companies did not create significant economic contribution for native community.

Non-extractive Conservation Concession implementation and preserve access opening to native community in natural resource utilization continuously is expected to become conflict mitigation options, for today and in the future, and to reduce psychological trauma due to HPH operation in the past.

E. 3.4. Conservation Concession and Preserving Economic Assets in Siberut Island

By doing Conservation Concession in Siberut, there are several advantages can be generated from that, such as:

a. Forest areas are not damaged and preserve local development continuation in the long term (more than 35 years).

b. Local community does not suffer from the loss of direct and indirect use of the forest.

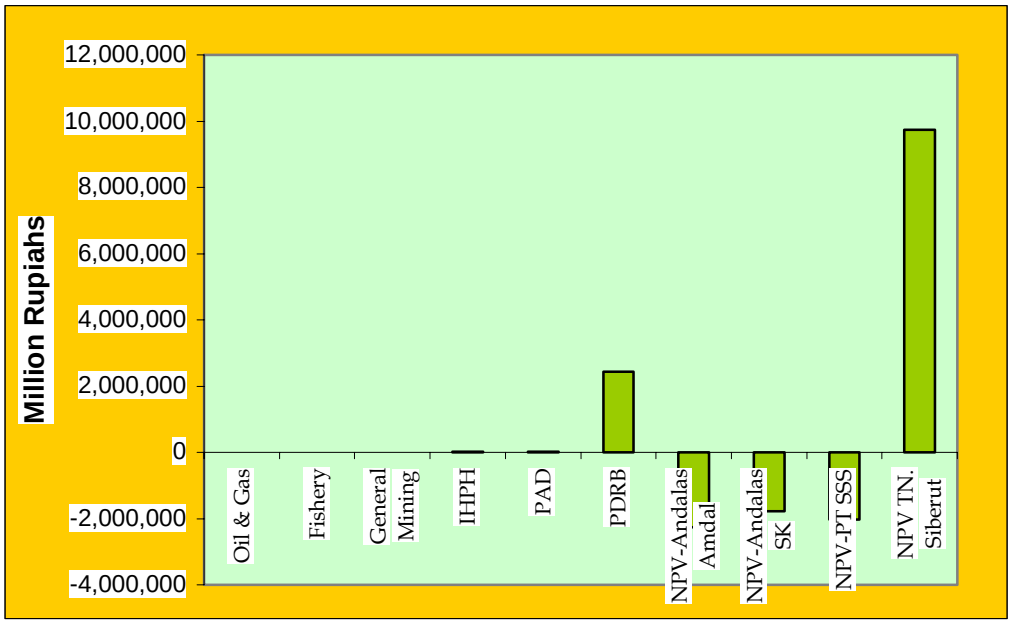
c. Secure long term healthy economic condition of Mentawai District: Regional Gross Domestic Product (PDRB) and APBD/PAD are healthier, cash flow is more stable, and there is no need to spend unproductive expenditures for flood control, dryness, horizontal and vertical conflicts, which happened in Kabupaten Nias and Kerinci.

d. Avoid the negative impact caused by logging operation. KAM and PT.SSS Net Present Economic Value (NPV) are significantly negative, so if they are subtracted with Gross Domestic Product (PDRB) and District Revenue (PAD) Present Value, the economic growth of Kabupaten Mentawai will be negative, minimum for 35 years (See Figure 8 below).

e. The inter-generation assurance of forest utility distribution, onsite and off-site benefits, for the community of Mentawai District and other fringe areas.

f. Conservation Concession strengthens the integrity and the continuation of Siberut national Park and it is worth Rp. 9.74 trillions for 35 years.

Figure 8. Production Sharing Comparison for Gross Domestic Product (PDRB) and District Revenue (PAD) of Mentawai District 2001 with NPV of KAM, PT. SSS and Siberut NP



Source: Effendi (2001)

E. 4. The Opportunity of Conservation Concession Implementation

E.4.1. Prioritized Location

Beside for National Park Area, based on Forestry and Plantation Ministry Letter of Decree No. 422/Kpts-II/1999 in regard of Forest Area Assignment in West Sumatra province with area of 2,600,286 hectares, Siberut island area had been fully sliced for production forest usage, limited production forest, and convertible production forest. Before that year, in 1994, all HPH were halted to operate in Siberut Island in accordance with President Decree Year 1992. Before the issue of that decree, since 1972 Siberut island had become the operation area of 3(three) HPH companies, named PT. Cirebon Agung, dan PT. Carya Parmin Pulau Siberut and PT. Kayu Siberut. These three concession had area of 30,650 hectares and until 1993 their wood logging was amounting of 1.7 millions m^3. The other data shows that tropical forest area that had been logged up to 57,700 hectares, and it exceeds of prearranged concession area.

Referring to last data on 57,700 hectares of the logged area, Siberut Island still at least has relatively undisturbed forest with the area of 155,000 hectares outside of Siberut National Park. The high content of relative undamaged forest shows Siberut island is very feasible to become conservation concession location to protect the remainder of primary forest outside prearranged conservation area. Though, it still requires intensive study about primary forest locations in the remainder area.

For the time being, to make easier in the priority assignment of the forest area, that will become conservation concession locations, some location options are forwarded, based on priority scale as below:

E. 4.1.1. Reserved Area Location HPHA PT. Salaki Summa Sejahtera (PT. SSS)

The first priority location is reserved area location for area HPHA PT. Salaki Summa Sejahtera lies in North Siberut. This location had not been granted with new HPHA right, it is still in the process of area reservation principle agreement via Forestry Minister Letter No. 74/Menhut-VI/2001 and Decree of West Sumatra Governor No.660.1-227 dated July, 18, 2001 in regard of AMDAL Agreement, RKL and RPL. Based on company AMDAL document data, there is primary forest with area of 17,880 hectares from reserved area of 49,440 hectares in the production forest allocated.

Also there is still opportunity in this location to convert production forest utilization right to become education forest, training, and research as stipulated in Forest Ministry Decree No. 465 /Kpts-II/1999 in regard of Forest Utilization Right for Education, Training and Research. This right can be applied to production forest area, which has not been granted with the right as in reserved area of HPHA PT. Salaki Summa Sejahtera. Forest utilization area may be granted to private/state research institution with area of 100,000 hectares maximum, for 35 years, and the right holder has to pay for forest resources provision and re-plantation fund.

Social community conflicts in reserved area HPHA PT.SSS has not in the stage of open and sharp conflict, and it is merely limited to support and not supporting the PT.SSS

existence. From field observations, normally the community does not support the comeback of PT. Cirebon Agung, which has changed its name to PT.SSS to exploit forest in Siberut Island due to trauma experienced by native community from PT. Cirebon Agung.

E.4.1.2. Reserved Area Location of HPHA Koperasi Andalas Madani (KAM)

HPHA Koperasi Andalas Madani location is in South Siberut. This location was granted the HPHA right via Forest Minister Decree Letter No. 105/Kpts-II/2001 dated March, 15, 2001. This area still contains primary forest with the area 13,656 hectares from 49,650 hectares of total HPH concession area. This decree was purely granting the right for forest utilization for economic profits, and not for education and research as stipulated in Forestry Minister No. 535/Kpts-II/99 in regard of Land Grant College (LGC).

The other note for the Forestry Minister Decree; it did not have base of legal justification in consideration of Governor Approval for AMDAL, and AMDAL result had been rejected in regional level. The other possibility, AMDAL was done after the issue of SK Ministry of Forestry No. 105/Kpts-II/2001. Besides, this decree had diverged from Letter of Ministry of forestry and estate crops No. 1439/Menhutbun/1999 dated September, 22, 1999, said that Koperasi Andalas Madani had been reserved for HPHA area in Land Grant College (LGC) program plan. In Forestry Minister Decree No. 105/Kpts-II/2001, there was no justification for Forestry Minister Decree No. 535/Kpts-II/99 in regard of Granting Procedure of Forest Area Utilization Right inline with Land Grant College, for education institutions. Utilization Right inline with Land Grant College is intended to conduct education, training, research and evaluation about seeding, planting, maintenance, harvesting, processing, marketing, protection, safety, and collection non-wood product in forest area.

So it is clear that forest utilization in accordance with LGC is intended for education development objectives in university, and not purely to extract economic profits. Based on this section of law, the activity in accordance with LGC is permitted only for training, research and evaluation, and not to exploit the forest. Even for research objectives,

research utilization location in production forest is limited for area of 1000 hectares with time period of maximal 10 years, as stipulated in Forestry Minister Decree 07.1/Kpts-II/2000 in regard of Criterions and Standard Environmental Service Utilization License in production forest.

Although there are peculiarities from legal aspect, protests from local community, burning the base camp, evicting company's heavy duty equipments, mass demonstration in Andalas University, Koperasi Andalas Madani is still conducting exploration preparation activity such rebuilding the base camp, procurement of more than 10 unit of heavy duty equipments in the field, hiring the labors, building logging roads, and hiring military *oknum* to guard HPHA location.

Compared with PT.SSS location, KAM location is more complex, consumes more time and more funds to develop as Conservation Concession area, because it has been granted with HPHA right owned by KAM. Revoking HPHA right of PT. Andalas Madani has legal and political implications. HPH business owner may forward a lawsuit to Forestry Minister, Governor, and Bupati who were involved in arrangement of the granting SK HPH to PT. Koperasi Andalas Madani.

Social preparation to accept Conservation Concept in KAM location is more complex rather than in PT. SSS location, because some native community groups had received compensation for the loss of trees, lands, and other economic plantations, patchouli. The compensation process was also not smooth and raised new conflict, because there was *oknum* native community who lived in Padang called themselves as island community, receiving compensation from KAM to get richer. In the other side, social preparation is more difficult, because conflict has opened, widened and toward physical conflict and repressive actions. For example, inviting military personnel to guard HPHA location or from the community themselves. They have prepared to oppose and defend themselves with bows and poisoned arrows.

E.4.1.3. Proposed Production Forest Location of PT. Nirwana Hijau Lestari

The other area, which has possibility to become Conservation Concession is production forest area in South Siberut, which is being proposed by PT. Nirwana Hijau Lestari to Regional Government as an HPH with area of 12,000 hectares. The content of primary forest in the proposed location has not been identified yet, so it needs further investigation.

This location has big chances to be intervened, prohibiting large-scale production forest extraction through production forest utilization for special purpose, research, and education as stipulated on Central Government Policy.

F. FRAME OF CONSERVATION CONCESSION IMPLEMENTATION IN SIBERUT

The policy analysis for Conservation Concession implementation in Siberut Island shows that Conservation International Indonesia has to make partnership alliance with similar institution in Indonesia, in order to have the concession right. The concession right can be implemented using Decree Letter of Forestry Minister No.465/Kpts-II/1999. The other important thing to be noted in obtaining Conservation Concession Right; based on policy analysis, its formalities and final decision making is still under Central Government. In other words, Conservation Concession implementation is not only involving Province Government or District Government Level. There are regulations related to concession holder rights are still under authority of central government policy.

In the other side, Conservation Concession cannot be detached from the importance of community involvement and public accountability. This is very important, due to tenurial conflict problems in Indonesia. In Siberut Island case, community involvement participation and obtaining community mandate become one of very basic justification that need Conservation International attention, in order to conduct Conservation Concession. But the reality in the field shows that application of conservation concession right cannot be fully implemented, in accordance with policy analysis mentioned above. This is because of the National Park buffer area has status of Production Forest.

In Siberut case, KAM had been granted area of 49,650 hectares due to inconsistency forestry policy in Central Government. Beside that, in license finalization process, PT.SSS was also granted management license in North Siberut amounting 49,440 hectares. PT. Nirwana Hijau Lestari is also on license finalization process to obtain the management right amounting 12,000 hectares in South Siberut, and application of PT.Maharani covering area of 17,500 hectares and about 2000 hectares had been utilized.

With simple analysis the total amount area of 4 companies that applied forest management right from North to South Siberut is 128,590 hectares. The satellite image analysis in 2001 showed that estimated primary forest area outside National Park was 98,238 hectares (See

Table 4). These give apprehensions in two things: First, forest management rights granted to those companies are overlay with community agriculture lands, where community agro forestry, is interpreted as primary forest area. It also reveals that KAM area right covers 39,698 hectares of primary forest from total area of 49,650 hectares. PT.SSS management area also covers only 31,484 hectares from total area of 49,440 hectares (See Table 5). The second, total primary forest area predicted is much smaller; this will raise question of how and where the companies have to fulfill the production target. So it is decent, if there is apprehension that HPH holders will utilize National Park area to obtain optimal profits.

Table 4. Percentage of vegetation cover in Siberut National Park and Outside Siberut Island (2001)

No	Class	Total Siberut Island		Siberut NP		Outside	Siberut NP
		ha		ha		ha	
1	Primary Dryland Forest	241,721.28	62.67%	143,482.59	86.10%	98,238.69	44.85%
2	Secondary Dryland Forest	27,992.16	7.26%	2,457.00	1.47%	25,535.16	11.66%
3	Swamp Forest	30,294.72	7.85%	0.00	0.00%	30,294.72	13.83%
4	Mangrove Forest	8,640.00	2.24%	0.00	0.00%	8,640.00	3.94%
5	Brush	6,465.60	1.68%	1,180.08	0.71%	5,285.52	2.41%
6	Swamp Brush	4,127.04	1.07%	688.50	0.41%	3,438.54	1.57%
7	Grassland	12,186.72	3.16%	3,051.36	1.83%	9,135.36	4.17%
8	Dryland Agriculture	4,540.32	1.18%	59.76	0.04%	4,480.56	2.05%
9	Dryland Agriculture Mixed with Brush	17,189.28	4.46%	4,204.62	2.52%	12,984.66	5.93%
10	Bareland	3,532.32	0.92%	882.36	0.53%	2,649.96	1.21%
11	Settlement	525.60	0.14%	2.97	0.00%	522.63	0.24%
12	Waterbody	694.08	0.18%	136.62	0.08%	557.46	0.25%
13	Nodata	27,797.76	7.21%	10,499.13	6.30%	17,298.63	7.90%
		385,706.88	100.00%	166,644.99	100.00%	219,061.89	100.00%

Source: CI (2001)

Table 5. Percentage of vegetation cover in PT SSS and KAM concession area (2001)

No	Class	HPH PT. SSS		HPH KAM	
1	Primary Dryland Forest	31,484.61	64.53%	39,698.10	80.77%
2	Secondary Dryland Forest	348.93	0.72%	696.87	1.42%
3	Swamp Forest	3,675.15	7.53%	437.76	0.89%
4	Mangrove Forest	27.72	0.06%	0.18	0.00%
5	Brush	1,014.12	2.08%	549.18	1.12%
6	Swamp Brush	528.39	1.08%	355.68	0.72%
7	Grassland	1,507.95	3.09%	1,100.07	2.24%
8	Dryland Agriculture	234.72	0.48%	178.02	0.36%
9	Dryland Agriculture Mixed with Brush	3,630.51	7.44%	1,803.24	3.67%
10	Bareland	210.06	0.43%	422.91	0.86%
11	Settlement	3.51	0.01%	0.00	0.00%
12	Waterbody	36.81	0.08%	4.77	0.01%
13	Nodata	6,088.50	12.48%	3,900.06	7.94%
		48,790.98	100.00%	49,146.84	100.00%

Source: CI (2001)

As conservation management instrument with the objective to combine between natural conservation interest and economic development, the conservation concession is the most appropriate to be implemented in Siberut Island. But looking at the field reality and policy picture in Indonesia, conservation concession implementation may be done in 2 big scenarios, which are 1) business to business approach scenario that involves direct compensation and 2) investment in environmentally compatible development options.

F.1. Business-to-Business approached Scenario: one of direct approach in preserving tropical rain forest

There are two different mechanisms in this scenario. The First, is to make direct acquisition to KAM and the Second, is to make concession application of production forest in Siberut that covers PT.SSS and other applicant area.

The Scenario of KAM concession buy up can be done directly. This requires that the advantage should satisfy many parties, using PDRB pattern in accordance with UU 25/99 and

PP 104/2000, where Mentawai Kabupaten receives compensation amounting 64%, Central Government is 20% and West Sumatera province is 16%. In its implementation, approach effort is needed in Central Government level, especially to Forestry Department and Finance Department. Due to that problem, further study is required in regard of perspective assessment from various related parties about the possibility of Conservation Concession implementation in accordance with Government Regulation as in UU 25/99 and PP 104/2000.

Scenario 'participate in concession bidding' can be directly implemented through procedures regulated by Forestry Department. Based on the analysis result of this issue, Conservation International could make cooperation with local partner, and making concession application to Forestry Minister, with procedure stipulated in Forestry Minister Decree Letter No. 465 /Kpts-II/1999 in regard of Forest Utilization Right for Education, Training and Research. Concession can be implemented in Production Forest, Protection Forest and National Park Utilization Zone, with maximum area up to 100,000 hectares with period of 35 years. Meanwhile, criterion and license standard could follow Forestry Minister Decree Letter No.061/Kpts-II/2000 in regard of Business Standard License of Production Forest Area Utilization. The time needed to obtain concession as the above procedure requires analysis in Forestry Minister in Central level. Meanwhile to fulfill all interests, finance balance procedure may use mechanism control as explained in 'buy-up' scenario.

There are also some scenarios to calculate the amount of 'compensation' for the forgone revenue from logging operation to the government of Mentawai.

F.1.1. Compensation based on capital investment put by logging companies (based on Minister Decree/SK on Granting the Concession)

If financial solution has to be done by 'buying out' KAM (49,650 ha) and PT.SSS (49,440 ha) areas, then investor has to prepare capital investment of minimum US$ 32 millions, considering that KAM (based on Minister Decree or SK) and PT.SSS investments are worth US$ 15,010,000 and US$ 15,924,284 respectively. Average investment per hectares of both concession holders is US$ 322 or equivalent with performance bonds

value for forest ecological recovery. So if forest investment value is subtracted by performance bonds value, then the result will be nil (no investment).

With assumption that investors are allowed to invest by 'buying out' KAM and PT.SSS each of US$15 millions and US$ 10 millions, it still can be considered as a low investment scenario, because the value is still below market investment rate, which is accomplished by KAM and PT.SSS.

If this is done, then both (conservation) investors pay to the state government Rp.7.083 billions (US$ 787,000) per year for 20 years and Rp. 2.975 billions (US$ 330,556) per year for 35 years respectively. In accordance with UU.25/99 and PP.104/2000, Mentawai District Archipelago will receive compensation amounting Rp 6.437 billions (US$ 715,222)/year (64%), Central Government will receive Rp 2 billion (US$ 50,000)/year (20%), and West Sumatra Province will be Rp 1.9 billions (US$ 50,000) per year (16%)respectively, for 20 years, with interest rate of 10%.

F.1.2. Compensation based on potential economic rent captured by government from logging operation

The other way to calculate the compensation for implementing conservation concession is by using the economic rent potentially captured the government from logging operation. The economic rent captured by government can be divided into the fees or charges that based on area (license fee/IHPH and tax on land and property) and based on the volume (timber royalties/IHH and reforestation fund/DR). Data in 1994 showed that 35% or revenues raised came from timber royalties (IHH), 64% from the reforestation fund (DR), and 1% from all the other fees and taxes.

Table 6. Economic rent potentially captured by government from logging operation

Type of fees and charges	Rate	Total (Rp or US$/ha)
Area base:		
License fee/IHPH (Rp/ha)	22,500	
Tax on land and property/PBB (Rp/ha)	2,700	

Volume base:		
Timber royalties/IHH		
IHH for Shorea sp (Rp/m3)	64,000	2,880,000
IHH for Mixed trees	36,000	540,000
Total fees from timber royalties/IHH (Rp/ha)		**3,420,000**
Total IHH in US$ (1 US$ = Rp 9000.-)		**380**
Reforestation fund/DR		
Reforestation fund/DR for Shorea sp (US$/ha)	14	630
Reforestation fund/DR for Mixed trees (US$/ha)	12	180
Total from reforestation fund/DR per ha		**810**
TOTAL timber volume base fees/ha (US$/ha)		**1,190**
Assumptions for timber stock:		
Potential commercial trees (m3/ha)	60	
Shorea sp (75%) (m3/ha)	45	
Mixed trees (25%) (m3/ha)	15	
Primary forest (ha)	123,000	

Note:
1 : Rate per ha for HPH extension or ex-HPH in Sumatra and Sulawesi based on Government Regulation number 59/98
2 : Rate per m^3 in Sumatra and Sulawesi based on Minister of Forestry Decree No. 858/Kpts-II/1999
3 : Rate per m^3 in Sumatra and Sulawesi based on Government Regulation number 92/99

Assuming if the potential commercial trees that can be logged per ha in Siberut Island is about 60 m^3in Siberut Island, then the main potential fees and charges that can be collected by the government based on the volume is about US$ 380/ha from timber royalties only and US$ 810/ha from reforestation fund only. The reforestation fund is ideally to be used to fund the replanting of the trees to substitute the trees that logged from the forest. Logically, in the conservation concession, the concession area would not be logged, so it is very reasonable to say that the reforestation fund is not needed in the implementation of conservation concession. So, the only fee to be considerably paid by the investors of conservation concession is the timber royalty.

Based on the data, the past logging operation in Siberut Island that conducted by three logging companies (named PT. Cirebon Agung, dan PT. Carya Parmin Pulau Siberut

and PT. Kayu Siberut) between 1972 and 1983 (about 21 years) had logged about 1.7 millions m^3 trees from 30,650 hectares forest area. It means that the logging rate in Siberut was estimated to be about 1,459 ha/year. If we use this number to calculate the potential compensation paid to the government for the forgone revenue caused by the implementation of conservation concession, then the minimum amount of money to be paid per year is about US$ 554,440/year.

F.1.3. Compensation based on the actual district revenue generated from forestry sector

This calculation is based on the assumption that only the district government that have to be compensated for the forgone revenue generating from the logging operation in Mentawai. The table 5 below shows the target and actual Mentawai District revenue coming from forestry sector.

Table 7. Mentawai District Revenue from forestry sector

Type of revenue	2000		2001		2002	
	Target (Rp)	Actual (Rp)	Target (Rp)	Actual (Rp)	Target (Rp)	Actual (Rp)
License fee (IHPH)	0	0	0	175,587,606	175,587,606	0
Timber royalties (IHH)	500,000,000	500,000,000	1,300,000,000	1,090,539,119	2,390,539,119	2,121,764,642
Reforestation Fund (DR)	0	0	0	0	0	2,910,930,000
TOTAL	500,000,000	500,000,000	1,300,000,000	1,266,126,725	2,566,126,725	5,032,694,642

Source: APBD 2000, 2001 and 2002

The revenue coming from timber royalties have been significantly increased from Rp 500,000,000 (US$ 55,556) in 2000 to Rp 2,121,764,642 (US$ 235,752) in 2002. It means that if we want to stop the logging operation and replace the forgone potential revenue from logging, then the average negotiated compensation to be provided to the district government ranges from US$ 55,000 to US$ 235,000 per year.

However, the calculation of compensation value in these three scenarios have not been subtracted by calculation of environmental damage value, which is possible, due to the result of extractive activity by KAM, PT.SSS or other proposed logging companies. In other calculation, environmental damage cost caused by flood, pollution and erosion amounting to about US$ 7,000/ha (See Appendix). High compensation value for each PT, has to be added with economic development investment at community level, with minimum calculation value is worth the same with total compensation of wood value to community plus work opportunity created by HPH companies. So calculation of compensation value becomes bigger.

Other aspect, which becomes justification in this scenario implementation, is small, direct community involvement. In other words, the possibility to get obstacle in implementation at community level is still high. It can be said, that scenario implementation needs time process, and additional investment for socialization in community level.

F.2. Environmentally Compatible Economic Development Options Scenario, in effort to create long-term development funding alternatives.

The extractive industries have high economic incentives to the stakeholders involved. There are large economic returns of those extractive activities to the land owners/project owners/private sectors/government. It is also true that society also benefit from these economic activities (facilities, employment, income, accessibility, etc).

In the same time the extractive industries also causes the damage or loss, which are often not taken into account to the cost and benefit analysis. This is simply because most of those damage or loss do not have a price or value in the market. Any damage or loss caused by the extractive activities has to be included in the Cost and Benefit Analysis.

Most of the development activities also will need a lot of land use conversion, for example, the conversion from the forest to the logging, mining or agriculture area. It is widely accepted that land use conversion is a primary factor explaining biodiversity loss. Economic rationality is determined by relative profitability or rate of return of two options. Here, conservation option includes sustainable use of forest, for example for agro-forestry,

non-timber forest product and eco-tourism and best practices of some extractive industries.

The rate of return are measured in terms of economic benefits and economic costs. The problem here is that the benefits from development are so 'real' and 'tangible', whereas the benefits from conservation (sustainable use of biodiversity) are often intangible. Therefore, the returns from development activities may simply higher than the returns from conservation because the later may consist of non-market benefits or benefits that accrue to people other than landowner (Pearce, et-al., 1994).

In order to make those cost benefit analysis for conservation, we have to be able to quantify the environmental benefits gained/lost from conservation/ development activities. Environmental resources supply a flow of direct and indirect services to the society. The services provided by these ecosystems and their corresponding levels of biological diversity are numerous, ranging from basic life-support to the filtration of non point source pollution from urban. But, many of their services remain unpriced by the market (Hanley, et.al., 1997). The environmental impacts are frequently not the subject of market transaction prices, therefore, they remain one of the most obvious examples of *externalities*.

Conservation International Indonesia team conducted second survey in the end of October to Mid of November 2001, to observe and to collect the data for cost benefit analysis calculation, to find best economic options for Mentawai District. The findings and result analysis of the superior products are presented in Appendix .

Calculation result revealed that timber profits, after subtracted with environmental damage cost became negative (-Rp 773,228,001,250) for 35 years (at 10% discount rate). This shows that granting the right to large-scale extractive industries has very high risk for land ecosystem, creating poverty as the result of losing natural resources due to high dependency of Siberut community to the forest.

Table 8. Total Net Present Value (over 35 years at 10% discount rate) of Forest from Timber, Ecological Function and NTFP value

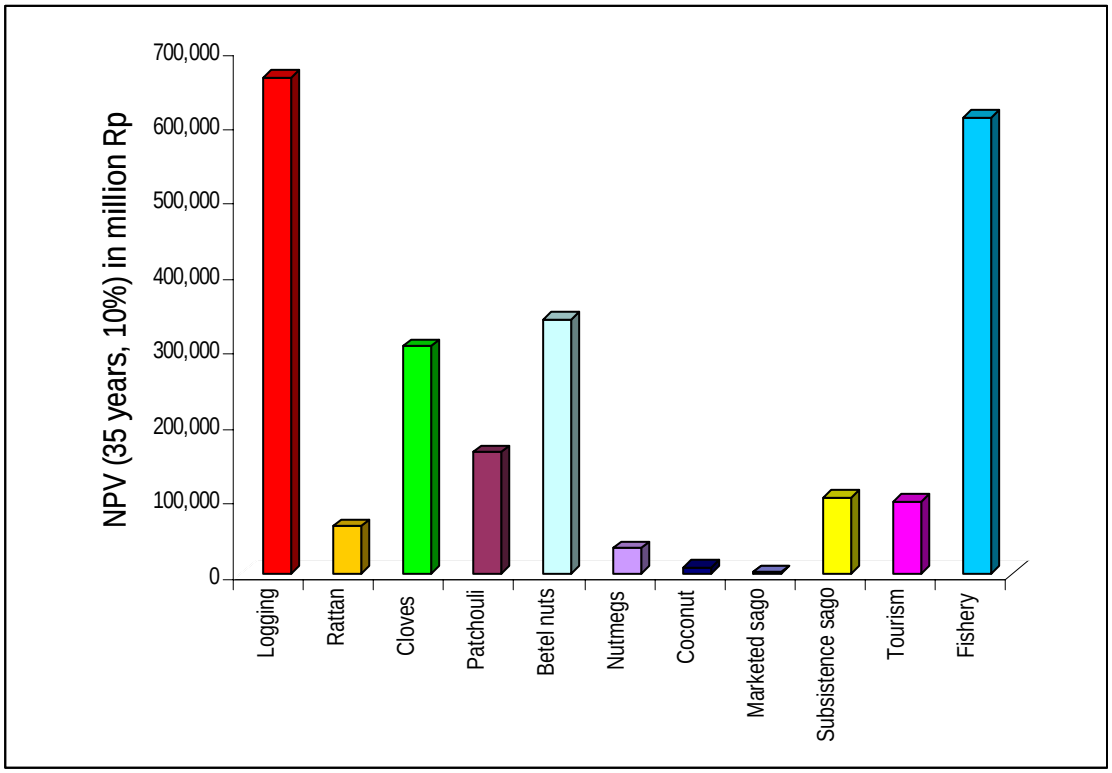
Figure (Rp)	Results
Logging	662,252,983,366
Ecological Function	(1,372,986,834,473)
Non Timber Forest Products	(62,494,501,143)
TOTAL	**-773,228,001,250**

Source: Anggraeni et al (2002)

The economic valuation of natural resource in Siberut Island has showed that the economic value of other economic activities options (outside logging) is much larger than logging activities. These other economic activities options include agro forestry, non-timber forest products (rattan), sago (subsistent and marketed), fishery and tourism. More over if we include the economic value of ecological services provided by the forest in Siberut.

As can be from the figure 9 below, Mentawai District is still able to find useful economic alternatives for long-term development funding. Development in fishery sector, tourism and non-timber forest product with good and correct management will give higher value than the logging value. Meanwhile the damage as the result of this activity is relatively smaller compared to logging. Ecologic function does not degrade significantly, so forest ecosystem as living support for Siberut community is still preserved and can be managed continually. The completed economic analysis on these economic alternative options can be seen on the Appendix.

Figure 9. Net Present Value of Each Natural Resources in Siberut Island



Source: Anggraeni et al (2002)

The scenario of environmentally compatible development options as alternative of logging activities can be made by making a modeling to show how the benefits generated by logging activities will inevitably cause the decrease of potential profits from other sources, such as from non-timber forest product (sago, rattan, etc), fishery, tourism and agro forestry.

The scenario to find alternative environmetally compatible economic development options in effort to create long-term development funding alternatives seems to be more favorable compared to logging based on following considerations:

- Majority community in Seberut Island actually is reluctant to large-scale extractive activities such as big commercial logging activities.
- The vast inter-community horizontal and vertical conflict potency in Siberut that is provoked by logging activities.
- Siberut community depends their daily life on the forest (subsistence).

- Strong norms, regulation and tenurial based on Siberut Customary Community; so the decision making related to development activity in Siberut must absolutely involve the community.
- Lack of advantage or profits received by the community from large-scale extraction. They receive one-time compensations and have to pay with the loss of natural resource as dependent source for their daily life.
- Siberut with relatively big primary forest area is the only main asset for income continuation of Mentawai District.
- The high value of non-timber forest products as cloves, shrub, sago, rattan and copra.
- The high economic value of fishery products and tourism
- The high investment of civil society organizations involving in conservation and National Park.

F.2.1 Environmentally Compatible Economic Development Options Implementation

Economic options analysis result of superior products as mentioned in the above graph, gives clear picture that increasing of development option to fulfill development needs, does not always have to come from timber. Economic option development scenario has to be implemented to various stakeholders and multi parties with a participative approach. This option is considerably cheaper than to 'buy up' or 'concession application'. The core of the implementation is participative approach through capacity increase. The advantage in this scenario is to give equal opportunity to related parties to determine most advantageous economic development option in Mentawai District. The weakness of this scenario is that the process will take longer time, but it is still worth for the output. This because of:

- **Capacity issue**: As new district, Mentawai is still has limitation in human resources and experience to run a government. So they are lack of outlook and perspective in developing economic activity options, to support long-term government funding. Therefore, this scenario will have to involve capacity building at all level (executives, legislative, community and NGO).
- **Partnership issue:** the lack of cooperation and the perception discrepancy among the conservation actors in Siberut will slow down the process. There is no synergy yet

between civil community organizations, government, privates and universities.

- **Horizontal conflict issue:** The groupings of community with different interests, having their own programs power, have big potency as origin of inter-community horizontal conflicts in Siberut.

On the other hand, regional government will receives higher long-term profits compared to the profits obtained from logging, whether in cash form or in community development. The advantages, which are obtained from implementation of this scenario, are:

1. Documented natural resource economic value.
2. Better recommendation input for district development planning.
3. Understanding and involvements of decision makers in natural conservation funding alternatives and district development are increasing.
4. Funding alternative options specific to district may be found.
5. Recommendation input in funding alternative integration in district fiscal decentralization.
6. Understanding and involvement of decision maker in funding alternative integration planning for natural conservation and district development in fiscal decentralization are increasing.
7. Recommendation input and policy changes in substantive planning of Renstra, Prodekab and RAPBD.
8. Fulfills community interest and other parties.
9. Attainment effort to achieve transparent, accountable government and public control.

G. CONCLUSION AND RECOMMENDATIONS

1. Siberut Island is worth to become trial test of Conservation Concession, because it has high conservation, scientific, ecologic fragility and still has remaining tropical forest to be preserved. Beside, it can increase sociologically and ecologic resilient power of Siberut National Park, Conservation Concession is expected to be able to answer life continuation challenge and protect culture system of Mentawai native tribe community in the future. It also reduces the tenurial conflict happening today and saving economic asset of Mentawai District and preserves the integrity of Siberut National Park.

2. Through partnership with local institutions, Conservation International is able to obtain Conservation Concession in Production Forest area in Siberut up to 100,000 hectares as in accordance with Forestry Minister Decree Letter No. 465 /Kpts-II/1999.

3. The chosen scenario of Alternative Environmentally Compatible Economic Development Options through partnership body to motivate multi-stakeholder management, will give wider advantage to Mentawai District. Beside of financial advantages, it also give advantage in the increasing understanding of interest holders in district level in performing natural resource evaluation, involvement in integration and harmonization of natural conservation funding alternative planning and fiscal decentralization in district development. Other than that, it helps in increasing human resources to set up Renstra, Prodekab, and RAPBD. Economic option development scenario will be more economics and acceptable to various parties compared to scenario of 'buying up' KAM management concession right.

4. Scenario of 'buying up' KAM management concession right has bigger risk from financial side and risk factor in its implementation because KAM has a lot of problem with Siberut community.

5. The option of ‘participate in bidding’ for application of conservation concession is the second alternative choice, which is economically cheaper.

6. Priority area as candidate for Conservation Concession is production forest area reserved by Central Government for PT. Summa Salaki Sejahtera.

7. Scenario options to apply Conservation concession implementation has to be analyzed further and discussed with interest holders in Central, Regional and Local level, so it gives bigger positive impact, reduce its negatives and critically discuss its implication and risk in accordance with prevailing policies and the interest of Mentawai Tribe native community.

8. Conservation International Indonesia could act as facilitator (60%) and implementator (40%) in Siberut.

9. To motivate manifestation of ‘Siberut Conservation Trust Fund’.

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Appendix. Economic Valuation of Natural Resource in Siberut Island

ECONOMIC VALUATION OF NATURAL RESOURCES IN SIBERUT ISLAND

(A Part of Feasibility Study of Conservation Concession in Siberut Island)

by:
Dessy Anggraeni and Ary Suhandi

January, 2002

I. BACKGROUND

Most of the extractive industries require large areas of land for their activities, with as prevalent example, the conversion of forest for logging or agricultural purposes. It is widely accepted that the conversion of land for the extractive industries is the primary cause for the loss of biological diversity on a global scale.

Economic rationality is determined by relative profitability or rate of return of two options. Here, conservation option includes sustainable use of forest, for example for agro-forestry, non-timber forest product and eco-tourism and best practices of some extractive industries.

II. METHODS AND APPROACH

The rate of return is measured in terms of economic benefits and economic costs. This can cause a disparity as the direct and visible benefits from extractive development are tangible, whereas the benefits from conservation based development (sustainable use of biodiversity) are often intangible. Therefore, the return from extractive development activities may be higher than the returns from conservation based development activities because the later may consist of non-market benefits or benefits that accrue to people other than landowners (Pearce, et.al., 1994).

However, the theory shows that forest provides a wide variety of good and services as shown on the table below:

Table 1. Use and Non Use Value of the Forest

	Use Value		Non Use Value	
Direct Use	Indirect Use	Option Value	Bequest Value	Existence Value
Outputs directly consumable	Functional Benefits	Future direct and Indirect Values	Use and Non use value of environmental legacy	Value from knowledge of continued existence
Timber, fuelwood, non timber forests products (rattan, nuts, resin, etc), agricultural production, recreation, tourism	Flood control, absorption of waste, recycling nutrients, protecting soil quality, erosion resistance, carbon fixing, climate regulation	Biodiversity, conserved habitat	Habitats, species, climate regulation	Habitats, genetic pool, source of scientific data, habitat for flora and fauna

Source: adopted from Pearce, et.al., 1994

In order to make those cost benefit analysis for conservation, we have to be able to quantify the environmental benefits gained/lost from conservation/ development activities. This paper would use benefit transfer to quantify environmental benefits gained/lost from conservation/development activities.

This equation of cost and benefit analysis tells us that:

$$\Sigma_t \, (B_t - C_t \pm E_t) \, (1 + r)^{-t} > 0$$

Any project or policy has to be regarded as potentially worthwhile when its non-environmental benefits (B) less its non-environmental costs (C) plus or minus the value of the environmental change (E), all discounted to a present value, must be positive (Turner, et.al. 1993).

These requirements mean that the valuation approach should use current available data as much as possible to reduce the expense of data collection. The data currently available is generally market based and describes either the production use of natural resources (i.e., fishing, farming, harvesting of forest products) or non-production use (i.e. tourist visitor numbers and expenditure).

III. TOTAL VALUE OF LOGGING ACTIVITIES

III.1. Benefit from Logging

Total Production

The forest in Siberut has been logged since 1972. Total area logged from 1972 to 1993 is 30,650 ha, producing about 1,746,154.92 m3 (MoF, DG Forest Protection and Conservation, 1994), meaning that during that period, the rate of logging was 1,460ha/year, extracting thereby 83,150 m^3 of hardwood (the volume/ha extracted is 57 m^3/ha). Trees extracted by logging were dipterocarpaceae, e.g meranti, keruing, mersawa and other commercial wood species.

According to the latest data from Ministry of Industry and Trade (2000), the FOB prices of log are as follows: luxury wood = US$ 500; meranti = US$ 150; merbau and bangkirai = US$ 170; mixed commercial timber = US$ 90; kempas = US$ 130. Since most of timber in Siberut Island is meranti and other mixed commercial timber, then we could assume that the average price of timber is about US$ 120/m^3.

Compared to the export price above, the communities only receive very low value from their own forest resource. For example, the communities only receive compensation as much as Rp 15,000 to Rp 20,000 per m^3. So, the local communities are actually not the beneficiaries of commercial logging.

Total Cost

The study of Wurarah (2001) on 3 HPH in Papua found the production cost of each m^3 of log as much as Rp 374,852. This cost consists of:

1. Unfixed cost: wages, daily labor, fuel, spare parts, premium, equipments, survey cost, etc.
2. Fixed cost: monthly salaries, THR, meals, medication, training, bonus, travel/per diem, guest, documenting, public service, etc.

Table 2. Net Present Value of Timber

Figure	Calculation	Result (Rp)
Total Revenue	= Total timber logged /year x Average Price	
	= 83,220 (m3) x 1,200,000 (Rp/m3)	99,864,000,000
Total Cost	= Total production cost/m3 x timber logged/year = 374,852 (Rp) x 83,220 (m3)	31,195,183,440

Gross Profit (per year)	= Total Revenue – Total Cost	
	= 99,864,000,000 – 31,195,183,440	68,668,816,560
NPV	**(over 35 years, 10% discount rates, constant profits)**	**662,252,983,366**

III. 2 Environmental Cost

As forest provides local and global non-market benefits, any loss of these benefits must be considered as costs. For example, logging creates deforestation and loss of benefits associated with natural forests (services from the forest: clean water and clean air), logging activity reduces the non timber forest products that can be obtained from the forest in its natural state, loss of spiritual and traditional values, logging creates deforestation that leads to the erosion, landslide and flood to the downstream community's health.

Logging is the primary cause for deforestation and is responsible for the loss of benefits associated with natural forests (services from the forest: clean water and clean air), the reduction of non-timber forest products, loss of spiritual and traditional values, erosion, landslides and floods affecting downstream communities.

Whiteman et al (1997) studied the cost of damage caused by deforestation, using three components, namely dwellings and property, infrastructure and crops. The study showed that the total annual cost of damage to houses and buildings if the forest loss occurring every year in the future at a 10% discount rate would be equivalent to Rp.1,896,330 per ha (US$ 806 per ha.). Meanwhile if forest was seriously reduced, the total annual cost of damage to roads and bridges, would have a capitalized value (at 10%) of Rp.150,900 per ha (US$ 64 per ha.) The additional annual loss of crops resulting from increased flooding associated with the removal of forest cover is estimated as much as Rp.104,487 per ha (US$ 44.5 per ha).

Since the additional loss will be incurred every year following the clearance, the capital value represented by the annual loss at a discount rate of 10% will be Rp. 2,151,717 million /ha (US$ 914.5 per ha.).

In terms of erosion and siltation, still according to Whiteman, et.al (1997), the effect of such a reduction in forest cover will further increase in the annual revenue due to the residual costs of dams by US$ 20,134 million, and the annual dredging costs by US$ 111 million to a total of US$ 129 million. This reduction in forest cover is equivalent to the loss of 33,546 Km^2 , and so represents a total of US$ 6,040 per ha of forest removed.

An example of the economic loss due to erosion, as a result of converting primary forest into Nilam fields (*Pogostemnon cablin*), was felt by the community of Rereiket in the month of November 20001. After a few days of rainfall, the Rereiket River flooded to the

highest level ever seen in the area, causing thereby major damage to crops and a livestock. All fields along the river were flooded and an estimated 14 cows and 60 pigs drowned.
Forests also store carbon and, if growing in volume, remove carbon from the atmosphere. All plants remove carbon from the atmosphere, but trees are able to remove and lock up larger volumes of carbon than other plants. Most plants have a rapid cycle of growth and decay, during which carbon is absorbed and re-released. Trees, by virtue of longevity and size are able to retain large volumes of carbon for hundreds of years (Whiteman, et. al 1997).

The value of carbon stored in forests can be valued according to the damage which will be caused, through global warming, should the carbon be released. To place a value on the storage of carbon in forests, an estimate of damage per tonne of carbon released is required. Frankhauser (1994) in Pearce (1995) suggest a 'central value' of US$ 20 of damage for every tonne of carbon released.

According to Pearce (1995), closed primary forest will contain as much carbon as 283 tC/ha, while closed secondary forest as much as 194 tC/ha and open forest 115 tC/ha. It is estimated that the conversion of closed primary forest to secondary and open forest causes a damage of about US$ 2,000 to US$ 3,000 per ha. These 'carbon credits' also compare favourably with the value of forest land for timber in, say, Indonesia where estimates are of the order of US$ 2,000 to US$ 2,500 per ha.

Based on hydrological analysis, the Panamanian case, Intercarib and Nathan Associates (1996) in Alyward (2000), shows that the benefits of water storage offered by 132,000 hectares of existing forest are estimated at 1,500 m^3/ha/yr. The study reports water storage benefits for these existing forest areas as $277/ha in present value terms. Data gathering in Muara Sikabaluan and Muara Siberut shows that during the dry season, people are willing to pay as much as Rp 100 per litter of clean water.

By using the estimations above, we could conclude the cost of damage caused by logging activities is as follows:

Table 3. Environmental Cost and Opportunity Cost of Environmental Services caused by Logging Activities

Type	Value (US$/ha)	Source
Environmental Cost:		
Flooding	914	Whiteman,et. al (1997)
Erosion	6,060	Whiteman et.al (1997)
Total Env'l. Cost:	6,914	
Opportunity Cost of Environmental Services:		
Carbon storage	2,500	Pearce (1995)
Water supply	277	Alyward (2000)

Total opp. Cost of Env'l services	2,777	
TOTAL	9,751	

Based on the estimation of environmental cost and the opportunity cost of environmental services provided by the forest caused by logging activities above, the benefit of logging is recalculated as follows:

Table 4. True Net Present Value of Timber

Figure	Calculation	Result (Rp)
Total Revenue	= Total timber logged /year x Average Price = 83,220 (m3) x 1,200,000 (Rp/m3)	99,864,000,000
Total Cost	= Total production cost/m3 x timber logged/year = 374,852 (Rp) x 83,220 (m3)	31,195,183,440
GrossProfit (per year)	= Total Revenue - Total Cost = 99,864,000,000 – 31,195,183,440	68,668,816,560
Environ-mental Cost	= Environmental Cost per ha * area logged/year = 97,510,000 (Rp) * 1,460 (ha/year)	142,364,600,000
Net Benefit	= Gross profit – Environmental Cost = 68,668,816,560 – 142,364,600,000	- 73,695,783,440
NPV	**(over 35 years, 10% discount rates, constant profits)**	**-710,733,851,106**

IV. OTHER ALTERNATIVE ECONOMIC ACTIVITIES

IV.1. Non Timber Forest Products (NTFPs)

NTFPs contribute in important ways to the livelihoods of Siberut people, providing them with food, medicines and other material inputs. According to Pearce (1995), the total value of Non Timber Forest Products in one ha forest in Indonesia is about US$ 38 – 135/ha. This economic analysis of NTFP only focused on rattan as it is currently the biggest marketed NTFP available in Siberut Island.

a. Rattan (*Manau calamus*)

The potentials of Siberut Island in producing rattan are relatively high compared to other areas of West Sumatra also producing rattan (MoF, DG Forest Protection and

Conservation, 1994). Rattan is the most traded NTFP in the interior of Siberut. According to the report by Kramer, et.al. (1997), 64 percent of households in Siberut collect rattan. Data from a field visit (November, 2001) shows that about 65% to 85% of households in the village of Ugai collect rattan from the forest. As the availability of rattan has decreased over the last years, some communities started to plant rattan (distance 8 x 8 m).

Total Production

In 2001, the data from co-management team in Siberut Island noted that there are about 3,000 people collecting rattan in that island. The average of rattan harvested every month per person is about 51 cuts having a length of 3 meters. There is variable data on how many pieces can be produced from one rattan stem. However, generally assumed is that one rattan stem produces 6 to 15 cuts.

Total harvest is estimated by multiplying the number of people collecting rattan by the number of rattan cut per person per year. From the calculation we found the number of rattan harvested in Siberut in a year is about 1,8360,000 cuts/year.

Price of rattan varies according to the diameter size as follows:

1. L (>36 mm) = Rp 5,000 - Rp 6,000 per cut
2. M (31-36 mm) = Rp 3,000 – Rp 4,500 per cut
3. S (26 – 30 mm) = Rp 1,400 – Rp 2,000 per cut
4. K (< 26 mm) = Rp 500 – Rp 750 per cut
5. KK (18 mm) = Rp 250 per cut

Total Cost

By interviewing people in the field, it is found that one person goes to the forest to collect rattan for 5 days in a month. So they are able to cut and collect around 10 cuts of rattan per day. The collection of rattan will usually happen by sibling groups. Therefore, it is difficult to estimate the exact production cost for collecting rattan. The hereunder calculation is based on the assumption that the consumption cost for collecting rattan per person per day is Rp 15,000 (for 2 boxes of cigarettes plus meals). Assuming that one person only collects the rattan for 5 days in a month, then the rattan collecting days per person per year is about 60 days. If there are 3,000 people colleting rattan in Siberut then the total rattan collecting days per year is 180,000 person working days.

The calculation of the economic value of rattan is based on the assumption that all rattan sold is at first class (>36 mm) and gross profit is constant.

Table 5. Net Present Value of Rattan

Figure	Calculation	Result (Rp)
Total Revenue per year	= Total Harvest x Average Price	
	= 1,836,000 (cuts/year) x 5,000 (Rp/cut)	9,180,000,000

Total Cost per year	= Cost/person/day x person working days = 15,000(Rp/day) x 180,000 (person working days/year)	2,700,000,000
GrossProfit (per year)	= Total Revenue - Total Cost = 9,180,000,000 – 2,700,000,000	6,480,000,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**62,494,150,143**

b. Other NTFPs

Other NTFPs found on Siberut, which have not been included in the calculation above, are firewood, eaglewood, damar, keruing oil, wild honey, pasak bumi, medicinal plants and other kinds of herbs.

Almost all people in Siberut use firewood to cook. There is still a lot of firewood available in Siberut and its usage has not yet been commercialized.

Damar has been used since a long time in Siberut as an adhesive for making and repairing boats. However, damar is mostly used for subsistent purposes and has still not been fully commercialized.

The potential for turning keruing wood into a market product is relatively high on Siberut. It is therefore recommended to develop a program and assist the communities in producing oil from keruing wood.

The production of honey is one of the many NTFPs on Siberut that must be improved. As the honeybee collects large mounts of nectar from durian trees during the blooming season, the production of honey is only limited to a certain periods of the year. Only a small number of people are involved in collecting honey, as it requires special skills. Honey collectors are able to collect 10 to 15 bottles a week. There are four periods of honey collection per year and each period takes two months. The total production of honey is estimated at 900 – 1,200 bottles per season or 540-720 liters. The market price for one bottle of honey is Rp.15,000/75cl. As there are four seasons of honey collection per year, the current total revenue/year is estimated at Rp.57,600,000.

Pasak bumi and other herbs are also available on Siberut. Usually these plants are used by Sikerei (medicine man) to make traditional medicine. Pearce (1995) estimated that the value of market and non-marketed medicinal plants in Malay Peninsular forest ranges between US$ 1-103/ha.

IV.2. Agroforestry

Agroforestry or the production of trees by itself does not lead to effective protection of remaining natural forest resources, but along with measures to protect boundaries it may reduce the causes for overexploitation. A specific challenge to institutions and policies exists where measures to protect the remaining resources on forest area (including permit requirements and taxes on products on their way to the market) are a major disincentive for farmers to grow their own trees or manage local forests for future marketing.

The complex agroforest systems in Indonesia, which are multiple species tree systems, often contain plot-level plant richness with a value as high as 50% of natural forests (Beukema 2001, Michon and de Foresta 1996); however, this does not imply that landscape-level biodiversity can be conserved for 50% in such systems).

a. Cloves (*Eugenia caryophyllus*)

Cloves are grown primarily in the coastal areas or on small islands located southeast off Siberut. Most of the trees were planted by in-migrants from Sumatra ((MoF, DG Forest Protection and Conservation, 1994). The villages of Saibi, Katurai and Taileleu are the main producers of cloves in Siberut. In Katurai, it is estimated that 85% of households cultivate cloves whereas in Saibi the estimation covers almost all households in the village.

Total Production

Based on the latest data from the field, it is estimated that the area of cloves is about 360 ha in the whole island. The production of one ha is about 2,000 kg/year. So the total production of cloves in Siberut Island is about 720,000 kg/year.

The distance between crops measures 8 m, meaning that in one hectare there are 156 trees. The amount of cloves produced per trees varies depending on the age of the tree. A young tree will produce between 3 to 7 kg, while a 12-16 year old tree, is according to informants, able to produce 15 to 25 kg. The price of cloves fluctuated in year 2001 between Rp 25,000 to Rp 45,000 per kg (price from farmer to upstream collector).

Total Cost

During data collection in the field, it was found that the labor wage for collecting cloves is about Rp 1,000/kg/person and the labor cost for cleaning a ha of cloves is Rp 600,000/year.

Table 6. Net Present Value of Cloves

Figure	Calculation	Result (Rp)
Total Revenue	= Total Harvest x Average Price	
	= 720,000 (kg) x 45,000 (Rp/kg)	32,400,000,000

Total Cost	= (Labor cost/kg x total harvest) + (Labor cost/ha/year * Total area) = 1000 (Rp/kg) * 720,000 (kg/year) + (600,000 (Rp/ha/year) x 360 (ha/year) = 720,000,000 (Rp) + 216,000,000 (Rp)	936,000,000
GrossProfit (per year)	= Total Revenue – Total Cost = 32,400,000,000 - 936,000,000	31,464,000,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**303,443,817,917**

b. Nilam (*Pogostemnon cablin*)

Nilam has became an important non-timber forest product in Siberut, since the middle of the nineties, when the price of patchouli oil reached Rp.1,000,000. Based on the latest data from field interviews (November 2001), it was found that patchouli is currently being cultivated in the whole of South-Siberut, including the villages of Madobak, Maileppet, Katurai, Matotonan, Muntei, Salapak and others. Data from Ugai shows that almost 90% of households are cultivating patchouli. Key informants in Ugai, a sub-village with 128 households, said that each household in the village owns an average of 1 ha of nilam, making the total size of the area where nilam is cultivated around 128 ha for that sub-village. The distance between crops in a nilam field is 1 m, meaning that one ha contains around 10,000 plants. The plant can already be harvested 6 months after planting, and will after the first harvest allow two more harvests with an interval period of six months.

Total Production

According to data from field interviews, 10 nilam plants can produce as much as one kg of nilam leaves. Meanwhile 40 kg of nilam leaves will produce 1 kg of patchouli oil. Therefore, it is estimated that one ha of nilam produces 1,000 kg of leaves, which after distillation becomes 25 kg of patchouli oil. The latest data from co-management team in Siberut noted that at least there is 4,480 ha of nilam plants in the Southern Siberut. One ha nilam plants could produce about 25 kg of patchouli. So the total production of patchouli from Siberut is about 112,000 kg/year.

Patchouli oil is currently sold according to the following prices:
1. From the farmer to collector in upstream = Rp 140,000 – Rp 150,000 per kg
2. From the farmer to collector in downstream = Rp 185,000 per kg
3. From the collector to buyer in Padang = Rp 205,000 per kg

Total cost

Normally, patchouli is cultivated, harvested and processed by family members, however, if people need to be hired to collect the leaves, the average wage is Rp 30,000 per container (50 kg).

Based on data available above, then the economic value of patchouli for South Siberut can be calculated as follows:

Table 7. Net Present Value of Patchouli

Figure	Calculation	Result (Rp)
Total Revenue (per year)	= Total Harvest x Average Price = 112,000 (kg oil/year) x 150,000 (Rp/kg)	16,800,000,000
Total Cost (per year)	= Labor cost/kg x total harvest = 600 (Rp.) x112,,000 (kg)	67,200,000
Gross Profit (per year)	= Total Revenue – Total Cost = 16,800,000,000 – 67,200,000	16,732,800,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**161,373,783,257**

c. Betel nut

Total Production

Betel nuts (pinang) is primarily found in the north of Siberut Island. The number of trees planted per ha is about 1,100 trees, with an average distance between trees of 3 x 3m. Betel nuts are collected twice a month. One betel nut tree can produce 48 kg of betel nuts/year. The current price of betel nut is Rp. 1,200/kg. One ha will produce about 52,800 kg of betel nuts. Data from co-management team in Siberut noted that there are about 500 to 1000 ha of betel nuts found in the North of Siberut Island. Taking the average of 750 ha, then, the total harvest of betel nuts from Siberut is about 39,600,000 kg or about 40 thousands tone per year.

Total cost

There is no data available for the labor cost. In order to do the calculation, we assume that the production cost (from planting to collecting) for one tree for one year is about Rp 15,000, then the NPV for beetle nuts is as follow:

Table 8. Net Present Value of Betel Nuts

Figure	Calculation	Result (Rp)
Total Revenue (per year)	= Total Harvest per ha x Average Price = 39,600,000 (kg) x 1,200 (Rp/kg)	47,520,000,000
Total Cost	= Total trees x Labor cost/tree/year = 825,000 (trees) x 15,000 (Rp/trees)	12,375,000,000
GrossProfit (per year)	= Total Revenue – Total Cost =47,520,000,000 – 12,375,000,000	35,145,000,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**338,943,967,093**

d. Nutmeg (*Myristica fragrans*)

Nutmeg is currently only cultivated in a limited amount of villages, such as in Saibi. Nutmeg is planted with distance of 8 m between each tree, meaning that there are around 156 trees per hectare. One tree can produce around 3-4 kg of nutmeg/month and 1-2 kg mace/month. A nutmeg tree produces beside old seeds or young seeds, also flowers, called mace. Nutmeg is often planted using mixed cropping techniques among clove trees.

Total production

According to interviews conducted in the field, it is noted that one nutmeg tree can produce 1 kg of flowers (mace) and 30 kg of old seeds (nutmeg). Data from the field noted that one ha nutmegs could produce 7,488 kg of old seeds and 3,744 kg of mace. Nutmeg is a promising commodity since market prices are quite high. The current price given by middlemen to farmers for mace is between Rp 42,000 to Rp 60,000/kg and for old seeds is between Rp 25,000 to Rp 40,000/kg. Data from co-management team in Siberut said that there are only about 10 ha of nutmegs at the moment in Siberut. The total production of nutmegs per year is about 74,880 kg old seeds and 37,440 kg of mace.
However, in order to be able to calculate the NPV of pala, we can assume that the area used for nutmeg is around 100 ha.

Total cost

There is no data available for the total cost of collecting the nutmegs, however we could assume that the production cost per one tree of nutmegs is about Rp 15,000 per year.

Table 9. Net Present Value of nutmegs

Figure	Calculation	Result (Rp)
Revenue From Flowers	= Total Harvest x Price of Flowers	
	= 37,440 (kg) x 42,000 (Rp/kg)	1,572,480,000
Revenue From Old seed	= Total harvest of old seeds x Price of old seeds	
	=74,880 (kg) x 25,000 (Rp/kg)	1,872,000,000
Total Revenue	= Revenue from flowers + revenue from old seeds	
	= 1,572,480,000 + 1,872,000,000	3,444,480,000
Total Cost (per kg)	= Production cost/tree x total harvest = 15,000 (Rp.) x 1,560 (trees)	23,400,000
GrossProfit (per year)	= Total Revenue – Total Cost	
	= 3,444,480,000 – 23,400,000	3,421,080,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**32,993,439,378**

e. Copra, coconut (*Cocos lucifera*)

Copra, a product derived from coconuts, is an important source of income for villages located in the south of Siberut, where coconut fields are located on small islands off the Southeast coast. Coconuts are harvested with an interval period of three months. During that period, men will go for a period of several days or weeks to the islands to collect the coconuts and process copra, which is then sold on the spot to in-migrant traders.

The number of trees planted per ha is about 156, with an average distance between trees of 8m. One tree produces enough coconuts to make 7 kg of copra per 3 months, meaning that ha produces around 4,368 kg of copra/year. The current price for one kg of copra is Rp.550.

Total Production

According to the seaport authorities, about 2,374 tons of copra was exported by ship to the mainland during the year 2001. As one ha copra produces 4,368 kg per year, the total area covered by coconut-fields is 543.5 ha (429 ha in the South and 114.5 ha in the North of

Siberut).

Total cost
There is no data available on production of copra. For the purpose of calculating the economic value of copra, we assume that the production cost of copra is about 1/3 of total revenue.

Table 10. Net Present Value of Copra

Figure	Calculation	Result (Rp)
Total Revenue (per year)	= Total Harvest x Average Price = 2,374,000 (kg /year) x 550 (Rp/kg)	1,305,700,000
Total Cost (per year)	= 1/3 x total revenue = 1/3 x 1,305,700,000	435,233,133
Gross Profit (per year)	= Total Revenue – Total Cost = 1,305,700,000 – 435,233,133	870,466,667
NPV	**(over 35 years, 10% discount rates, constant profits)**	**8,394,918,914**

f. Sago (*Metroxylon sagu, Metroxylon rumphii*)

Sago palm swamps are found in lowland areas where they are planted or natural propagated. The surface of a sago plot is expressed by mata. One mata has a surface of around half a hectare and can contain from 100 until 200 mature trees. The mata consist of several bakkat, or a group of sago trees surrounding the initial planted tree. One mata contains around 20 to 25 bakkat and one bakkat around 5 to 10 trees (Meyers, 2001).

According to Whitten and Whitten in Meyers (2001), sago on Siberut has a higher grow rate than in other areas with an average of 12 m after 8 years. A mature tree is felled and cut in sections of 1.5 m. A sago tree of 9 meters long or 6 sections of 1.5 meters produces 360 kg sago starch. Three people are able to process the tree in seven days, with an average of 6 to 8 hours labor/day.
The need of sago as staple food in Siberut Island is about 100 to 125 kg per households per month. The community is able to buy processed sago at the factory with the current price of Rp 700/kg. In order to be able to buy processed sago for a month, a family will spend as much as Rp 87,500 per month. If we calculate the value of sago as the subsistence economy then by assuming that there are about 10,000 households in Siberut, then the value of sago for subsistence economy is about Rp 10 billion per year or the net present value is Rp 101 billion in the next 35 years (at discount rate 10%).

The price for 1,5 m cuts of sago, sold by the communities at the factory site, is Rp.4,600. To be able to purchase enough staple food, a household has to produce about 5-8 trees a month. However, most families do not buy sago from the factory and still process it themselves.

Total production

Only small portion of sago harvested is sold to the factory in Siberut. According to the data from co-management team in Siberut, sago sold to the factory reached 18,720 cuts per year.

Total cost

According to the data from the field, one man could cut about 10 trees per day. Assuming that than 1 mature tree could produce 8 cuts of 1.5 m of sago then in one year there are about 2,340 trees cut to be sold to the factory. This amount of trees would need about 234 working days per year. Labor cost per day is assumed to be Rp 15,000 per day.

Table 11. Net Present Value of Sago

Figure	Calculation	Result (Rp)
Total Revenue	= Total Harvest x Average Price	
	= 18,720(cuts/year) x 4,600 (Rp/cut)	86,112,000
Total Cost	= Total working days x Labor cost	
	= 234 (days/year) x 15,000 (Rp/day)	3,510,000
GrossProfit (per year)	= Total Revenue – Total Cost	
	= 86,112,000 – 3,510,000	82,602,000
NPV	**(over 35 years, 10% discount rates, constant profits)**	**796,626,819**

IV.3. Fisheries

The estimation of the economic value of fisheries of the total reef value in Siberut is calculated on the profitability of fisheries based on market information.

Fishing methods used in Siberut include nets, line and hook, trolling and other less sustainable practices as bubu (cages), cyanide fishing, and bombing.

Total Revenue from Fishery

In order to calculate the revenue from the fishing activities, we only use the data of amount of fish actually sold and not the total catch of the fish. However, the data gathered at Pulai Bugai shows that about 9 tons fish were caught with a 30% mortality rate level during the

three months of non-fishing season (MoF, DG Forest Protection and Conservation, 1994). Total revenue coming from fishery activities can be seen on the table below.

Table 12. Total Revenue from Fishery

Type of fishing	Type of fish	Number of fishermen	Fish caught/ month/fish erman (kg)	Fishing days per year	Total catch/ year (kg)	Price (Rp/kg)	Total Revenue (Rp/year)
Compressor	Swalo-sea cucumber	1,270	20	240	203,200	150,000	30,480,000,000
Motor boat	Lobster	1,270	15	240	152,400	150,000	22,860,000,000
Mangrove	Crabs	1,300	25	240	260,000	25,000	6,500,000,000
	Oyster		25	240	260,000	15,000	3,900,000,000
Bagan	Dried fish	120	34	240	32,640	12,000	391,680,000
Sail boat	Live fish	1,270	25	240	254,000	75,000	19,050,000,000
	Raw fish	80	150	240	96,000	5,000	480,000,000
TOTAL							83,661,680,000

Source: Co-management team of Siberut (2001)

Total Cost

In the economic calculation of coral reef fisheries in West Lombok, operational costs for sailboats used to fish on the reef represented 68% of the revenue (Riopelle, 1995), while in the artisanal fisheries of Bunaken (the majority of which are also non-motorized) costs represented only 25% of revenue (NRMP, 1996a in EPIQ/NRM2, 1999).

Information available for defining the fishing costs on Siberut is provided also by co-management of Siberut as can be seen below.

Table 13. Total cost from fishery

Type of fishing	Type of fish	Number of fishermen	Boat	Fishing days per year	Fishing cost	Transportation cost	Total Cost (Rp/year)
Compressor	Swalo-sea cucumber	1,270	181	240	4,572,000,000	1,563,840,000	6,135,840,000
Motor boat	Lobster	1,270	181	240	4,572,000,000	1,563,840,000	6,135,840,000
Mangrove	Crabs	1,300	-	240	3,120,000,000	-	3,120,000,000
	Oyster			240		-	
Bagan	Dried fish	120	-	240	288,000,000	-	288,000,000
Sail boat	Live fish	1,270	-	240	4,572,000,000	-	4,572,000,000
	Raw fish	80	-	240	288,000,000	-	288,000,000
TOTAL							20,539,680,000

Assumption: 1) ransom per day is Rp 15,000/person for fishing sea cucumber, lobster, live fish and raw fish and Rp 10,000/person for collecting crabs and oyster and dried fish; 2) fisherman spend about 40 liter for one night fishing; 3) solar price is Rp 900/liter

Table 14. Total Value of Fishery in Siberut

Type of fish	Total Revenue	Total Cost	Gross profit
Swalo	30,480,000,000	6,135,840,000	24,344,160,000
Lobster	22,860,000,000	6,135,840,000	16,724,160,000
Crabs	6,500,000,000	3,120,000,000	3,380,000,000
Oyster	3,900,000,000		3,900,000,000
Dried fish	391,680,000	288,000,000	103,680,000
Live fish	19,050,000,000	4,572,000,000	14,478,000,000
Raw fish	480,000,000	288,000,000	192,000,000
TOTAL	**83,661,680,000**	**20,539,680,000**	**63,122,000,000**
NPV (10%, 35 years)			**608,758,602,669**

IV.4. Tourism

During the period of 1990 to 1994, the number of tourists who visited Siberut Island, is estimated between 1,877 to 2,197 people/year (MoF, DG Forest Protection and Conservation, 1994). However, data from 2000 shows a very significant decline in the number of tourists, with only 990 people per year visiting Siberut for surfing or cultural purposes.

Surfing tourist

According to the data from PT MWB (Mentawai Wisata Bahari), since January to December 2000, at least there were 2,000 foreign surfers in Mentawai Islands. The tour and travel company that guide them are PT Mentawai Wisata Bahari and Great Breaks International based in Hongkong. Besides that two companies there are 4 other operating companies, such as Surfing Travel Company managed by an Australian. The price for surfing tourist, according to PT MWB is between US$ 1,450 to 2,450/pack/12 days/person. The district government (Mentawai districts) take the retribution as much as 5 US$/day/person from the company.

Cultural tourist

Tour manager is normally managed from Bukittinggi. Local people only get benefit from porter, river transportation and accommodation in location.

The price for cultural tourist is US$ 150/pack/person/10 days. Number of visitors according to Siberut Police Station is in 2000, there were 417 people (or 34 people per month) and in 2001 until August is 411 people (or 51 people per month). Most of tourists come from England, France, Denmark, Australia and Austria

For both types of tourist, still according to MoF, DG Forest Protection and Conservation (1994) as much as 85% of tourist to Siberut arrive on pre-arranged tours, most originating in Bukitinggi.

Tour Operator Cost

According to the data from MoF, DG Forest Protection and Conservation (1994), tour operator cost is about 75% of the tourist fee paid to the operator. 16% of it goes to the operator in Siberut (such as for travel in the island, cook/porter and accommodations). So, the tour operator estimated to get profit as much as 25% of its tourist fee. Based on that, then the best opportunities to increase local participation are found in the guide sector; handicraft sector; and island transportation sector.

Table 15. Net Present Value of Surfing tourist

Figure	Calculation	Result (US$)
Total Revenue	= Total tourist/year x tourist fee/package	
	= 2000 (people) x 1,950 (US$/persons/12 days)	3,900,000
Estimated Operator Cost	= 75% * total revenue = 75% * 3,900,000 (US$)	2,925,000
GrossProfit (per year)	= Total Revenue – Total Operator Cost	
	= 3,900,000 – 2,925,000	975,000 (Rp 9,750,000,000)
NPV	**(over 35 years, 10% discount rates, constant profits)**	**9,403,055** **(Rp 94,030,549,983)**

Table 16. Net Present Value of Cultural tourist

Figure	Calculation	Result (US$)
Total Revenue	= Total tourist/year x tourist fee/package	
	= 417 (people) x 150 (US$/persons/10 days)	62,550
Estimated Operator Cost	= 75% * total revenue = 75% * 62,550 (US$)	46,912
GrossProfit (per year)	= Total Revenue – Total Operator Cost	
	= 62,550 (US$) – 49,912 (US$)	15,638 (Rp156,380,000)
NPV	**(over 35 years, 10% discount rates, constant profits)**	**150,811** **(Rp 1,508,110,000)**

V. DEVELOPMENT OPTIONS

The purpose of this paper is to present the economic value of all existing development or economic activities in Siberut Island in order to choose the best development options for the conservation and economic development. Some development scenarios can be made using the analysis above as a basic data

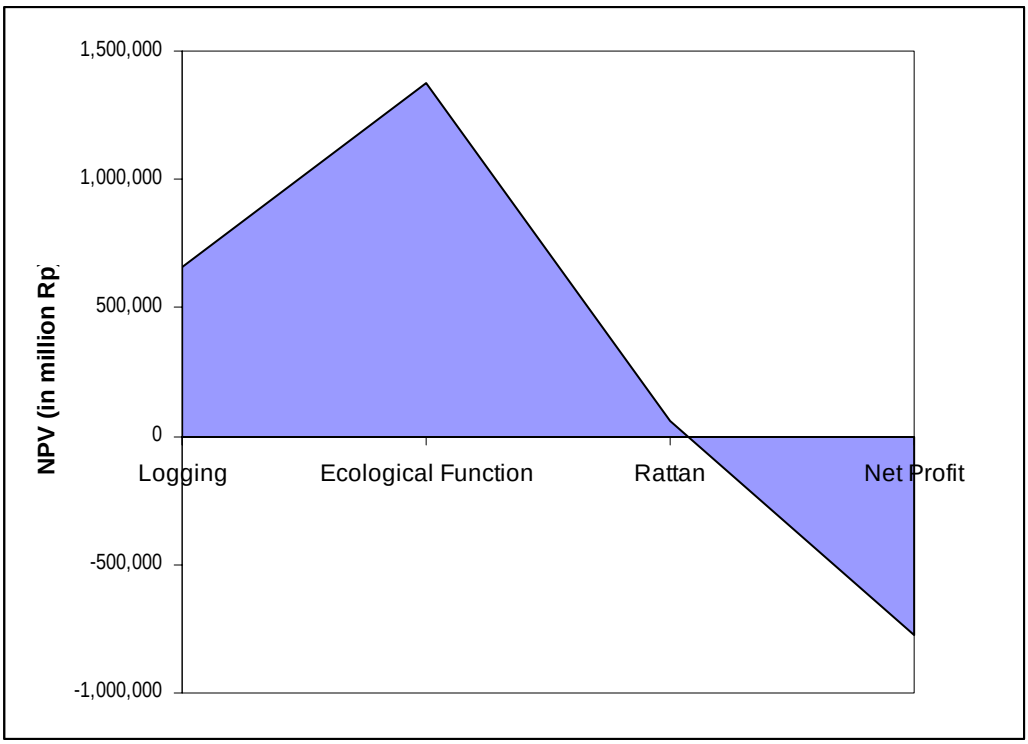
For logging to be the economically rational development choice in the Siberut Island the benefits from logging must be greater than the costs that arise from the impact of logging on the economic activities carried out under alternative sustainable development options.

For example, if the Mentawaian government finally decides to do logging in the Siberut Island, then we could make an analysis of the true benefit they could get from logging activities. By considering that due to logging activities, then the forest loose the ecological functions and potential NTFP, then the calculation of total value of the forest is as follows:

Table 17. Total Net Present Value of Forest from Timber, Ecological Function and NTFP value

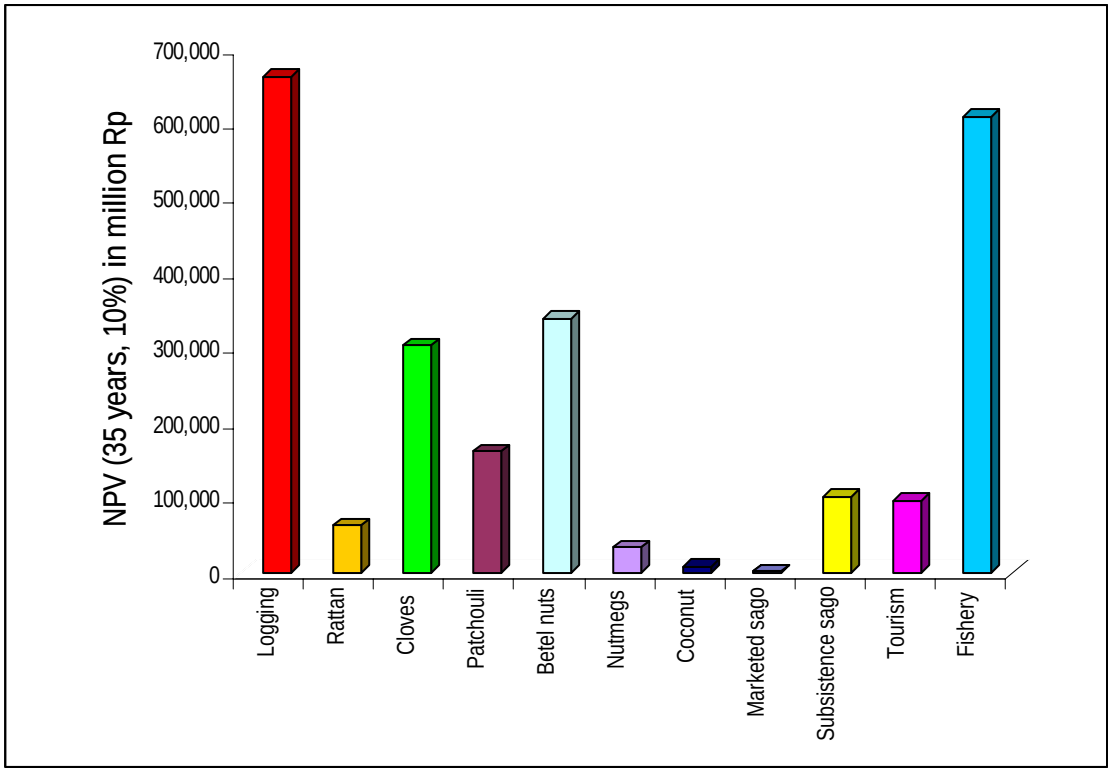
Figure (Rp)	Results
Logging	662,252,983,366
Ecological Function	(1,372,986,834,473)
Non Timber Forest Products	(62,494,501,143)
TOTAL	**-773,228,001,250**

Figure 1. Total Value of Forest



The data collection in the field found that there are some existing economic activities done by local community that have quite high economic value compared to the logging activities as can be seen on Figure 2 below. The main comparable economic activities in Siberut Island include fishery, tourism, NTFPs (rattan and sago) and agro forestry (especially cloves, patchouli and betel nuts). These economic activities are still very promising to be further developed to give more benefits to the local community as an alternative of logging activities.

Figure 2. Net Present Value of Each Natural Resources in Siberut



Further analysis could be done to choose more environmentally friendly development options for Siberut. One thing to remember is that each option would have consequences to other potential natural resource. The benefits generated from logging would also inevitable raise the negative impacts to other sources, such as to the non-timber forest product, tourism and agro forestry.

For example, the logging will increase erosion resulting in downstream sedimentation and the impact that has on coral reefs. The thick canopy, vegetation and leaf-litter in pristine tropical forests are very effective at preventing soil erosion and little downstream sedimentation occurs. Erosion rates under natural forest are 90% lower than under traditional slash and burn agriculture, and 99% lower than under weeded plantations (Chomitz and Kumari, 1998 in Cannon, 1999). Logging roads and log yards increase erosion 260 times relative to natural forest, so that even relatively selective logging results in relatively high erosion rates (Hodgson and Dixon, 1988 in Cannon, 1999).

Sediment deposition is thought to lead to oxygen and nutrient starvation that can cause the death of corals or increase their susceptibility to disease (Hodgson and Dixon, 1988 in Cannon, 1999). In their 1988 study of logging impacts on reefs in Palawan, Philippines, Hodgson and Dixon found that the increased sedimentation reduced coral cover by 50%.

A reduction in living coral cover due to sedimentation reduces food availability for fish, with corresponding declines in fish populations (Hodgson and Dixon, 1988 in Cannon, 1999). In

his study of Indonesian reefs, Cesar (1996) assumed reefs that are 50% destroyed (defined as the ratio of dead coral cover to total coral cover) have a 50% lower maximum sustainable yield.

An additional impact of logging might be a reduction in the quantity and quality of available fresh water. As mention above, the clean water supply in Siberut Island has been influenced by the sedimentation and now the people in some places such as in Muara Siberut and Muara Sikabaluan have to buy clean water for daily needs. and is , and any reductions in supply are likely to result in several costs.

VI. CONCLUSION

From the analysis shown above, it is clear that there are some development options to be done in Siberut Island. The problem now is how to wisely choose the environmental friendly economic development option in order to increase the welfare of local people, satisfy the need of government for collecting their district revenue and in the same time to conserve the lowland tropical forest in Siberut Island.

For logging to be the economically rational development choice in the Siberut Islands the benefits from logging must be greater than the costs that arise from the impact of logging on the economic activities carried out under more sustainable development options (multiple-use conservation). The value on the costs of the impacts of logging on other economic activities such as tourism, NTFPs, agro forestry and fisheries need to be compared with the benefits of logging.

The main comparable economic activities in Siberut Island include fishery, tourism, NTFPs (rattan and sago) and agro forestry (especially cloves, patchouli and betel nuts). These economic activities are still very promising to be further developed to give more benefits to the local community as an alternative of logging activities.

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