

UNDERLYING CAUSES OF DEFORESTATION AND FOREST DEGRADATION IN INDONESIA: A CASE STUDY ON FOREST FIRE

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I. INTRODUCTION

For several months started in July 1997, an area of South-East Asia stretching from Thailand and Philippines to Malaysia and Irian Jaya has been covered in smog, caused by vast forest fires on the main islands of Indonesia. The fires created ecological, social and economical problems. For humans, the smog has caused illness and deaths from respiratory diseases, along with hunger, shipping accidents and misery for the 70 million people living in affected areas. This paper will first look at ecological, economic, and social impacts of forest fires, the causes including intermediate causes, secondary causes and underlying causes. It will then discussed on link between forest fire and underlying causes of deforestation and forest degradation in Indonesia.

II. THE INDONESIAN FORESTS: AN OVERVIEW

Indonesia possesses one of the largest areas of tropical forest in the world. In fact, Indonesia possesses very rich biodiversity in its forest cover, with over a dozen major forest formations. The natural diversity and distribution of forest formations in Indonesia are a function of primary factors: rainfall regime; elevation; and soils (Dick, 1991). The Indonesian islands have a tropical maritime climate that is strongly controlled by the Indian Ocean to the west and south and the Pacific Ocean to the north and east. Mountains over 2500 m are common in most regions, and Irian Jaya boasts both the highest point between the Himalayas and the Andes (Mt. Puncak Jaya at 5002 m). At the local level, the most important influence on vegetative cover is the nature of the soil. The physical and chemical properties of a soil depend largely on the characteristics of the parent materials from which it was derived, local climate, and age as a function of the length of time it has been exposed to the destructive weathering actions of climate. These environmental factors have combined to produce a rich Indonesian forest mosaic, ranging from evergreen rainforest to savanna woodlands, and tidal mangrove to sub-temperate montane and sub-alpine forests.

III. FOREST LAND USE POLICY: AN OVERVIEW

Since having independence, all Indonesian natural resources controlled by the State (The Constitution of 1945, Article 33). Referring the Basic Law, the Basic Forestry Act No. 5/1967 stated that all Indonesian forests are claimed to be State Forest Land. Following the Basic Forestry Act, Forest Land Use Policy

(referred as TGHK) was established under Government Regulation No. 33 in 1970 and formalized in a set of Minister of Agriculture Decrees in 1980 and 1981. The deadline completing Forest Land Use Policy (TGHK) designations was 1985. Bureau of Planning of the Ministry of Forestry declares the width of Indonesian state forest is 140 million hectares comprising 113.8 million hectares of permanent forests and 26.6 million hectares of convertible forests. Based on Forest Land Use Policy, the permanent forest is categorized into: 1) production forest (64.3 million hectares); 2) protection forest (30.7 million hectares); 3) natural conservation area and nature preserved forest (18.8 million hectares); 4) convertible forest (26.6 million hectares). But nowadays forested permanent forests is 91.7 million hectares in width comprising 51.3 million hectares of production forest, 24.8 million hectares of protection forest, 15.3 million hectares of nature reserve, and 19.8 million hectares of convertible forest (Ministry of Forestry, Directorate General of Forest Protection and Natural Conservation, 1997).

IV. INDIGENOUS COMMUNITY-BASED FOREST RESOURCE MANAGEMENT SYSTEMS

The Indonesian forests have been well managed and protected by local communities since millennia through strong traditional community-based forest resource management, which use traditional knowledge and traditional law systems. Many researchers resulted that the practice of indigenous community-based forest resource management systems in Indonesia has existed for centuries among people who live near the forests. They continues to exist today in Central and East Kalimantan where swidden agriculture farmers of Dayak manage simpukng fruit agroforests, rattan agroforests areas, and Lembo agroforests area (in East Kalimantan) that mimic natural forest; in West Kalimantan where the Dayak manage tembawang (Dipterocarp agroforests).; in Lampung, Sumatra where Krui people manage damar agroforest areas that also mimic natural forest; in Bali where Tenganan people manage mixed protection and production agroforests area; and in West Java where Badui and Kasepuhan people manage their mixed protection and production tree garden through traditional agroforestry system. These practices are different from management by government agencies or industrial firms by being generally smaller-scale, more decentralized, and oriented towards a diverse mix of consumption, market and cultural needs.

V. FOREST FIRES IN INDONESIA

Fires have been burning out control on several Indonesian islands during 1997 and still being continued of this year. Main centers of the disaster were Kalimantan (Indonesian Borneo), Sumatra and Irian Jaya, others also reported from Sulawesi and Java. Up to two million hectares of forest and non-forest land had already been burnt.

The fires are not new problem for Indonesia. There was a big forest fire on the island of Borneo which burning for several months during 1983. It was at the

time thought to be the biggest forest fire in history took place in Borneo. Combined effects of fire and drought destroyed 25,500 km² of primary and secondary forest and a further 7,500 km² of settlement areas. Kutai National Park was virtually destroyed by the fire, and in some Dipterocarp forest areas left unburnt by the fire, 70 percent of the bigger trees died of drought (Leighton, M and N. Wirawan, 1986). Since then, the cycle of forest fires in Borneo appears to be increasing and fires were reported to be larger than ever before, during 1994, creating such a smoke haze that flights out of Kalimantan had to be cancelled for long periods.

Table 1. Forest Fire in Indonesia

Forest Fires (main areas)	Year	Affected area in ha
Kalimantan/Sumatra	1982/83	3.5 - 3.7 million
Sumatra/Kalimantan	1986	~ 1 million ha
Kalimantan/Sumatra	1991	~ 500,000 ha
Kalimantan/Sumatra	1994	300,000 ha
Kalimantan/Sumatra/ Irian Jaya/Java/Maluku/ Sulawesi	1997	1.7 - 2 million ha
East Kalimantan	1998	so far 283,000 ha

Source : Bobsien A. and Hoffmann E. (1998).

VI. FIRES IMPACTS

The fire has had an enormous series of side effects on ecology, economy and socio-culture which occur in a local regional and global scale. According to Bobsien and Hoffmann (1998), besides the immediate impacts there are many follow-up impacts which will only unfold their full effects in medium and long-term (see Table 2) after discussion on social impacts.

1. Ecological Impacts

Missed-use and over-use of fire as a cheap method of land clearing has caused massive changes to the vegetation of large areas in Indonesia. Fires in non-adaptable-to-fire forests can result in long-term or permanent change of vegetation cover, even more forest can be lost altogether and replaced by other vegetation. In Kalimantan in many places of original dipterocarp forests are already replaced by alang-alang grasslands through repeated burnings (Bobsien and Hoffmann, 1998). Total number of alang-alang grasslands in Indonesia which has been predicted are around 11 million hectares (Mudhyarso, pers. comm. 1998). These phenomena emerged due to all environmental media in forests such vegetation,

soil, water and area are affected through forest fires which then lead to the situation where the ecosystem functions are seriously affected.

Forest biodiversity is endangered or lost as an immediate impact of forest fire. Number of tree species is likely to decline after fire. In total approximately five percent of trees in Indonesia are already currently classified as globally threatened (WWF, 1997). Indonesia as one of six mega-biodiversity countries in the world which has a comparatively high amount of endemic plant and wildlife species, has been facing problem with increasing threatened species due to over-exploitation of forest resource and the species distinction will furthermore increase through the forest fires. The fires damaged habitat, feeding ground and roaming areas of wildlife (the case of Muara Kaman Nature Reserve, East Kalimantan), they also caused change of wildlife behaviour (the case of *Nasalis larvatus* (Bekantan) of Muara Kaman Nature Reserve), and accelerated rate of the loss of highly endemic Black Orchid species in Kersik Luay Nature Reserve, East Kalimantan (Telapak, 1998). A million hectares of peat forest which are being converted into rice-fields under the Government One-Million Rice-Fields Project may already on fire in Central Kalimantan. CIFOR has identified the main fire problem in Indonesia as coming from a one million-hectare area of peat forest being drained for a government rice-planting project. It is also predicted that the 1983 fires still burning deep in peat (WWF, 1997). Fires in these peat forests are dangerous because the fires can go deep underground and can continue to burn - uncontrolled and unseen - for months. The contribution of tropical peatlands to the global carbon cycle is higher than those of most of the temperate zones and about 15 % of the global peatland carbon may reside in tropical peatland (RAMSAR, 1997). Fires in peatlands can make future regeneration more difficult as they kill tree roots and destroy seed banks. South East Asian countries, particularly Malaysia and Indonesia, hold to over 60 % of global resources of peatland (around 20 million ha). Five percents of the regional total were on fire at the end of 1997 (WWF, 1997).

The combined impacts of large-scale deforestation and forest fires may also contribute to ecological changes on national, regional as well as global scale. Immediate transboundary effects such as acid rain and air pollution is one problem. Other problem is Indonesia and her neighbor countries may likely be hit more frequently with greater intensity of regional droughts. Bobsien and Hoffmann (1998) explained the regional and global effects:

- The regional climate, including the hydrological cycle is closely linked to the global hydrological cycle and to global atmospheric circulation, which is the key determinant of the position and movements of tropical high-pressure areas. Large-scale biomass burning creates conditions in which future burnings is more likely, creating a spiral of further destruction. El Nino effects are likely to occur more often and more intensely. Haze reduces the sun radiation needed for primary production of plants, so the agricultural sector will suffer production losses.
- Carbon dioxide (a major greenhouse gas) generated by the 1997 fires equaled

that for the whole of Europe in one year. Such rapid destruction of carbon dioxide sinks and emission of greenhouse gases are likely to intensify the effect of the El Nino weather conditions and speed up global warming. According to Dr. Harger, Intergovernmental Oceanic Commission of UNCESCO, who has evaluated available climatic data from Indonesia since the beginning of climate data recording in the last century, El Nino has already increased its frequency and intensity. Some decades ago El Nino occurred only every 4-8 years and was less intense, however, in the last two decades the frequency of El Nino increased to 2-4 years. There is ample evidence, that El Nino could, in the future, occur every year. However, El Nino also amplified by local drought conditions.

2. Economic Impacts

Meanwhile forest fire in 1997 caused economical losses of US \$ 3.5 to 7 billion from ecological impacts, hotel business, tourism, transportation, health and plantation (Elfian, 1998). A study conducted by the Singapore-based Economy and Environment Program for Southeast Asia and WWF Indonesia in October 1997 estimated financial losses - based on conservative estimates - at some US \$ 1.4 billion in Indonesia, Malaysia and Singapore. This estimate did not include the tremendous loss of forest resource and damage to biodiversity. According to D. Glover, Director of the Economy and Environment Program for South East Asia, Indonesia's forest fires could cost S.E. Asia US \$ 5-6 billion in short-term health-care plus losses in industrial production, tourism, timber and plantations (Jakarta Post 18.3.98).

Forest fire in 1981 damaging 60,000 hectares of forests was calculated having losses of US \$ 951,000 and needed at least US \$ 25,5 million to recover them. Those figures have not included economical loss on ecological values such as hydrological value, etc (Elfian, 1998). However, in 1982/1983 the great 'Borneo' forest fires produced economic losses of US \$ 5.5 billion (Lennertz and Panzer, 1983 in Bobsien and Hoffmann, 1998).

3. Social Impacts

The smoke contains high concentrations of particulate matter and numerous chemicals that are harmful to health, especially when exposure continues over several months. In Padang, West Sumatra, the head of local health office reported that the haze his region has not only caused over ten thousand cases of respiratory tract ailments but thousands of others have complained of eye irritation and infections due to sulphur dioxide. The World Health Organization of Philippine office estimated that hospital visits for upper respiratory type problems were up 2-3 times usual levels when the smog was at its worst in Indonesia (WWF, 1997). In Malaysia and Singapore the effect on the human health was well documented when the limits of the so-called PSI (Pollutant Standard Index) was exceeded by 800 and more, with 100 PSI regarded as unhealthy limit and 300 as hazardous limit. Altogether in six Asian countries up to 70 million people were affected by haze. However, this is only a rough estimation since Indonesia has no sufficient pollution monitoring equipment (Bobsien and Hoffman, 1998).

The situation became worse for many people in East Kalimantan province due to the effects of drought and water scarcity. The author was in Samarinda, East Kalimantan for ten days in September 1997, personally experienced the serious water scarcity of the city which then led another various health problems. Social life was also seriously affected where schools, factories, and even airports had to close down for weeks. In February 1998, airport in Samarinda, East Kalimantan had to be closed for 17 days, in March 1998 airports in Central Kalimantan and North-Sumatra had to cease temporarily operation too. The risk of accidents with all kind of transport increased. On September 25 1997, A Garuda airliner carrying 222 people crashed shortly before landing at a north Sumatran airport after the pilot got confused in dense smoke, resulting in Indonesia's worst ever air disaster. On September 27, two ships collided in the Straits of Malacca, due to the smog, with 29 people lost. On October 19, a further collision between a passenger boat and tug left four people dead and a reported 21 missing, and soon afterwards a collision in thick fog on the Barito River resulted in 29 people drowning when a ferry sank. Indigenous communities who live inside and surrounding forest areas are most suffered from the fires. Before the fire came, they already had problem with access to their long standing swidden fields which have naturally regenerated but claimed as state forest land managed by private concessionaires. The fires destroyed most of the Dayak's (East Kalimantan indigenous people) income sources including rattan gardens, fruit gardens, mixed rice and crop fields, and communal forest areas which provided timber and non-timber forest products. That situation brought them to the serious food crisis situation. It became worse due to the incredible high price of food coming from other area because smoke influenced transportation system.

Cultural life of the Dayak people also affected by the damage of Dayak's community-based forest resource management system, since the system is integrated in their strong socio-cultural tradition.

VII. FOREST FIRES AS A RESULT OF DEFORESTATION AND FOREST DEGRADATION IN INDONESIA

Most of the fires are set deliberately, often illegally by commercial interests in Indonesia. Most of the fires happened in commercial plantation areas, transmigration land-clearing projects, one million rice field converted from peat-swamp forests, over-logged forests, secondary forests at production forest which are on-going managed by concessionaires, industrial timber estate areas (commercial plantation). The fires also happened in secondary forests of protection forest, nature reserves and wildlife sanctuaries, recreation forest, national parks and grand forest parks. The picture shows that forest fires in Indonesia happened in areas where deforestation and forest degradation have existed since the starting period of forest exploitation for economic and political purposes. It can be said that forest fire is also resulted from deforestation and forest degradation in Indonesia. Discussion about forest fire causes at the following paragraphs will give clear picture.

VIII. FOREST FIRE CAUSES

In a discussion paper the World Wide Fund for Nature distinguishes three categories of causes which created the forest fires in Indonesia (WWF, 1997): 1) Immediate causes include deliberately started fires, set mainly by plantation concessionaires; 2) Secondary causes include logging and conversion to more flammable species, which increase the likelihood of fire, coupled with a severe El Nino climatic effect, which may itself be intensified as a result of global climate change; 3) Underlying causes include national land use policy, government intervention failure.

1. Intermediate Causes

The Government of Indonesia has said that about 80 percent of the fires were started by commercial plantation owners, industrial estates and transmigration land-clearing projects. The Government of Indonesia has, for the first time, publicly identified suspected culprits. So far, 176 plantation timber and construction companies and transmigration scheme have been named as possible users of fire to clear land. These include a reported 43 Malaysian companies.

2. Secondary Causes

Fire risk is increased dramatically by the conversion of natural forests to rubber, oil palm and timber plantations, and by the logging of natural forests which opens the canopy and dries out the ground cover. Plantations are drier and trees are more spaced that natural tropical moist forest, thus supporting circumstances for fire to spread. Facts also mentioned that fires burned most easily in secondary forest. Selective logging destroys much of the moist undergrowth and the closed canopy that reduces the likelihood and impact of forest fires in natural forests. Drainage for agriculture such existed in one million hectare of rice field, also increase risks of fire.

3. Underlying Causes

All secondary causes above which increase fire risk such forest land clearing to large rice field areas, commercial plantations, logging are caused by national forest land use policy which allocate certain numbers of forested lands into production forest and convertible forest. Widespread corruption has caused and flourished widespread illegal practices in the Indonesian timber and plantation industry. Structural collusion between government officials and companies is one reason of high transaction cost for companies which then lead to breaking the law by forest companies such doing illegal logging, manipulating forest assessment report for the purpose of forest land use change, etc. Government intervention failure in encouraging (by subsidies) of timber estate development and of inefficient domestic pulp and paper industries. The intervention has led to the massive forestland clearing for timber estates using deliberate fires. Since newly established timber estates are still premature in term of providing raw material for domestic pulp and paper industries, it has led to the increased illegal logging and illegal re-logging of over-logged areas which increase fire risk.

IX. FOREST FIRES AND UNDERLYING CAUSES OF DEFORESTATION AND FOREST DEGRADATION IN INDONESIA

Deforestation and forest degradation can be attributed to many different causes. Some causes operate directly on the forest itself and are often easily recognizable in the field: these are referred to as "direct causes". Behind these direct causes, however, may lie a whole sequence of causes, each more indirect or remote than the one which precedes it; these are referred to as "underlying causes" (CSD, 1996). It has been identified that some of direct causes of deforestation and forest degradation in Indonesia are commercial plantation, transmigration, infrastructure development, mining, logging and fire. Previous discussion on this paper regarding ecological impact showed contribution of fire as direct cause of deforestation and forest degradation. The following sub-chapter focuses on the linkage of some underlying causes of deforestation and forest degradation in Indonesia, which are forest land use policy including logging, timber plantation, and conversion into big-scale agroindustry land, transmigration, and mining.

1. Indonesian Forest Land Use Policy - The Way towards Forest Fire

Primary rainforests which have not been undisturbed do not usually burn due to high moisture, and there are no natural causes for forest fires such as lightning. Indigenous forest dwellers have sophisticated land-use and forest resource management skills which are highly adapted to the sensitive environment. But when primary rainforests are greatly altered by activities such as logging, mining, conversion into big-scale agricultural land (e.g. agroindustry land), plantations, and settlement areas, these land-use changes influence many ecological characteristics. Many aspects of the misuse and mismanagement of rainforests in Indonesia have become subject of researches, NGO campaigns, public and political debate, but the results are quite far from success concerning the goal of achieving better protection of indigenous communities and rainforest ecosystems. International conventions, scientific programs and public/political debate excluded the issue of increased risk of forest fires. The 1997 Indonesian forest fires should be used as ample evidence of the misuse and mismanagement of tropical rainforests, which led to deforestation and forest degradation in Indonesia. Underlying causes of deforestation and forest degradation in Indonesia which is clearly linked with the forest fires issue need to be analyzed. For that purpose, it might be useful to divide Indonesian forest politics into three phases.

2. Logging Phase (1967 - now)

The year of 1966 was an event of political change when Soeharto - a long-power holder until May 1998 - took the power of the nation from his predecessor, Soekarno first president of Indonesia. Under His leadership, the New Order was beginning in 1967. It was also new era of forest resource management through establishment of The Basic Forestry Law of 1967 which influenced by national development policy affected by finance foreign debts. The Basic Forestry Law of 1967 constituted a legal instrument facilitating commercial access to and development of income streams from legal rights to forest resources. Article 5 of The Basic Forestry Law states all forest areas within the boundary of Republic of

Indonesia including natural resource in the areas are authorized by the government. The Basic Forestry Law is then being used as a mechanism to legitimize state claims of ownership over forest resources and to arbitrarily sanction the removal of local control from forest communities, including indigenous ones (Moniaga, 1993). Following the Basic Forestry Act, Forest Land Use Policy (referred as TGHK) was established under Government Regulation No. 33 in 1970 and formalized in a set of Minister of Agriculture Decrees in 1980 and 1981. The deadline completing Forest Land Use Policy (TGHK) designations was 1985. Based on Forest Land Use Policy, the permanent forest is categorized into: 1) production forest (64.3 million hectares); 2) protection forest (30.7 million hectares); 3) natural conservation area and nature preserved forest (18.8 million hectares); 4) convertible forest (26.6 million hectares). Until 1966 some 75 % (144 million ha) of Indonesia was covered with tropical rainforest. The common prevalence of the prized tree species Dipterocarpaceae in Kalimantan and Sumatra made Indonesian rain forest one of the most valuable in world. Large scale logging of timber began as a follow up of establishment of the Basic Forestry Law in 1967 when all Indonesian forests were declared state property. The Basic Forestry Law also followed by opening of opportunity for foreign investments in logging activities. All policies enacted during that period supported the exploitation of the Indonesian rainforest as part of national development policy mainly to finance foreign debts. During the timber boom in the 70's with the help of well-connected foreign companies Indonesia became the worlds biggest raw log exporter. Timber became the second biggest earner after oil and gas in the Indonesian economy after the oil price decrease in 1982. By 1983, 560 logging concessions had been granted on 65.4 million hectares, more than the total area of Indonesia's production forests stated in the Forest Land Use Policy. Before designation completion of Forest Land Use Policy (TGHK) in 1985 which included forest lands demarcation, it has been commonly known that logging companies operate within unclear demarcation areas. Over-logged areas within conservation areas (national parks, nature reserves) is evidence of the mismanagement. In 1980 the government changed its forest policy by introducing ban on raw log export, and promoting development of plywood industry. By the late's 80's Indonesia was the world largest plywood-producer and has achieved a 75 percent market share in the mean time. However, overestimation of forest resources, poorly managed large-scale operations, non-compliance of concessionaires to the principles of sustainable forestry, lack of law enforcement, an overcapacity in the plywood industry and meager reforestation resulted in rapid exploitation of primary forests (Hurst, 1990). After continuous short-term and profit-oriented timber exploitation, forest coverage in Indonesia had decreased to 119.3 million ha (62 %) in 1982 (RePPPProt 1990) and 92.4 million ha (48,6 %) in 1983, including plantations and was logged-over secondary forests (Bobsien and Hoffmann, 1998). WALHI, a strong environmental group, stated that only 53 million ha (37 %) primary forest are left in 1998. The deforestation rate for the time period between 1982 and 1993 has reached an incredible 2.4 million ha/year. In comparison: FAO in 1990 stated that the annual deforestation rate of tropical forests worldwide is 987 million ha (Bobsien and Hoffmann, 1998).

3. Timber Plantation Development Phase

The overall macroeconomic situation and the specific situation in the relevant policy fields created high need for policy change. Since Indonesia's oil resources will be depleted soon (~2005), and the country will then not only lose oil export revenues but will become an oil importer, the national development planners like to boost the economic performance of other sectors. Amongst other promising businesses pulp and papers as well as agrobusiness (especially tree crops) were identified to be further potential export revenues. On the other hand, in the mid 80's there was clearly visible evidence in forestry sector of an up-coming timber crisis due to over-logging. At that time industrial plants in some parts of Sumatra already suffered from raw material shortages, and in 1990 timber shortages also emerged in Kalimantan. In the initial stage the government tried to solve the problems by establishing timber estates program (to refer as HTI, Hutan Tanaman Industri). In order to resolve the dilemma, the government seemed to settle on timber estates as a scheme for providing alternative sources of wood. For this reason, three types of timber estates were proposed: a) HTI pertukangan, hardwood plantations to relieve supply shortages of construction and woodworking raw materials; b) HTI kayu energy, timber estates to supply raw material for fuelwood and charcoal production; and c) HTI kayu serat, timber estates to support the pulp, paper and rayon industry. Third type of timber estates which is pulp and paper plantation received the most attention and investment by the private sector and government since pulp and paper business is the most profitable one. Despite the originally purported goal by the government to use timber plantations to counter hardwood shortages, in practice the thrust of the timber estate scheme is creating fast-growing tree plantations to support the development of the pulp and paper industry. In 1990, the Ministry of Forestry started granting Industrial Timber Plantation Rights (HPHTI) which allow concessionaires to plant and harvest plantation timber on so-called unproductive areas of permanent production forest. Various government ministers stated that Indonesia is aiming to become the greatest supplier of paper pulp and palm oil in the world. Thus in the 90's is an enormous program is underway to convert primary forest into timber as well as rubber and oil palm plantations in Indonesia.

4. Large-Scale Oil Palm Plantation Phase

Another ambiguous governmental development program to increase export revenues is the development of tree-crop (oil palm, coffee, cocoa and pepper) plantations. Plantation development also serves the government's long standing goal of relocating people from densely populated island of Java to the outer islands (to be referred as transmigration program). Official incentives include low-cost financing for estates where 80 % of the land belongs to smallholder transmigrants and 20 % to the company. Some 35 companies are developing plantations in conjunction with transmigration. However, only the big conglomerates can afford the investment costs of setting up transmigration sites. There is a recent trend that Malaysian businessmen seek for land to establish new plantations in Indonesia. Some of the reasons are: a) Malaysia's over-aged rubber plantations and decreasing oil-palm production; b) In Indonesia land can be cleared more

easily owing to the lack of control and the Indonesian counterparts freely take out the remaining trees (Bobsien and Hoffmann, 1998).

Until 1996, Indonesia exports of palm oil products has increased 32 % since the last five years, and were worth more than \$ 1 billion. Government plans call for the production of 7.2 million tons of crude palm oil by the year of 2000, with the plantation area move at 2 million hectares and the Ministry of Agriculture has announced that an additional 1.5 million hectares will be added in 1998 as part of a new policy to address the monetary crisis (CIFOR, 1998). With respect to the present economic crisis the palm oil business is very attractive, because investment needs and operation costs are in Rupiah, but export sale will return investment in dollars. The government then lifted its export ban on palm oil on April 22 1998. The integration of Forestry and Plantation into one Ministry in 1998 which support "one-roof" authorization of forest lands conversion into plantations, can be used as evidence of government ambiguous plan on plantations. Some measures of the IMF package directly concern the palm oil sector. For example, Point 39 requires Indonesia for removing "all formal and informal barriers to investment in palm oil plantation" - a requirement which is clearly detrimental to environmental concerns, because it will highly increase additional pressure from international investors to convert forest land. Point 50 of the IMF catalogue requires the government to "reduce land conversion targets to environmentally sustainable levels by the end of 1998" - a requirement, which is contradictory to the first one, and the timing is ill-fated to prevent major forest fires in 1998.

5. Logging, Timber Plantation, Oil Palm Plantation and Forest Fires Relationship

1). Logging Case

Official report of local government office of East Kalimantan stated that total areas on 1998 fire since January 1998 are at least 489,280 ha which includes 299,846 ha of logging companies areas (60 %), 85,803 ha of industrial timber estates (18 %) (Telapak, 1998).

Logging activities in Indonesia basically have opened up forest canopies and resulted in widespread forest roads, clear-cuts and degraded secondary forests. Poor logging practices in the absence of enforcement of logging regulations caused severe damage to primary forests. The ecological impact of logging alone is severe enough to result in a significant increase of fire risk especially in times of periodically occurring El Nino droughts. In 1982/83 some 3.5 million hectares of Indonesian forests burned, including some 378,000 ha in East Kalimantan, an event that remained widely uncovered by the media. At time logging activities was in the highest peak, meanwhile timber plantation development was not a major issue in the national development planning agenda (Bobsien and Hoffmann, 1998).

2). Plantation Case

The role of timber plantation and tree-crop plantation business as a major and immediate cause for the forest fires in 1997 was officially stated by the Indonesian government. Minister of Environment stated that about 80 % of the fires were started by plantation owners, industrial estates and transmigration land-

clearing projects (see table 3). Indonesia has, for the first time, publicly identified suspected culprits. So far, 176 plantations, timber and construction companies and transmigration projects have been named as possible user of fire to clear land, despite a ban on burning during the unusually long dry season.

Large-scale plantation establishment of pulp and paper estates ((150,000 ha each) or tree crops (some of them 100 - 100,000 ha) inevitably requires bigger scale burnings. It is important to note that the monoculture softwood plantations dramatically increases the fire risk. By using fire to establish, for example, Eucalyptus plantations or Acacia plantations, such plantation themselves will hold a huge fire potential in future. It is because the plantations are drier and trees are more evenly spaced than natural tropical moist forest.

Many oil palm plantations were also identified as using fire for land-clearance in 1997. Fires were also sometimes used to deliberately blur the boundary of concessions and to acquire more lands. From 176 companies have been named as possible users of fire there are reported 43 Malaysian companies.

Table 3. Areas affected by fire during July-September 1997 and during January - April 1998

Forest Type	July-Sept. 1997	July-Sept. 1997	Jan. - April 1998
Production Forests (Logging)	576,000 ha (33.7 %)	37 %	105,900 ha (42 %)
Conservation area	46,000 ha (2.6 %)		75,600 ha (30 %)
Plantation area	796,000 ha (46.55%)	43 %	71,000 ha (28 %)
Peat Swamps area	260,000 ha (15.20%)	12 %	
New Transmigration area	30,000 ha (1.70%)		
Stridden Agriculture area	3,000 ha (0.2 %)	9 %	
Total	1,714,000 ha (100%)	100 %	252,500 ha (100%)

Source: Bobsien and Hoffmann (1998)

X. CONCLUSION

Excessive forest fire is direct cause of deforestation and forest degradation in Indonesia. But evidence suggests that forest fire is also resulted from deforestation and forest degradation. Underlying causes of forest fire such as national forest land use, government intervention failure in encouraging (by subsidies) development of timber estate as well as domestic pulp and paper, and structural widespread corruption, can also be referred as some of underlying causes of deforestation and forest degradation in Indonesia.

XI. RECOMMENDATION

It is strongly recommended that actions on addressing underlying causes of forest fire which will directly relates to addressing some of underlying causes of deforestation and forest degradation should be taken by government of Indonesia immediately. Otherwise remained forest resource of Indonesia will continue to deplete, and high losses of ecological, socio-economic cost could harm current economic and financial crisis faced by Indonesia.

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