

Economy and Environment Program
for Southeast Asia
22 Cross Street
#02-55 South Bridge Court
Singapore 048421
Tel: (65) 6438 7877
Fax: (65) 6438 4844
E-mail: eepsea@idrc.org.sg
Web site: www.eepsea.org

RESEARCH REPORT

No. 2009-RR9

An Assessment of Forest Management Options For Preventing Forest Fire In Indonesia

Luthfi Fatah and Udiansyah
The Faculty of Agriculture,
Lambung Mangkurat University
Jln Jenderal Ahmad Yani, PO Box 1028
Banjarbaru 70713, South Kalimantan
Indonesia
Tel/Fax: 62 511 477 2254
Email: luthfi.fatah@gmail.com

This EEPSEA study highlights the root causes of forest fires in Indonesia and assesses a range of potential new policy options to improve the situation. The study is the work of Luthfi Fatah, from the Faculty of Agriculture at Lambung Mangkurat University, Indonesia. Uncontrolled forest fires are one of the key causes of habitat destruction in Indonesia. The haze they produce causes significant pollution problems for people in the country and in surrounding nations. Partly as a result of these fires, Indonesia is currently losing nearly two million hectares of forest every year. Deforestation on this scale, at this speed, is unprecedented and deeply worrying. Indonesia's forests are home to a large share of the world's biodiversity and also provide a livelihood for millions of people.

The study finds that the weak enforcement of forest conservation rules and regulations is a key problem and that this is caused by a wide range of resource and institutional failures. It highlights three key policy improvements that would address the forest fire problem in a cost effective way. The improvements involve strengthening policy implementation in the field, putting in place an effective reward and punishment system and the establishment of an institution to monitor and record stakeholder compliance and violation. The study recommends that all three of these policy options are of a high priority. It also highlights a number of steps that must be taken to make sure that they are implemented effectively. These include ensuring that parliament supports and finances the appropriate policies, and empowering local communities to help weed out corruption and bribery.

Published by the Economy and Environment Program for Southeast Asia (EEPSEA)
22 Cross St, #02-55 South Bridge Court, Singapore 048421(www.eepsea.org)
Tel: +65-6438 7877, fax: +65-6438 4844, email: eepsea@idrc.org.sg

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ISBN: **978-981-08-5354-9**

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An Assessment of Forest Management Options for Preventing Forest Fire in Indonesia

Luthfi Fatah

Udiansyah

September, 2009

Comments should be sent to: Luthfi Fatah, Faculty of Agriculture Lambung Mangkurat University, Jalan Jenderal Ahmad Yani, P.O. Box 1028, Banjarbaru 70713, South Kalimantan, Indonesia. Telephone/Fax: +62 511 477 2254, Mobile: +62 857 17000 529, Email: luthfi.fatah@gmail.com

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support research and training in environmental and resource economics. Its objective is to enhance local capacity to undertake the economic analysis of environmental problems and policies. It uses a networking approach, involving courses, meetings, technical support, access to literature and opportunities for comparative research. Member countries are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, and Papua New Guinea.

EEPSEA is supported by the International Development Research Centre (IDRC); the Swedish International Development Cooperation Agency (Sida); and the Canadian International Development Agency (CIDA).

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ACKNOWLEDGEMENTS

Many people have supported this research and we would like to express our sincere thanks.

First of all we would like to thank Dr. Hermi Francisco for her initial encouragement of our research in this subject area and also for all the help she provided throughout the research, during the preparation of the research proposal, right up until the completion of the report. Dr. Francisco was exceptionally helpful and supportive. We also would like to express our appreciation to EEPSEA for the research funds they allocated to us. This research has allowed us to learn more and to develop a network in the field of environmental economics.

We would also like to thank Dr. Nancy Olewiler, a friendly and helpful advisor. We very much enjoyed our work with her. Her expert advice helped us to overcome problems and she was always able to provide support for us in handling the research.

Thanks to Catherine Ndiaye for assisting us with administrative tasks. Catherine was always easy to contact and very communicative, she helped us fulfill the requirements of the research and facilitated our participation at biannual workshops. Our thanks also go to Ms. Ang Cheng Hiang, who booked our tickets to attend EEPSEA workshops.

We greatly appreciate the help and support of our colleagues at Lambung Mangkurat University, Bogor Agricultural University, and colleagues in the Department of Forestry at both central and regional levels, especially at the regional level in Riau Province. In particular we would like to thank our key informants, who have supported this research with their data and valuable comments and opinions.

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AN ASSESSMENT OF FOREST MANAGEMENT OPTIONS FOR PREVENTING FOREST FIRE IN INDONESIA

Luthfi Fatah and Udiansyah

EXECUTIVE SUMMARY

Manageable and controllable fires can be profitable tools that help human beings deal with their environment. However, when fires are unmanaged or uncontrollable they can be a potential threat to sustainability. Almost every year in Indonesia, from February to March and from August to October, forest fires take place. Numerous policy recommendations have been made to national and regional governments, and many initiatives have been taken by the government and other stakeholders. However these efforts have proved to be ineffective and satisfactory results are still a long way off. The problems of fire and smoke haze keep coming back year after year, particularly during the periods of prolonged drought. Current policies have some weaknesses and the suspected root cause of most of the problems is the absence of a controlling system.

This research lists some alternative policy options for a controlling system to improve forest fire prevention and mitigation. The research assessed the options based on criteria to eliminate weaknesses in current policy. Methods that were used include literature review, stakeholder consultation, economic valuation, and workshop and focus group discussion.

The study results indicate that recommended alternative policy options for improving land and forest fire prevention and mitigation, as well as for filling gaps in existing policy are: improving policy implementation in the field (this requires funding of an additional 65 percent on the top of the existing budget or 4,905 million rupiahs); implementing a reward and punishment system (50 percent or 3,773 million rupiahs); and establishing an institution to monitor and record stakeholder compliance and violation (an additional 70 percent or 5,282 million rupiahs).

The policy implication of these research results is that the government of Indonesia may need to reorganize itself in order to ensure a significant and equal commitment at both central and local government levels to ensure appropriate responses when land and forest fires start. This is the first step. The second step is for all levels of government to approach the parliament and the wider stakeholders in their locations to raise awareness and lend support via the allocation of an adequate budget. The third step is the implementation of all three options high-priority highlighted in this study (see above). Of the three options, it would probably be best to first establish institutions responsible for the monitoring and recording of stakeholder compliance and violation. Out of all of the recommended steps, there is one very important point that needs to be taken into consideration for the successful implementation of the options – all stakeholders have to work together to stop bribery, corruption and collusion from taking place. One effective way for this to happen would be to promote transparency and to give communities some kind of monitoring capacity.

1.0 INTRODUCTION

Indonesia experienced the most serious forest fires in 1997-8. The main contributor to this problem was the severe El-Niño, which induced drought. The result was catastrophic. Many Indonesian cities were covered in a blanket of haze. Visibility was limited because the density of the smog was high so vehicles moved very slowly. Many members of the population experienced health problems such as coughs, sore throats, stinging eyes, and difficulty in breathing.

Fires, when manageable and controllable, can be profitable tools to help human beings deal with their environment. However, when fires are uncontrollable they are a potential threat to the sustainability of the environment. Fires can affect ecosystems, contribute to carbon emissions, and have a negative impact on biodiversity (Tacconi 2003). By early 1998 nearly 10 million ha had been affected by Indonesia's forest fires, incurring damage of almost US\$10 billion. Smoke from these fires shrouded much of Southeast Asia in haze for months (Barber and Schweithelm 2000). Large areas were burned, producing persistent haze over large areas of Sumatra and Kalimantan. These unwanted fires are recurrent – they happen every year during the dry season. Normally the haze dissipates in September when heavy rains extinguish the fires, but this was not the case in 1997. In 1997 the rains failed, the fires intensified, and the haze thickened and spread to neighbouring countries. Haze reached Malaysia and Singapore in July, and air quality deteriorated steeply in September. The haze covered an area of 1 million km², affecting about 70 million people. The haze prompted an outburst of complaints from neighbouring countries that drew global media attention. Land, air, and sea transport accidents were linked to the poor visibility caused by the haze, including a ship collision in the Straits of Malacca that killed 29 people. Hospitals and clinics were filled with people seeking treatment for respiratory, eye, and skin ailments. Schools, businesses and airports closed, and tourists stayed away, inflicting economic hardship on the region.

1.1 The State of Indonesian Forests

The Indonesian forests represent some of the most magnificent tropical forests in the world. In extent, they rank third behind Brazil and the Democratic Republic of Congo (formerly Zaire). They have a unique and rich biodiversity. The forest types of Indonesia vary largely. Some of the main categories of forest in Indonesia include: evergreen lowland dipterocarp forests in Sumatra and Kalimantan, seasonal monsoon forests and savanna grasslands in Nusa Tenggara, nondipterocarp lowland forests, and alpine areas in Papua. Indonesia also contains the most extensive mangrove forests in the world, estimated at 4.25 million ha in the early 1990s. Most of these habitats are under serious threat (Matthews, Achmaliadi and Barber 2002).

Indonesia today is losing nearly 2 million ha of forest every year. Deforestation on this scale, at this speed, is unprecedented. Environmental organizations are sometimes accused of hyperbole in their claims of the forests' imminent destruction but in the case of Indonesia, predictions of catastrophic habitat loss and species decline are not exaggerated. The most recent and authoritative survey of the country's forest cover predicts that lowland dipterocarp forests – the richest tropical habitat of all – will have

vanished from Sumatra and Kalimantan by 2010 if current trends continue unchecked (Holmes 2000). Despite its small share of the world's land, Indonesia plays an enormous role in the biodiversity of the world. Indonesia comprises only 1.3 percent of the earth's land surface but it is home to a disproportionately high share of its biodiversity, including 11 percent of the world's plant species, 10 percent of its mammal species, and 16 percent of its bird species. (See Figure 1) The majority of these species are found in Indonesia's forests. Forests in Indonesia provide habitats for some of the world's most beloved mammals, including the orangutan, tiger, rhinoceros, and elephant. As recently as 1930, three subspecies of tiger, Balinese, Javan, and Sumatran, ranged across the country. Of these three, the Balinese tiger (*Panthera tigris balica*) became extinct in the late 1930s and the Javan tiger (*Panthera tigris sondaica*) in the 1970s. Today, only the Sumatran subspecies remains. Despite the tigers' ability to live in a wide range of habitats, forest fragmentation and agricultural development as well as the demand for tiger products have contributed to the decline of the population. Tigers lead a solitary life and have nocturnal habits so an accurate census of their numbers is nearly impossible. It is thought that there are around 400-500 tigers left in Indonesia, living mostly in five national parks on Sumatra (Matthews, Achmaliadi and Barber 2002).

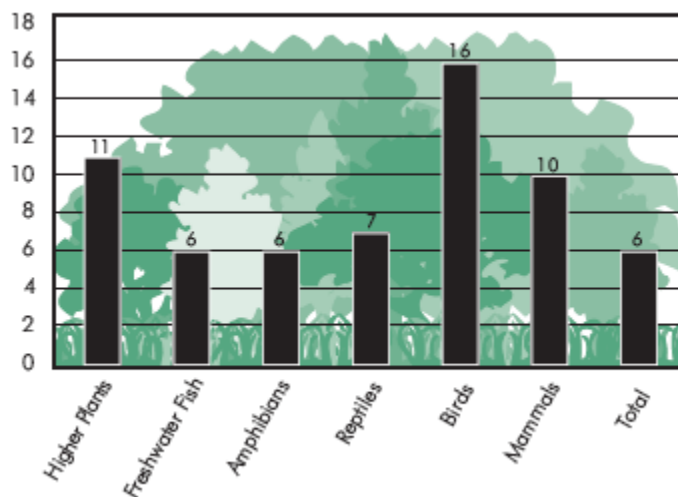


Figure 1. Indonesian Share of World Species

Source: World Resource 2000-01. Washington DC: World Resource Institute

The forests also provide a way of life for communities. A large though undetermined number of communities live in or depend on Indonesia's forests. Estimates made over the past several decades have varied wildly depending on the definitions used and the policy agenda pursued. The precise numbers of these people have been estimated at anywhere between 1.5 million and 65 million (Zerner 1992).

1.2 Forest Fire Related Problems

The frequency and intensity of forest and land fires, particularly on Kalimantan and Sumatra, has been increasing even though tropical forests contain a lot of moisture that is normally quite fire-resistant. Tropical forest will burn only after long periods of extended drought – the existence of El Niño contributed significantly to the growth of the fires of 1997-8. In addition to natural causes, some forests had been over-logged and

some degraded, creating scrub on deforested lands that is more prone to fire (Schindler et al. 1989).

There are different types of fires and it needs to be understood that not all fires are problematic – there are fires that create significant amounts of haze and those that generate much less. Land-clearing fires, lit on purpose for the establishment of plantations, do not create significant haze unless they are on peat land. Fires burning out of control in areas that are supposed to be maintained as forests, such as those that occurred in East Kalimantan in 1997-8, do create problematic amounts of haze.

According to Goldammer (1990), radiocarbon techniques have been used to date the charcoal deposits of East Kalimantan. The evidence shows that lowland forest areas have been repeatedly burned over the centuries, beginning at least 17,500 years ago during the periods of extended drought that characterized the Quaternary glacial period. Based on this evidence, forest fires are not new. However, in the last decade there have been growing concerns over the problems related to forest fires.

The first significant forest fires can be traced back to 1982-3. The way forests are managed in Indonesia combined with an El Niño event to cause damage to 210,000 km² of East Kalimantan. East Kalimantan was the location of Indonesia's first timber boom and was almost completely divided into logging concessions during the 1970s. Logging practices in this area were generally poor, leaving a vast collection of logging waste in the forests. Pioneer and secondary species grew rapidly in logged-over areas, forming a dense and fire-prone layer of ground vegetation in place of the sparse ground cover characteristic of primary rainforests (Matthews, Achmaliadi and Barber 2002).

Widespread fires recurred several times in the decade following the East Kalimantan fires. The fires burnt an estimated 500,000 ha in 1991 and nearly 5 million ha in 1994 (BAPPENAS 1999). Forest fires can obstruct development due to their enormous impact on the ecosystem through carbon emission increases and through loss of biodiversity. In addition, haze from these fires affected Singapore and Malaysia as well as Indonesia, disrupting air and sea transportation and sharply elevating air pollution levels.

The next severe forest fires were related to El Niño, which induced drought in Indonesia in 1997-8. The results were catastrophic. By early 1998, nearly 10 million ha had been affected by the fires with the damage estimated at nearly US\$10 billion. Smoke from these fires shrouded much of Southeast Asia in haze for months (Matthews, Achmaliadi and Barber 2002).

In the following years, forest and land fires in Indonesia keep occurring. However these have not been as massive as in 1997-8. But annual fires in Kalimantan and Sumatra continue to generate smog that blankets southern parts of Southeast Asia and releases large amounts of carbon. Details of hotspots in Kalimantan and Sumatra (2001-May 2006) located by the National Oceanic and Atmospheric Administration (NOAA) satellite can be seen in Table 1.

Table 1. Number of Hotspots in Kalimantan and Sumatra 2001-06

Province	2001	2002	2003	2004	2005	May 2006	Average
Riau	560	9361	5902	8096	22320	6792	8839
Central Kalimantan	135	14332	10816	13761	3192	242	7080
West Kalimantan	545	8939	9087	8387	3590	1159	5285
South Sumatra	86	6705	5401	6310	1173	2555	3705
North Sumatra	382	2052	1201	2235	4203	3524	2266
Jambi	68	996	2541	2573	967	1528	1446
South Kalimantan	630	2071	2133	2209	884	9	1323
East Kalimantan	527	2314	1034	2907	886	106	1296
Lampung	45	1844	1459	1472	425	167	902
Bangka Belitung	99	1209	1997	703	262	211	747
West Sumatra	10	379	421	451	465	2542	711
Aceh	81	813	190	292	518	1163	510
Bengkulu	2	129	209	231	222	1027	303
Riau Archipelago	32	400	221	245	797	27	287
Total	3202	51544	42612	49872	39904	21052	

Source: Walhi 2006

In 2001, the number of fires or hotspots recorded by satellite in Sumatra and Kalimantan from January to August was very low – only around 3,200. The annual number of fires since 2002 has consistently been between about 51,000 (the highest, in 2002) and about 21,000 (May 2006). Riau Province holds the record for the highest number of fires, followed by Central Kalimantan, West Kalimantan and South Sumatra (Walhi 2006).

1.3 Suspected Root Causes of Forest Fires

Almost every year, from February to March and from August to October, forest fires and the haze created by the fires puts an additional burden on social and economic activities in Indonesia. The haze also brings with it conflicting accusations of blame. The game of allocating blame for the fires that cause the haze repeats itself as regularly as the fires themselves. Actually, the causes of the fires are varied and the solutions are complex.

There are many causes of forest fires and they can be classified into several groups, including weather-related, land-usage related, illegal activities, and weaknesses in regulation. Looking at land and forest fire issues it becomes obvious that the root cause of these problems is weak regulation. The other three problems cited can be addressed if

the regulation is appropriately designed and implemented. Descriptions of each cause are presented in the following subsections.

1.3.1 Weather-related

The El Niño weather system brings with it drought that significantly contributes to forest fire problems, including the widespread smog and its accompanying enormous carbon emissions. El Niño may not directly start the fires but an El Niño drought creates a situation where it is easy for fire to start and spread rapidly, regardless of whether the fires are intentionally or unintentionally lit. In early 1997 the Indonesian Environment Ministry warned of a possible El Niño year but the warning was not effective and burning continued across vast areas of Sumatra and Kalimantan.

In 1997 the main contributors to the haze pollution that affected Singapore, mainland Malaysia and Sumatra in Indonesia were fires in the peat lands of Jambi, Riau, and South Sumatra provinces. The weather that brought the drought caused trees and grass in the peat lands to become very dry, eventually acting as a powerful fuel for fire. In non-El Niño years, the clearing of peat lands for oil palm and timber plantations appears to be the main source of forest fires that create haze (Sargeant 2001).

1.3.2 Land-use Activities

Forest fire problems can come from fires that are intentionally or unintentionally started. Some fires are used for land clearing by large and small companies that then use the cleared areas for oil palm and other plantations. Some cleared land is used to provide people with livelihoods. Both intentionally and unintentionally lit fires are dangerous because they can spread to other areas and become uncontrollable.

Many land and forest fires have been caused by the uncontrolled use of fire for land clearance. In Jambi and Riau fires were started by oil palm plantation concessionaires and in South Sumatra fires were started by small-scale farmers (Walhi 2006). The problem is often exacerbated by livelihood activities such as rice cultivation, fishing, grazing and logging (Anderson & Bowen 2000; Barber & Schweithelm 2000; and Tapper et al. 2001). In Central Kalimantan the One Million Hectares of Rice Project was the main cause of smoke exported to Malaysia and Singapore. In West and East Kalimantan fires were caused by oil palm plantations and forest concession holders.

Plantation firms and even people engaged in government projects set a significant number of fires, clearing many hectares of forest at a time (BAPPENAS 1999). Eventually fires initially set in grasslands and scrublands escaped into adjacent logged forests and burned with greater intensity. The fires continued, reaching drained peat swamps and burning beneath the surface long after above-ground fires had exhausted their fuel supplies.

1.3.3 Illegal Activities

Some fires are a result of arson. Based on the opinions of Barber and Schweithelm (2000), Potter and Lee (1998) and Wakker (2000), there are four principal reasons why people initiate fires.

Firstly, burned forest becomes degraded and degraded forest does not have protected status – so fire is a useful tool for increasing the stock of land available for conversion to plantation agriculture.

Secondly, in areas already allocated for plantations, fire is a cost-effective way of clearing the land. According to one oil palm firm operating in Central Kalimantan (Agro Indomas), land clearing by mechanical means is more than twice as expensive as setting fires.

Thirdly, oil palm fruits must be processed quickly. Agricultural products in general are perishable, so firms benefit financially if they site their processing facilities as near as possible to their plantations, thus saving on transportation costs. However, many of these accessible areas are populated and owned by farmers or local residents. Some oil palm firms hire outsiders to set fire to the land. The fires reduce the value of the land by degrading it and then the companies can more easily take over, paying local people only a small amount of compensation.

Fourthly, sometimes local inhabitants set fires to protest at the takeover of their land by oil palm firms or other plantations. In many cases local people's rights are ignored and they are not properly compensated for the loss of their land. Companies tend to take over land by force and sometimes via bribes, leaving local people with no means of supporting themselves. Often locals respond with arson, burning their land or land already owned by the firms as a means of asserting their rights and in order to drive competition away.

1.3.4 Weakness in Regulation

Other possible causes of fires are a complex web of poverty, development, and good-governance issues. These factors are closely related and have significant influence on land and forest fire issues.

Forest and land fire problems originate from the fact that the controlling forest management system does not work well. Inadequate control leads to a situation where the government (or an authorized institution) is unable to rapidly implement appropriate responses. Some fires can be contained if the authorities are aware of the situation but because of the weaknesses of the controlling system the authorities don't have enough information to fully understand the situation and so cannot act quickly. Because of the absence of a good controlling system, the authorities don't know which companies are complying with the rules and regulations and which are not. In turn, this situation makes it difficult to allocate rewards or administer punishments to companies that either disregard or follow forestry management rules and regulations.

Disputes between different groups of people who benefit from forest and land usage can also be a cause of fire. One cause of conflict is the lack of a fair system for allocating land resources between poor indigenous peoples, migrants seeking a living, and corporations expanding their investments. A transparent and fair policy is needed here. Government (both regional and/or central) policy to generate revenue and royalties from forest and land exploitation needs to be balanced with appropriate efforts to improve the welfare of the communities living near the forest and land resources, as well as the communities where the direct impact of the land exploitation is taking place.

1.4 Research Focus and Scope

The scope of forest management policy is wide so this research will focus on an assessment of policy options that address the root causes of forest fires. The research will highlight weaknesses in current government policy and try to formulate alternative policies based on examples from other countries and from the ideas of key informants.

To help sharpen the research results a study case was conducted in Riau Province. Riau is the province that has the greatest number of forest fires – based on data recorded by NOAA during 2001-06, on average, Riau had 8,839 hotspots. Central and West Kalimantan followed Riau with 7,080 and 5,285 hotspots respectively.

Although the case study was conducted in one province only, the problems of forest fires are similar regardless of which province or forest area is affected. There is not much variation in the causes, impacts and values, either for benefit or loss, that arise from using fires for land clearing or other activities. The key informants were not only from Riau Province and the institutions in Riau that relate to forest management and forest fire problems, but also from relevant institutions at a national level. Therefore, suitable policy options for a controlling system to deal with forest fires that resulted from this study apply to Indonesia as a whole.

1.5 Research Objectives

Numerous policy recommendations have been made to national and regional governments and numerous forest management initiatives have been conducted by stakeholders. However these measures seem to have been ineffective. The problems created by fires and smoke haze keep coming back year after year, especially during periods of prolonged drought. Fire prevention has been unsuccessful and fire mitigation – the reduction of the impact of forest fires and effective adaptation to the situation when fires do take hold – has slipped from government attention.

There is a need to listen to all categories of stakeholders in order to formulate appropriate and balanced regulations that weigh up all the interests related to forest and fire utilization. The regulation has to be fair, transparent and applicable and also needs to consider the involvement of stakeholders and role sharing.

Dealing with such complex issues and accommodating all forest stakeholders is one of the major challenges facing Indonesia. None of the researchers looking at the problem of forest fires claims to have found the complete answer. But it comes as no surprise to learn that they generally agree where to begin – with the government. This research will assess the status quo and some alternative policies for managing forest resources, particularly policy options to implement appropriate measures to prevent and deal with forest fire problems.

The general objective of the research is to assess policy options (both the status quo and the alternatives) in order to improve the controlling system that deals with forest fire problems in Indonesia.

The specific objectives are:

1. To evaluate and assess the policy options for forest resources management, particularly for a controlling system to prevent and mitigate forest fire based on the following criteria:
 - a. Rules and regulations
 - b. Method and operational
 - c. Skills and capacity
 - d. Compliance and enforcement
 - e. Mismatch between power and authority
2. To compare the implementation costs of the leading alternative policy options.
3. To formulate recommendations for what government can do to achieve an improved controlling system for dealing with forest fire problems in Indonesia.

1.6 Research Project Contribution

Without sufficient information, it is difficult for the authorities to design the right policies for forest fire prevention and management. Government institutions have policies in place to prevent and control forest fires but they are not well coordinated and there is a lack of enforcement so they are ineffective. There have been changes in the policies formulated and implemented but they did not increase the effectiveness of forest fire prevention efforts. Some of the policies even contradict each other. For example, before 1997 there were Ministry of Forestry decrees to prevent forest fires from starting but the decrees did not prohibit purposely-made fires. A decree of April 1997 even legally allowed people to use managed fires for a particular purpose. However in October 1997 this decree was cancelled because 1997 was the year of devastating forest fires in Indonesia.

Some regulations and decrees are rarely applied. Many factors have given rise to this situation. In general, there is no professional organization which specifically deals with preventing forest fires and no legal punishment is meted out to companies involved in forest fires. Efforts to mitigate forest fires are carried out by various institutions with little coordination and unclear objectives. These institutions also have a limited mandate, limited tools and equipment, and limited field skills with which to do their jobs. Failure to apply rules and regulations is exacerbated by a lack of political will from leaders and the justice system and limited access to forest fire data, so the relevant people are unable to develop adequate plans for forest fire prevention and management. Another reason why the rules and regulations are not applied is because different institutions have different perceptions of their roles.

2.0 RESEARCH METHODS

2.1 Research Questions

The questions addressed via this research are:

1. Which policy options for a controlling system best tackle forest fire problems? Based on assessments using criteria from the following five categories: rules and regulations, method and operational, skills and capacity, compliance and enforcement, and mismatch between power and authority.
2. Which policy option is most cost effective?
3. What does the government need to do in order to improve the controlling system?

2.2 Research Variables

The research variables used as tools to assess policy options fall into five categories, described in section 3.5 Criteria to Devise Alternative Policy Options, on pages 21-2. Each criteria had its priorities scored as low, medium, or high. A high score indicated that the policy option being evaluated had a greater advantage with the criteria and therefore was prioritized for short-term implementation.

The measurement of variable cost effectiveness is the value of cost needed to implement a particular policy option. To simplify the process of cost effectiveness calculations and to keep research to a manageable size, the research assumes that all the policies have a similar purpose – to reduce the probability of fires and/or mitigate damage if they do occur – and therefore that they will generate the same value of benefits. The cost calculated is then only the cost required to implement each particular policy.

To assess policy options and to give each of the options their scores, the research used expert opinions. The opinions were collected through interviews with KIs, academics, representatives of NGOs, and key community leaders. This approach was also applied for estimating the cost of implementation of the policy options.

2.3 Population and Samples

This research takes all stakeholders in Indonesia as the research population, including government institutions at central, provincial, and local (district) levels dealing with forest management and forest fire prevention. The stakeholders can be categorized into several groups including: government institutions, universities, NGOs, commercial companies, and communities. In order to collect the information needed for policy assessment interviews with key informants were used. The key informants were chosen from stakeholders including, government officers, academics, representatives of NGOs, company employees, and community leaders.

The greatest number of forest fire hotspots recorded by NOAA satellite between 2001 and May 2006 was in the province of Riau, so Riau was chosen as the research area.

Key informants were chosen from government institutions responsible for forest management and forest fire prevention in Riau Province. These included people from the Environmental Control Agency, the Regional Forestry Department, the Regional

Development Planning Board, the Agency for Natural Resources Conservation, and the special fire brigade for forest fires. A representative from an NGO and a representative of commercial companies that utilize forest products were also consulted. In addition, Central Government Institutions were taken as samples as well. These included the Department of Forestry, the National Forest Fire Control Centre, the National Coordinating Agency for Emergency Disaster, and the Ministry of Environment.

2.4 Method of Information Collection

The research used primary and secondary data. Primary data was collected via in-depth interviews with KIs. Questionnaires were used as a guide to aid the interviewer and to make sure the relevant data was collected. The questionnaires listed important information that needed to be covered with the KIs but during the interviews more in-depth interaction was promoted to ensure intensive discussion of the research areas. Instead of using a written survey with a potentially low rate of participation, in person and/or telephone interviews were used to collect data.

Secondary data was collected from various relevant private and public institutions. Secondary data included research reports, annual reports, and other publications. The data included recent information on the number of forest fires, forest fire distribution, and the physical and financial damage caused by forest fires. Some data sources were national and some came from the provincial Statistical Bureau. Other data was also collected from national and regional Development Planning Agencies, and environmental management at both national and provincial levels.

2.5 Procedures and Techniques for Data Processing and Analysis

Collected data, both primary and secondary, was compiled, sorted, categorized and adjusted to suit the methods employed. The purpose of this analysis was to assess and evaluate alternative policy options, as illustrated in Figure 2 on page 11.



Figure 2. Procedure for Policy Analysis

Current government policy was reviewed and evaluated to work out its relationship with forest fire problems. Based on this evaluation, a list of problems arising from weaknesses in the current policy was compiled. The weaknesses indicated policy gaps. The research employed three methods to find information about alternative policy options to fill the existing policy gaps. Firstly, information on examples of similar situations in other countries (case studies of other jurisdictions) was collected. Secondly, information was collected through interviews with key informants (KIs) in Indonesia, including forestry officials, NGOs, academics, and other appropriate individuals. Thirdly, information was collected via a case study conducted in Riau Province.

The collected information was formulated into several alternative forest management policy options. The alternative policy options were then taken to a workshop. All the stakeholder representatives were invited to the workshop, including the key informants who had initially provided the information. The workshop's purpose was to confirm which options should undergo further assessment and analysis. The workshop came up with alternative policies that could be adopted by the government. The next step was to assess these alternatives using the criteria. At this stage every alternative policy option was evaluated according to the 25 criteria within the five categories described on pages 21-2. The scoring was used to help rank the options based on priority so that the process revealed which alternative options had greater priority via

higher scores. As a complement to this analysis, the alternative policy options then went through a cost analysis.

The options were assessed using the criteria, and the valuations of cost components and the estimated value of each component were based on interviews with KIs. KIs were asked to score (low, medium, high) every policy option for each criterion. Using their expert knowledge, the KIs predicted the cost of implementing the components of a particular policy option, and they estimated the value of each cost component.

This information was once again taken to a workshop, which was composed of the same participants as the previous workshop. In this way we could make sure that the alternative policy options would be applicable, would fill policy gaps by eliminating the weaknesses in current policies, would be effective and efficient to implement compared to other options, and would be accepted by the stakeholder representatives

As well as the procedures described above, several additional methods were utilized to assess the alternative policy options. The methods were as follows:

- Literature review
- Stakeholder consultation through KI interviews
- Economic valuation through implementation cost analysis
- Workshops
- Focus group discussions

Literature review was used to assess and evaluate policy options. Studying the literature helped to stimulate ideas and formulate boundaries and ideas for interviews with KIs (see below). The literature included documents relevant to managing forest fire problems, such as previous research reports, annual reports from various government agencies and other bodies involved in forest fire prevention and mitigation, magazines and newspapers.

The purpose of stakeholder consultation was to obtain in-depth insights from all the stakeholders. Interviews were conducted with key informants, including KIs from government agencies. The KIs interviewed were asked to give their opinions on particular policy options, judging by certain criteria. They were also asked to provide their expert opinions on cost components and their estimated values for each of the leading policy options.

Economic valuation particularly applied to predicting the cost of the implementation of the policy options. It was easy to give some of the predicted costs a monetary value, but some other costs had no market value and therefore appropriate economic valuation methods were required.

Workshops were an important way of verifying personal judgments given by KIs during stakeholder consultations. At the workshops all interviewed elites and other stakeholders gathered together to do assessments of each policy option. Comments and reviews from stakeholders were collated to ensure that the leading policy options chosen were appropriate.

In addition, focus group discussions (FGDs) were held in order to sharpen the focus of the policy options assessment. The FGDs were also used as a way of verifying

data and assessment results. These FGDs were conducted before and after the workshops. Basically FGDs were conducted because data needs to be verified and because views on the acceptance of any particular policy need to be sought from the affected communities. It was with these objectives in mind that group leaders from within communities were selected for FGDs. Although we understand that communities cannot do much in relation to a policy's implementation, we feel that it is worthwhile to gain some knowledge of their point of view.

3.0 POLICY ON FOREST MANAGEMENT

3.1 Current Government Policy on Forest Management in Indonesia

We assessed current government policy on forest management in Indonesia via consultations with the staff of various institutions under the governance of the Department of Forestry, combined with data from the departments' websites and their annual reports.

The Department of Forestry formulated a forest management policy in 2002. The policy was supposed to establish forest areas and to legally conserve biological resources with the help of strong institutions. A further aim of this policy was to deliver optimal benefits to forest communities. Current government forest management policies in Indonesia are based on these objectives and can be divided into five categories. Each category is managed under one Directorate. The categories are:

1. Forest Fire Control
2. Forest Inventory and Protection
3. Environmental and Natural Services Utilization
4. Biodiversity Conservation
5. Area Conservation

The Forest Fire Control Directorate aims to manage land and forest fires properly and to protect communities from the negative impacts of fires. The Forest Inventory and Protection Directorate prepares and formulates policy, standards, and technical guidance in forest inventory and protection. The Environmental and Natural Services Utilization Directorate develops forest services by utilizing environmental and natural resources to gain added value. The Biodiversity Conservation Directorate ensures that ecosystem functions, which are essential for life, are properly maintained. The Area Conservation Directorate has a remit to ensure the sustainability and good management of designated forest areas.

In relation to fire problems, there have been two main acts regarding the regulation of land and forest fire management in Indonesia. They are Act No. 41/1999, concerning forestry, and Government Regulation No. 4/2001 concerning controlling environmental damage and/or pollution associated with forest and land fire.

The problem of forest fires is one of the five national priority programs. The government of Indonesia (Ministry of Forestry) has determined that the fire problems include land fires and forest fires and that prevention measures have priority. Local communities are involved in both designing and implementing the program.

Overall, the control program for land and forest fires is implemented in three main policies: the institutional development policy, the technical operational policy, and the community participation and empowerment policy.

3.1.1 Institutional Development Policy

The purpose of the institutional development policy is to strengthen institutional capacity (organizational, facilities and equipment, regulation and funding) and the capabilities of all stakeholders involved in land and forest fire management. This consists of (1) establishing a priority program called Forest Fire Brigades or Manggala Agni, (2) procuring adequate fire-fighting equipment, (3) improving forest fire management and control systems (4) strengthening inter-sector cooperation and coordination and (5) strengthening foreign cooperation and coordination.

1. Institutional Development

1. Establishment of Forest Fire Control Brigades (Manggala Agni)
2. Development of Forest Fire Control Equipment and Supplies
3. Development of the Forest Fire Control System
4. Strengthening Inter-sector Cooperation and Coordination
5. Strengthening International Cooperation

3.1.2 Technical Operational Policy

The technical operational policy includes three sub policies: fire prevention, suppression and impact mitigation. (1) The fire prevention policy aims to increase people's awareness of the damage and negative impacts of fire on forest resources and the environment. It also tries to control combustible fuels, the sources of fires and to improve early detection and early warning measures. (2) The emphasis of the fire suppression policy is empowerment – the empowerment of people to use the available fire-fighting equipment to suppress fires as soon as they start. (3) The focus of the fire impact mitigation policy is law enforcement, the prosecution of individuals who break forest fire laws, and the rehabilitation of burned areas. Some of the important initiatives within this policy are the development of a forest and land fire campaign, an increase in early warning and detection capability, fire-fighting operations, and promoting adverse impact mitigation activities.

2. Technical Operation

1. Forest Fire Prevention
 - a. Forest Fire Control Campaign
 - b. Strengthening Early Warning and Detection of Forest Fire
2. Forest Fire Suppression
3. Forest Fire Post-Suppression

3.1.3 Community Participation and Empowerment Policy

This policy proposes an increase in local community involvement and empowerment in forest and land fire management, as well as a strengthening of commitment to the protection of natural resources from fire hazards. The policy promotes increased local community participation by establishing village fire brigades and introducing non-fire land preparation technology (zero burning). The latter program has been implemented through the establishment of a home charcoal industry pilot project,

using material from unburned vegetation trash and debris collected during site preparation.

3. Community Participation and Empowerment Policy
 1. Promotion of Public Participation
 2. Community Empowerment

3.2 Policy Implementation

The above policies are implemented using a variety of strategies. These strategies address land and forest fire problems caused by many factors. The following strategies have been developed by the Ministry of Forestry to suit different purposes. (1) Strengthening coordination and cooperation between institutions at both national and local level. (2) Establishing the effective prevention, suppression, and post-fire management of land and forest fires. (3) Supporting public empowerment and participation in land and forest fire controls, including all stakeholders.

Non-forest factors have a significant influence on the formation of forest policy and in the drive to strengthen institutions involved in forest management in Indonesia. Many issues have no direct relation to forests but significantly affect policy and the institutions that deal with forest management (Matthews, Achmaliadi and Barber 2002). Indonesia's multiple economic, political and social crises offer an important context for the challenges facing efforts to slow deforestation, reform forest policy, and strengthen forestry institutions.

The government began developing new policies in the aftermath of the fires of 1994. International aid agencies increased their support for fire-related programs and for the first time the Association of Southeast Asian Nations (ASEAN) began to discuss Indonesia's fires as a regional problem (State Ministry for Environment and UNDP, 1998). Yet forest degradation and deforestation in Indonesia continued to intensify during the 1990s, with increasing pressure on forest lands from developers of oil palm and timber plantations.

An intensive multi-national collaboration began at the end of 1997. Scientists from CIFOR (Center for International Forestry Research) and ICRAF (International Centre for Research in Agroforestry) met with representatives of the US government to plan an in-depth study on the causes and impact of forest fires. This activity was funded by the US Forest Service and the US Agency for International Development. In order to support analysis of the causes of forest fires, as well as to provide a better basic program for fire monitoring, remote sensing technology was combined with studies of local social conditions.

The first study was conducted in Lampung Province, Sumatra, and Kalimantan in Timur Province, two places where forest fires were frequent during 1997-8. The US Forest Service took responsibility for the coordination of data collection through remote sensing, while CIFOR and ICRAF conducted field studies in order to verify secondary data with real conditions in the field. The field studies identified land utilization, social and economic issues affecting forest fires, and the main factors affecting forest fires.

Since this time many other studies have been carried out and many policies have been formulated and implemented but the problems presented by forest fires have still not been satisfactorily addressed.

3.3 Sustainability of Current Government Policy

Weaknesses in current government policy in Indonesia have rendered efforts to address the forest fire problem unsuccessful. These weaknesses have created gaps in policy implementation and demonstrate that policy options that target these gaps are needed.

Maintaining the status quo in current government policy brings with it the risk of intensifying land and forest fire problems, particularly with the threat of increasing global temperatures thanks to climate change. Climate change will also bring with it more frequent and prolonged droughts and previous experience has shown us that this increases the seriousness of forest fires and their impact.

The need to change forest fire policy is obvious even though there have been many improvements, particularly in extinguishing fires and in understanding the causes of fires. There is clear evidence that implementation in the field needs to be increased and that the findings of different researchers from different institutions and research centres need to be adopted and implemented with strong support from the authorities. A monitoring, recording and reporting system needs to run alongside these increased and expanded measures. The structure and procedures of the current monitoring system needs to change and the people involved need to become empowered. Additionally, the current policy does not provide enough incentives or disincentives for people to follow or break the rules and regulations relating to the prevention of land and forest fires.

3.4 Policy Gaps in Current Government Policy

The weaknesses and policy gaps in current government policy vary widely. For the purpose of analysis, we have split these areas into five fields:

1. Rules and regulations
2. Method and operational
3. Skills and capacity
4. Compliance and enforcement
5. Mismatch between power and authority

3.4.1 Rules and Regulations

The rules and regulations are not consistent and lead to low levels of law enforcement. The decision-making process is not transparent, there are inadequate mandates, and it is unclear which institution has authority and responsibility. In order to create a policy that will lead to good governance in forest resources management, decisions need to be made in a manner that is just and fair to all stakeholders – in other words the decision-making process has to be transparent and decision-makers need to be held to account. The capacity of forest-dependent communities and excluded groups to

participate in decision-making needs to be increased so that greater social and environmental corporate responsibility is promoted in the forestry sector (CIFOR 2007). These approaches would also support the transformation of national and local government policies so that they promote more effective and fairer forest management, including forest fire prevention.

Unclear institutional authority and responsibility and inadequate mandates (State Ministry of Environment and UNDP, 1998) are significant problems. In February 2001 the government issued new regulation on forest fires (Government Regulation No. 4, 2001). This regulation addressed the pollution and damage to the environment caused by forest and land fires. The new regulation set out the responsibilities of government at different levels (central, provincial, and district) for handling fires. This regulation was an attempt to stop buck-passing amongst various branches of government – buck-passing that hindered fire prevention and fire-fighting efforts (*Tempo*, 17-23 July, 2001). However, the situation did not improve. Widespread fires were burning in many parts of Sumatra and Kalimantan by mid-July, 2001, spreading haze as far as Malaysia and southern Thailand (Agence France-Presse, 2001).

The rules and regulations are not consistent – probably due to unclear objectives and limited technical knowledge about the fires. According to Matthews, Achmaliadi, and Barber (2002), before 1997 numerous Ministry decrees dealt with fire prevention in forest areas but intentional burning was not strictly prohibited. In fact, in April 1997 there was a decree legalizing the practice of controlled burning that even set out technical guidelines for burning. This decree was revoked in October 1997 as a result of that year's disastrous fires. A new decree was applied which prohibited the use of fire for land clearance on state forest lands. The Ministry of Agriculture established a zero burning policy for land clearance by decree (1995), and the Ministry of Transmigration and Settlement of Forest Dwellers established a similar policy for the preparation of transmigration areas in April 1997.

Indonesia has a variety of environmental and other laws that criminalize intentional burning, both nationally and at provincial level. But the enforcement of these laws is rare. Even in the aftermath of the 1997-8 fires, almost no legal action was taken against companies who set fires and no substantial legal penalties were handed down. Failure to implement existing laws was caused by many factors including: a lack of political will on the part of law enforcement agencies; a lack of access by enforcement authorities to data on fires; a lack of facilities and equipment to support field investigations; differing perceptions by various agencies on what constitutes adequate legal proof of intentional burning; a lack of understanding of legal provisions on corporate crime that would allow for companies, rather than individual employees, to be prosecuted; a lack of integrity on the part of law enforcement authorities; and conflicts of interest among agencies, some of which are charged with conservation and fire suppression, others with the promotion of plantation and agricultural products.

3.4.2 Method and Operational

Weaknesses in this area include no analysis of the costs and benefits of policy actions, inappropriate policy responses, uncoordinated government agencies, duplication of functions across agencies, and a tendency to detect and control fires rather than to prevent them. Many policies have been established without any analysis of their costs or their benefits in addressing forest fire problems and its root causes (Tacconi 2003).

Determining appropriate policy responses is one of the problems regarding improvement in forest fire management (Colfer 2002). One strategy option is to campaign for fire prevention. Abberger (2004) indicated that there are no specific details given on the involvement of other agencies in the planning and implementation of this policy. This is an example of why policy assessment is needed – there is a need to evaluate whether or not policies are appropriate and are well implemented.

Specific fire-related policy advice includes replacing the current impractical and unenforceable zero-burning policy with one that allows land clearing by judicious use of fire where appropriate but bans it during extremely dry years. It includes implementing better management of land clearing fires in peat lands. It also includes developing transparent systems that reconcile traditional land claims and modern law and thus discourage people from seeking their own searing brand of justice. And it includes spending money on fire prevention systems and on land-clearing machinery and training for farming communities – not wasting it on ineffectual fire-fighting equipment and suppression measures, such as the almost \$1 million spent on cloud seeding during 1997-8 (Matthews, Achmaliadi and Barber 2002).

Different agencies are responsible for fire prevention and fire suppression in South and Central Kalimantan. Several government agencies have fire prevention and control policies but they are not well coordinated and are generally not enforced. A review by the State Ministry for Environment and the United Nations Development Programme (1998) concluded that the existing regulations “are apparently not effective to control fires. Furthermore, there are indications that concessionaires have become parasites inside the government body. It also looks as if government subsidizes concessionaires for using fires. The concessionaires gain benefits by burning plantation land for minimizing land clearing costs while the government pours fund to concessionaires for regional development.” (Walhi 2006).

Duplication of functions between institutions that deal with forest fire problems is a significant weakness in Indonesian forest fire policy (State Ministry of Environment and UNDP 1998).

Government initiatives on forest fires prioritize activities to detect and control fires rather than activities to prevent them in the first place. For example, government programs emphasize infrastructure provision for firefighters and for creating a system of fire detection. Meanwhile, policy or law enforcement activities are not directed towards preventing the use of burning to clear forests. It is clichéd but true: prevention is better than cure. Even the best-equipped fire force in the world will still need the next monsoon to put out Indonesia’s fires. Meanwhile the meteorological cauldron will be cooking up the next, even hotter, El Niño.

3.4.3 Skills and Capacity

A central weakness in this area is that the Indonesian government does not really know what needs to be done to combat forest fires. In addition, local institutions are weak, there is confusion over the nature of policy problems, there is limited knowledge of the fires’ economic and ecological impacts, and the causes of forest fires are unclear. These weaknesses were highlighted when severe forest fires once again burned through many parts of Sumatra and Kalimantan in mid-2001, creating a haze which reached Malaysia and southern Thailand. The Minister of Forestry’s response to this newest

round of fires was to tell the press: “So far, we don’t have a clear blueprint of how to cope with the problem. We will start to prepare it,” (*Straits Times*, 12 July, 2001).

Measures to address forest fire problems are undermined by weak local institutions (State Ministry of Environment and UNDP 1998). Besides this there are other constraints; confusion over the nature of policy problems reduce the effectiveness of the policies applied; limited knowledge of the economic and ecological impacts of forest fires leads to a situation where fires are not taken seriously enough. A lack of understanding of the causes of forest fires – for instance, it is still being debated whether the fires are natural or man-made (Colfer 2002) – makes the implementation of forest fire policy unsuccessful.

3.4.4 Compliance and Enforcement

Weaknesses in this category include firms failing to comply with the rules and regulations of forest resource management, a lack of accurate data on forest resource utilization, insufficient and unreliable monitoring systems, little law enforcement, and an accompanying absence of punishment and reward.

Without a reliable monitoring system there is insufficient data on the utilization of forest resources by firms and households. Because of this the authorities have difficulty deciding on appropriate action for forest resource management. The authorities also do not have enough information on which activities should be rewarded and which ones should be punished. Consequently, law enforcement is practically non-existent.

Many firms and individuals take advantage of the fact that exploiting forest resources has the potential for huge financial gain with little or no risk of prosecution. They consume forest resources with no thought of planetary sustainability and take no heed of existing rules and regulations. An improvement in the monitoring system must take place if this situation is to be dealt with. A good monitoring system would facilitate the formulation of appropriate fire-prevention policies and could help to provide relevant data to enable law enforcement (by, for example, identifying which companies ignore the rules and regulations).

3.4.5 Mismatch between Power and Authority

There are several areas of weakness in this category. There is a mismatch between the power and authority of central government and local government. Long delays can occur between a central government decision on a forest fire problem and the local government response to these decisions. There is a lack of coordination between different levels of government, particularly with regard to permit creation. Local government has limited research and development skills and the influence of bribery and corruption is ever-present.

Sometimes fires do not spread immediately and it is possible to reduce or halt them using local staff and resources. But often local government needs to take action that exceeds its authority. The current law states that the decision to execute the required fire-fighting actions rests with central government. If local government tries to take steps towards fire-mitigation it can be judged as having broken the law, and some individuals or interest groups are quite happy to let local government take the blame. So, instead of taking immediate action, local governments do not want to be held responsible for breaking the law and instead choose to report the problem to central government and await their decision. Bureaucracy ensures that a decision can take considerable time.

This delay gives the fires time to grow and spread, rendering the proposed actions inappropriate. Typically, a revised action is proposed in response to the changed situation but is subject to the same lengthy approval process and delays.

Another weakness is lack of coordination. For example, in South Kalimantan all the potentially productive forest areas have been allocated to large companies with concession rights. Local government was not involved in this process because consultation between central and local government is very limited – even though the negative impacts of deforestation and its attached problems are felt at local level. Again, central government needs time to deal with this situation but local communities need immediate help. In the case of floods for example, people don't have the luxury of waiting for central government to make decisions and take action, they have to survive by whatever means possible. In a situation such as this local government is the first institution to be blamed for the problems and also the first institution people approach to ask for help. Another consequence of a lack of coordination is that many local governments issue land-clearing permits to areas that have already been allocated to other companies by central government – and we know from experience that unclear property rights lead to more rapid destruction of natural resources.

Limited skills and knowledge among local government staff also contributes to forest fire problems. If staff don't understand what needs to be done or what factors have to be eliminated in order to prevent or mitigate forest fires, it is unlikely that a policy of any kind will be successful. This situation is aggravated by bribery and corruption.

3.5 Criteria to Devise Alternative Policy Options

Alternative policy options need to address the weaknesses in current policy described in the five categories above. New policy options have to be able to remove or eliminate the weaknesses in each category. In order to be sure of this objective we selected 25 criteria grouped into the five categories. If an alternative policy met the criteria then it was deemed capable of addressing a policy gap or policy weaknesses. Each criterion was measured in order to indicate how an alternative policy option fared compared with others.

The criteria used to assess alternative policy options were as follows.

Table 2. Category-Based Criteria for Policy Options Assessment

No	Criteria	Category
1	a. Making the decision-making process transparent and accountable. All stakeholders and communities should be provided with access to the decision-making process and the formulation of policy.	Rules and regulations
2	b. Determining and implementing adequate mandates for relevant government agencies and other stakeholders to deal with the problems of forest fires.	
3	c. Making clear to stakeholders what authority institutions have and distributing responsibilities to institutions based on their authority.	
4	d. Making an effort to ensure that all the rules and regulations regarding forest fires are consistent and well coordinated.	
5	e. Making sure that rules and regulations that have been devised and agreed are applied and that there is sufficient law enforcement.	
6	a. The study and analysis of each policy's ability to deal with forest fire problems.	Method and operational
7	b. Choosing policies that appropriately respond to or anticipate forest fire problems.	
8	c. Improving activities by government agencies to deal with forest fires and ensuring coordination and collaboration between government agencies and between government agencies and other stakeholders.	
9	d. Working comprehensively across agencies to avoid duplicating functions and to use resources efficiently.	
10	e. Promoting fire prevention activities rather than detection and control.	
11	a. Improving the skills and capacities of relevant government agency staff to ensure that they understand the nature of forest fire problems and fully understand what is needed to address the problems.	Skills and capacity
12	b. Improving the ability of local government agencies to deal directly with forest fire prevention and mitigation.	
13	c. Taking appropriate action to eliminate confusion over the nature of policy problems.	

No	Criteria	Category
14	d. Promoting training for key staff to improve their knowledge of the economic and ecological impacts of forest fires and of the policies designed to address these problems.	
15	e. Providing and facilitating measures, tools, and activities to clarify the causes of forest fire problems.	
16	a. Make firms utilizing forest resources comply with rules and regulations on forest management.	Compliance and enforcement
17	b. Support the generation of accurate data on the activities of anyone/any company engaged in utilizing forest resources.	
18	c. Support law enforcement.	
19	d. Improve procedures and systems for monitoring to ensure that reported data is correlated with the findings of activities in the field.	
20	e. Implementing rewards and punishments to all parties involving in utilizing forest resources, based on compliance.	
21	a. Giving local governments the power and authority to address the problems of forest fires.	Mismatch between power and authority
22	b. Enabling a timely response to forest fires from central government – before the problem gets worse and spirals out of control.	
23	c. Enabling coordination between all levels of government regarding the issuing of permits to utilize forest resources.	
24	d. Establishing anti-bribery and anti-corruption procedures (and a monitoring system) for all parties involved in forest management.	
25	e. Improving the R&D capacities of local governments so that they can appropriately respond to the situations that lead to forest fire problems.	

4.0 OVERSEAS POLICIES FOR FOREST FIRE CONTROL

4.1 Differences and Similarities between Countries

Policies vary widely across different countries. Some countries seem to have concentrated policies to address forest fire problems and some countries are less concentrated. The intensity of forest fires in a country may be one of the factors that determines how a country develops and formulates a policy for dealing with forest fire

problems. The differences between policies are too significant if we compare country with country. However, these differences seem to form three patterns: differences in the technology being used; differences in the focus of improvement, and differences in sources of funding. Based on these patterns it seems that there are two types of country groups; western/developed countries and eastern/developing countries.

In developed countries, the use of new technology is dominant. For example, to support improved fire detection Australia utilizes advance information technology equipment. There has been significant investment in fire-fighting equipment in the USA, Canada and Germany. In developing countries on the other hand, policies that address forest fire are more reliant on improving traditional approaches. Local wisdom for dealing with forest fire problems is being formalized and improved upon. After some adjustment, much local wisdom is being accepted as national policy in many countries. In India the *jhum* burning tradition has been formalized into the Mizoram rules, Tanzania focuses on strengthened local ownership, Vietnam allocates forest lands to communities, and in the Gambia traditional methods of maintaining fire breaks around forest patches are promoted.

If we look at sources of funding for forest fire policies there is also a clear difference between developed and developing countries. These two groups of countries have different levels of national income – so developed countries fund forest fire policies themselves, whereas developing countries have to be supported by other countries in addition to their own funds.

Another difference between developed and developing countries is in the focus of improvement. In developed countries improvements have focused on rules, regulations and technology. The establishment of the Healthy Forest Initiative (HFI) in the USA, the implementation of fire detection systems in Australia, and the development of procedures and systems for assessing forest fire threats to wildfire in Canada are some examples of these improvements.

Conversely, in developing countries the focus of improvement is mostly on the improvement of human resources. The fire program in the Philippines concentrates on improved organizational capability, Vietnam is improving the organization of forest fire crews, local forest rangers, and community committees, Thailand is empowering the community via the Community Based Fire Management (CBFM) program.

Despite the differences between developed and developing countries, there are also several commonalities that can be extracted as general ingredients of forest and land management policies all over the world. These include:

1. Community involvement
2. Legal and formal programs
3. Support of continuously improving regulation and institutional engineering
4. International collaboration

4.1.1 Community Involvement

Many countries find that communities play significant roles in ensuring the achievement of forest and land fire management objectives. Community involvement is not the same in every country. Community involvement can be increased by transferring

the ownership of land or forests back to the community. In Vietnam and Tanzania forest and land has been given back to the community and this has proved to be an effective way to support forest and land conservation. In other countries, such as India, Namibia, South Africa, the Gambia, and Thailand, the involvement of the community takes the form of using their skills and expertise to design, implement and monitor land and forest fire management programs.

The involvement of the community increases their authority over and responsibility for forests and also improves the reporting mechanism should there be a forest or land fire problem. If a community is involved in monitoring and reporting fires then the fires can be handled at source, before they get out of control.

4.1.2 Legal and Formal Programs

We can see from the policies of many countries that the legal and formal aspects of programs are important. A formal fire management program that is introduced and implemented via government decree or any other relevant regulation strengthens policy and ensures a higher percentage of stakeholder compliance than voluntary programs or programs introduced by a particular group. Adequate support of the legal and formal aspects of a program create an atmosphere conducive to the enforcement of law. Proper enforcement of violations of rules and regulations deter other stakeholders from repeating similar mistakes.

4.1.3 Support of Continuously Improving Regulation and Institutional Engineering

Another common feature of overseas policies of forest and land fire management is considerable support for improving regulation and institutional engineering. Some countries, such as the USA, Australia, Canada and Germany, focus on the implementation of improved regulations. The implementation of HFI (Healthy Forests Initiative), FRCC (Fire Regime Condition Class), SPLATs (Strategically Placed Landscape Area Treatments) and DFPZs (Defensible Fuel Profile Zones) in the USA give some idea of how the USA keeps trying to improve fire regulation. In Australia the government has introduced fire detection systems, assessment systems, enhanced firefighter management systems, and improved communication. In Canada wildfire assessment procedures are combined with strategies and techniques to reduce the area burned and with the synthesis and distribution of information that will mitigate the threat of wildfire.

Other countries, e.g. Vietnam, Thailand and the Philippines, focus on the social and community aspects of fire management and on the creation of institutions that can appropriately address the problems of forest and land fires. Vietnam gives communities a central role in addressing forest and land fire problems; the Philippines is working to improve DENR (Department of Environment and Natural Resources) capability, together with strengthening community members. Thailand has implemented a Community Based Forest Fire Management (CBFiM) program.

4.1.4 International Collaboration

Many of the problems caused by forest fires cross administrative borders such as districts, provinces, and even countries, much like the haze itself. Burned forest in Indonesia is mostly located in Riau, West Sumatra, West Kalimantan and Central Kalimantan, but the haze affects people in Singapore, Malaysia, and even Vietnam.

Dennis (1999) pointed out that the fires of 1982-3 were the first to bring Indonesia's forest and land fires to the attention of the world. Since then, numerous reports have been written, seminars and training courses given, fire-fighting equipment distributed, and short- and long-term fire assessment and management projects undertaken. The emergency status of the fires of 1982-3 prompted international donors and agencies to provide support to Indonesia, either in cash or in kind.

Members of the international community include UN agencies such as UN OCHA (Office for Coordination of Humanitarian Affairs), UNICEF, UNESCO, and WHO. Donor countries include Australia, Canada, Denmark, Finland, France, Germany, Japan, Malaysia, Norway, the People's Republic of China, the Russian Federation, Singapore, South Korea, Sweden, Switzerland, Thailand, Taiwan, the United Kingdom, and the United States.

4.2 Learning from Overseas Policies

In pursuance of the research objective (to assess policy options, both current and alternatives, with the aim of improving the controlling system for dealing with forest fire problems in Indonesia) fire management policies from countries around the world have been reviewed. The relevant results should be adopted in order to improve existing policies in Indonesia.

Many factors contribute to forest fires. The suspected central root cause of forest fire problems is that the current controlling system does not support policy, which has in fact been formulated reasonably well. Initial assessments of the existing policy on forest fires in Indonesia have identified five areas of weaknesses: rules and regulations, method and operationals, skills and capacity, compliance and enforcement, and mismatch between power and authority.

Increasing the level of community involvement in Indonesian forest fire policies appears to make a positive contribution to the effectiveness of the policy. One of the policy weaknesses in the category of mismatch between power and authority is the fact that local government is unable to take the action needed to fight fires as quickly as possible, partly because of a lack of authority but also because they don't have adequate resources. Giving communities greater involvement would lend local government significant support in managing and controlling fires. The active involvement of the community would also lead to earlier fire detection because people living in affected areas are aware of fires or hotspots as soon as they occur.

Indonesia has a community involvement program, managed via the community participation and empowerment policy (page 14). The program has been implemented in many places and community participation has been raised. However, the impact of this policy would be more significant if its implementation were expanded and intensified.

The policy of increased public participation should be more actively pursued alongside the provision of training to improve community skills and sense of empowerment.

Community involvement also helps to address weaknesses in skills and capacity. One particular weakness is centred in the lack of strength in local institutions. Improving community involvement could provide opportunities for local institutions to participate more actively in forest fire management and to become empowered in the area of policy development. In addition, appropriate responses could be identified and response times could be shortened. These improvements would be cost-efficient because local institutions are in an ideal position to apply traditional wisdom and techniques to fire situations.

If we assess existing fire management policies in Indonesia and compare them with the legal and formal aspects of overseas policy, it becomes obvious that this is an area where serious review and improvements are required. Improvements in the legal and formal aspects of fire policy could help to address some of the gaps in current policy in Indonesia, in particular gaps in the following categories: rules and regulations, compliance and enforcement, and mismatch between power and authority. In the category of rules and regulations, weaknesses include inadequate mandates, unclear institutional authority and responsibility, inconsistent rules and regulations, and little or no law enforcement. All of these issues could be addressed if legal and formal programs were appropriately applied. A legal and formal program could help to clarify areas of authority and responsibility, could adequately assign mandates, and make it easier to check the consistency of new rules compared with existing rules. These measures would certainly also help the establishment of law enforcement, which is a significant weakness with regard to compliance. Properly formulated rules and regulations, backed up with formal support and legal clout, would help to clarify who is responsible for what and what the punishment is for neglected responsibilities – this would also help to close the gap between power and authority.

Continuously improving regulation and institutional engineering is another common ingredient of forest fire policy gleaned from overseas. Improvement in these areas would contribute to addressing policy gaps in all categories but particularly within rules and regulations and the mismatch between power and authority. Continuously improving regulation is able to accommodate change and can adjust to new conditions – sometimes a rule is needed almost immediately to respond to or to anticipate a new situation. The need for greater powers for local government staff could be met by continuously improving regulation. In addition, improved institutional engineering could help to ensure that local staff capabilities are up-to-date and sufficient to deal with forest or land fires in their areas.

Finally, well-developed collaboration with the international community makes a significant contribution towards the effectiveness of forest fire policy. Appropriate, timely and effective international collaboration can help to address policy gaps in all categories.

5.0 PROPOSED POLICY IMPROVEMENT

The following pages contain proposed policy improvements. We have summarized these proposals based on the insights shared and suggestions made by key informants during interviews. Key informants looked at the current policies and reviewed them in light of their experiences. They then came up with proposed improvements. They believe that these improvements could fill the policy gaps and could help to improve the effectiveness of policies in dealing with forest and land fire problems.

The proposed policy improvements are categorized into three areas: institutions, implementation, and community involvement. Improvements in institutions include: expanding the role of Manggala Agni (fire brigade), developing a super agency, and devising more effective institutions and agencies. Improvements in implementation include: improved policy implementation, improved training of law enforcers, improved law enforcement, and the introduction of technology to both utilize and conserve the forests. Improvements in community involvement mainly concern promoting community participation.

5.1 The Improvement of Institutions

5.1.1 Expanding the Role of Manggala Agni

Manggala Agni (fire brigade) is an institution that was established by the Department of Forestry to prevent land and forest fires in Indonesia, especially in forests that have been designated conservation areas. The brigade was formed to deal with forest and land fire management, particularly policies related to the empowerment of fire management institutions at all levels (local, regional, and central government). The brigade was also created as a model for stakeholders in the development of institutions concerned with the management of forest and land fires. Manggala Agni's mandate needs to be expanded to match its tasks. Manggala Agni needs to have adequate authority and power to carry out its job in a timely, efficient and effective manner. More brigade units need to be established so that they are not responsible for such large areas of land. An appropriate budget is needed for this expansion as well as some delegation of authority from central government.

5.1.2 Developing a Super Agency

Almost no one who uses fire to clear their land is brought to justice. Some people do go to trial but no one has been sent to jail. Why is this the case? Because these individuals use loopholes and alibis in order to avoid prosecution. Burning on a Friday afternoon is a preferred alibi – if burning takes place on a Friday afternoon offenders can claim that they were not on site when the fires started (because they were at Friday afternoon prayers). If their case is brought to court they argue that they were not at the location, therefore they didn't know about the fires and so are not responsible for them.

This kind of practice implies the need for a super agency (something similar to KPK, Komite Pemberantasan Korupsi, the Corruption Eradication Committee). This

body could conduct necessary efforts to prevent fires and could collect information so that the people responsible for forest fires do not have a way to escape responsibility.

Another function of a super agency would be to coordinate responses to fire problems. A super agency could hold all the authority and responsibility which was previously divided between different agencies. Many responses to fire problems are not put into action quickly enough, often because there are too many agencies and institutions involved, each with their own differing levels of authority. Sometimes action taken by institutions overlaps and sometimes no action is taken at all.

5.1.3 Devising More Effective Institutions and Agencies

Many institutions and agencies have been set up as part of forest fire policy in Indonesia. Some of them function very effectively and others still need improvement. One possible way of ensuring that an institution is working effectively is to implement policies in smaller units and to support agencies with adequate authority and power (including tools, technology, and budget).

There is a need to make people/institutions responsible for forest and land fires. Workforces and institutions need to be properly formulated and they have to be backed up by appropriate and adequate budget allocations. In addition, a punishment and reward system needs to be implemented and the Kabupaten (district) level of government needs to have adequate power and authority. Most of all, there needs to be a regulation that states that a land owner who uses fires for land clearing or land cultivation will need to pay a fine.

5.2 The Improvement of Implementation

5.2.1 Improved Policy Implementation

Policy implementation in the field should be improved so that well designed rules and regulations can be properly implemented and so that recommendations for forest and land fire management can be realized. To enable this many rules and regulations need to be reviewed and matched up with conditions in the field.

Some rules need adjustment so that they can be implemented at district level. In interviews with key informants it emerged that some rules and regulations have been well designed by central government to work at national and provincial level but are problematic when applied at district level. These problems in implementation have been caused by a mismatch between power and authority and by a lack of coordination and delegation between central government and local government.

5.2.2 Improved Training of Law Enforcers

Some respondents mentioned that upholders of the law do not always have much knowledge of the environment and so they do not care about conservation and the prevention of forest and land fires. There is a need to improve human resources in the area of law enforcement (police, attorneys, and judges) through relevant training and education because only when these professionals understand the importance of the environment will they will act responsibly regarding the enforcement of its preservation.

5.2.3 Improved Law Enforcement

In fact Indonesian laws and acts (Undang-Undang, UU) and government regulation (Peraturan Pemerintah, PP) regarding the prevention of forest and land fires is sufficient and well designed. According to these rules it is mandatory for every person to take care of the environment with a view to sustainability. It is mandatory for people to safeguard against pollution and environmental damage in the areas they are responsible for. It is also law that every single estate plantation owner has to avoid land clearing and/or land cultivation by means of fire. There are also penalties for anyone who breaks these laws. But, at present, almost no one who has broken the law has been brought to justice. It is very expensive to bring a person who has broken the law to court because witnesses are needed to prove that a law has been violated.

These rules, regulations and penalties are clearly stated in Government Regulation No. 4, 2001, concerning Controlling Environment Damage and/or Pollution regarding Land and/or Forest Fire. Article 11 states that every person is prohibited from engaging in forest and/or land fire activities. Article 12 states that it is mandatory for every person to avoid causing environmental damage and/or pollution because of land and/or forest fire. Article 14 states that it is mandatory for every company chairperson to put in place an infrastructure to prevent land and/or forest fires; examples of this kind of infrastructure include early warning systems, fire-prevention equipment, standard operating procedures, and appropriate training.

Currently, different people and institutions are responsible for fire control in different areas. The Forestry Service and the Forest Plantation Company are responsible for commercial forest, Local Government is responsible for protected forest, the Estate Plantation Company is responsible for their own areas, and on agricultural land responsibility is held by farmers.

At the present time many people still use fire to clear land in agricultural and estate plantation areas. This is because land clearing by fire is easier, cheaper, and faster. These activities continue because there is no adequate enforcement of the law. Zero burning must be enforced because there is evidence that forest and land fires are planned and set on purpose. Forest fires on estate plantations that were lit on purpose have some common characteristics.

1. The Friday afternoon alibi – the staff were not at work so they couldn't possibly have lit the fires.
2. The spider web method – a particular way of lighting fires that is an effective way to get fires going on all the areas that need to be cleared.
3. Annual planning fires – the burned areas are in current use and need to be cleared.

Good law enforcement would make the implementation of rules and regulations more effective – it would also prevent other people from repeating these violations.

5.2.4 The Introduction of Appropriate Technology to Utilize and Conserve Forests

Many people in Indonesia engage in subsistence agriculture and most of them use fire to clear land for cultivation. These practices have been in place for many years. It is not fair to prohibit them from using fire without showing them an alternative method of

land clearance. There is an urgent need to find appropriate (conservation-sensitive) land-clearing technology and a suitably profitable method of utilizing land and forest areas for cultivation so that communities have incentives to work towards conservation.

A solution has already been implemented in one small area. The Department of Forestry and the Ministry of Environment have set aside machines for composting and for making charcoal briquettes. These methods avoid the use of fire and provide an additional income for farmers. At the moment it is difficult to obtain fertilizer and even if it is available it is very expensive and sometimes it is counterfeit. Compost is an excellent alternative to fertilizer and is good for the environment. Kerosene is also scarce and yet it is fundamental to people's daily needs. Processing stems and branches from trees on their own land to be turned into charcoal briquettes takes away the need for forest fires and also empowers communities by offering them a better life.

These new technologies should be disseminated and implemented as soon as possible to villages with land and/or forest fire issues. The program should be rolled out at district and province level, not only from central government departments.

5.3 Improvement in Community Involvement

Community involvement is a very important factor that contributes to the success of fire prevention and mitigation programs. The experiences of other countries shows that the involvement of the community is significant.

Community involvement in Indonesia needs to be improved. The form and intensity of this involvement will differ from one location to another, and from one period of time to another. In some cases involvement in the form of participation is suitable but in other cases more authoritative roles may be needed. Extinguishing forest fires is easier and more effective when the fire is still small and controllable. It is obvious that at this point of the involvement of the local community is needed – with their participation monitoring can be done more effectively and information can be communicated more quickly. In turn, appropriate responses can be delivered on time as and when they are required. A mechanism such as this would help efforts to locate and handle fires so that they do not expand and become uncontrollable. The Fire Concern Community (Masyarakat Peduli Api) is a good example of this system.

The Fire Concern Community (FCC) is a community-based body that aims to monitor fires and act quickly to control potentially dangerous fires in areas of land or forest near their livelihoods. The FCC was initially formed amongst communities near protected forests and its primary function was to secure protected forest against fire. However, the functions and responsibilities of the FCC were expanded to cover not only protected forest but all the surrounding land and forest. Considering their expanded role, the FCC's mandate needs to expand in order to enable them to do their job – they also need an increase in budget.

Besides this, there is a need to involve people engaged in land clearing. This action has to be married with a policy that regulates and monitors the use of fire for land clearing. This policy could include introducing permits for the right to use fire, more rigid monitoring and reporting systems, and faster decision-making by the authorities.

6.0 IDENTIFICATION OF POLICY OPTIONS

The proposed policy improvements collected from key informants were compiled and presented at the first workshop. The workshop was conducted on 30 August 2008 and was attended by 48 participants who represented forest management stakeholders including: universities, government agencies at provincial and district level, district government, NGOs, private companies, and newspaper reporters. Discussions took place during the workshops and the exchange of work experiences, skills, knowledge and methods that took place was very useful as a way of evaluating the proposed policy improvements. The workshop reached agreement about some of the policy options that could address the gaps in current Indonesian forest fire policy.

It is not accurate to refer to forest fire problems – we should refer to forest and land fire problems. In fact, land fires make a greater contribution to haze. Forest fires account for about 20 percent of fires, with most of the area being burned being imperata grassland (*padang alang-alang*). The other 80 percent of fires are all about land burning, either on purpose or by accident. Land burning is used to clear land before crop planting on plantations. Fire is commonly used for land clearing because it is practical, fast and cheap. According to some interviewees from universities, NGOs and government officers in the field, many of the people involved in land burning are not native to the region concerned. It is also obvious that they use fire on purpose. Some fires are caused by negligence – dried leaves and woods catch fire at the end of the burning process and this grows and creates larger fires.

Forest fire management policy in Indonesia has been well prepared and has good regulations and recommendations. Many of the problems of forest and land fires are related to the implementation of the regulations and recommendations. For example, zero burning and community-based forest management has been a rule since 1986. The problem has been that the concept works from the top down, was not formally implemented, and that the authority given for implementation was inadequate. This lack of authority extends to the limited power given to the people in the field who have direct contact with the problems, limited technological support for staff to conduct their work, and a lack of budget for implementation. These conditions have led to a situation where control is weak, initiative is limited, and a system of reward and punishment for compliance with regulations cannot be established.

People are unwilling to show initiative because they have no incentive to do so and no authority to back it up. In addition, fire-fighting equipment, particularly equipment that was provided as part of overseas aid, is not always useful in Indonesian conditions. This also applies to technology. Some technology is well intentioned but needs adjustment to an Indonesian context. Sophisticated technology is less effective if the people living in fire-affected areas are not involved. In order to involve these people effectively, support is needed, either in the form of training, learning from other locations, or guidance in forest and land fire suppression.

Many aspects of Indonesian forest and land fire management policy only operate at a high level, such as central government. If we analyze these policies using the criteria already outlined, many of them stand up to analysis and achieve anything from very good

to average results. However, when we look at the implementation of these policies in situ, at regional level (provincial and district), it becomes obvious that the results are not satisfactory.

Basically, all the proposed policy improvements suggested by the key informants were adopted in the workshop and workshop participants reached a consensus on policy options that could improve the forest fire controlling system in Indonesia. These options provide alternative answers to policy gaps in current government policy. To recap, the five categories are as follows:

1. Rules and regulations
2. Method and operational
3. Skills and capacity
4. Compliance and enforcement
5. Mismatch between power and authority

In the next sub-sections, identified policy options are presented based on these categories.

6.1 Identifying the Policy Options

The policy options were devised after looking at recommendations from the first workshop. These options have been shortlisted from various suggestions made during the workshop. The primary rationale applied during the shortlisting process was the practicality and clarity of the options.

6.1.1 Rules and Regulations

- a. Smaller units of executing agencies
- b. Stronger implementation in the field
- c. Introduction of fire permits for land clearing
- d. Stronger monitoring and reporting systems
- e. Promotion of delegation of authority and power from central government to local institutions

6.1.2 Method and Operational

- f. Establishing an agency to find appropriate technology and suitably-profitable ways of utilizing land and/or forest areas for cultivation, keeping conservation in mind
- g. Expansion and promotion of the Fire Concern Community (FCC)
- h. Legal establishment of and budget allocation for the Fire Concern Community (FCC)
- i. Promotion of community training to improve community roles and understanding of forest and land conservation, especially with regard to forest fire prevention

6.1.3 Skills and Capacity

- j. Promotion of training and education for upholders of the law
- k. The same as # i
- l. Support and promotion of socialization activities to improve community awareness

6.1.4 Compliance and Enforcement

- m. Establishment of institutions to monitor and record stakeholder compliance and violation
- n. Improvement of monitoring and recording systems
- o. Implementation of punishment and reward systems
- p. Same as # e
- q. Same as # c
- r. Development of a super agency responsible for forest fires to prevent bribery and corruption
- s. Development of an advocacy institution to help forest-dependent communities protect their rights

6.1.5 Mismatch between Power and Authority

- t. Empowerment of the supervising agency to identify individuals or firms responsible for forest or land fires
- u. Expanding the role of Manggala Agni (fire brigade)
- v. Workforces and institutions need to be formulated to the Kabupaten (district) level
- w. Appropriate and adequate budget allocation to support the functions of the workforce and of institutions
- x. The same as # n

6.2 Evaluation of the Options Using the Defined Criteria

The next step was to evaluate these options again using the criteria in the appropriate category. For example the five options (a to e) in the rules and regulations category were evaluated using the criteria of rules and regulations (numbered 1 to 5, see page 21). This procedure also applied to the other options in different categories. The results will be recommended according to the priority of alternative options that the government may want to implement. The option priorities consist of high (need to do within one to two years), medium (within three to five years), and low (more than five years). The research tools were key informant interviews, focus group discussions and the second round of workshops. The evaluation results are summarized in Table 3 (below).

Table 3 shows that if we look at options based on their categories it appears that options for addressing policy gaps in the rules and regulations category are of a high priority. All of the five policy options to address policy gaps in rules and regulations have high priority scores. This indicates that the key informants think that immediate action is needed to improve rules and regulations.

Table 3. Summary of Option Evaluation using the Defined Criteria

Category of policy gaps	Policy options	Rank
1. Rules and regulations	a. Smaller units of executing agencies	H
	b. Stronger implementation in the field	H
	c. Introduction of fire permits for land clearing	H
	d. Stronger monitoring and reporting systems	H
	e. Promotion of delegation of authority and power from central government to local institutions	H
2. Method and operational	f. Establishing an agency to find appropriate technology and suitably-profitable ways of utilizing land or forest areas for cultivation, keeping conservation in mind	L
	g. Expansion and promotion of the Fire Concern Community (FCC)	M
	h. Legal establishment of and budget allocation for the Fire Concern Community (FCC)	M
	i. Promotion of community training to improve roles and understanding of forest and land conservation, especially with regard to forest fire prevention	L
3. Skills and capacity	j. Promotion of training and education for upholders of the law	L
	k. The same as # i	L
	l. Support and promotion of socialization activities to improve community awareness	M
4. Compliance and enforcement	m. Establishment of institutions to monitor and record stakeholder compliance and violation	H
	n. Improvement of monitoring and recording systems	M
	o. Implementation of punishment and reward systems	H
	p. Same as # e	H
	q. Same as # c	H
	r. Development of a super agency responsible for forest fires to prevent bribery and corruption	L
	s. Development of an advocacy institution to help forest-dependent communities protect their rights	L
	t. Empowerment of the supervising agency to identify individuals or firms responsible for forest or land fires	M
5. Mismatch between power and authority	u. Expanding the role of Manggala Agni (fire brigade)	L
	v. Workforces and institutions need to be formulated to Kabupaten (district) level	H
	w. Appropriate and adequate budget allocation to support the functions of the workforce and/or institutions	H
	x. The same as # n	M

The options in the compliance and enforcement category mostly score as medium priority – of the seven options formulated to address policy gaps four are high priority, one is medium, and two are of low priority.

The results for options in the mismatch between power and authority category are similar, as are the options in the method and operational category. There are five options listed in the former category. Two of them are high priority, two are medium, and one is

low priority. While for the later, there are four options in total and the two are of medium priority and two are low priority.

The options in the skills and capacity category appear to be of the lowest priority. Of the three options two are low priority and one is of medium priority.

6.3 The Options based on their Priorities

The analytical framework for the formulation of policy option recommendations was as follows. Current government policy (the status quo) was reviewed and evaluated to understand its relationship with forest fire problems. Based on this evaluation, a list of the problems arising from weaknesses in current policy was compiled, indicating policy gaps. The next step was to collect information. This included collecting policy examples and experiences from other countries, as well as information collected through interviews with key informants and information collected through the case study. The collected information was then formulated into several alternative policy options and taken to a workshop. The workshop resulted in alternative policies for possible adoption by the government. The next step was then to assess these alternatives using the criteria. At this stage every alternative policy option was evaluated based on the 25 criteria from the five categories described (pages 21-2). Scores were used to help rank the options: high priority (for example, implement within one to two years), medium priority (within three to five years), and low priority (more than five years).

The research results show that out of the total of 24 options in five categories, there were four options that applied to more than one category. These were options c, e, i, and n. Options c and e applied to rules and regulations as well as to compliance and enforcement. Option i applied to method and operational as well as to skills and capacity. Option n fell under compliance and enforcement, but was also included in mismatch between power and authority. Therefore if we look at the options regardless of their categories there are only 20 different options. These 20 options underwent an evaluation process to group them into the three criteria described above (high, medium, and low). The results are shown in Table 4.

In Table 4 we can see that there are a total of nine policy options with a high priority. Given the possible contributions these nine policies can make to forest fire prevention and mitigation, they should be implemented immediately, within one to two years. The policies in general ask for stronger implementation of rules and regulations in the field. This requires strong and appropriate institutions, empowered local institutions, and the enforcement of a system of punishments and rewards.

There are five policy options that have medium priority. These policies can wait before they need to be implemented (three to five years). These policies generally require more community involvement in forest and land fire prevention and mitigation, including budget support for these tasks.

Table 4. Options Grouped According to Criteria

Policy options	Rank
e. Promotion of the delegation of authority and power from central government to local institutions	H
c. Introduction of fire permits for land clearing	H
b. Stronger implementation in the field	H
v. Workforces and institutions formulated to Kabupaten (district) level	H
w. Appropriate and adequate budget allocation to support the functions of the workforce or of institutions	H
a. Smaller units of executing agencies	H
o. Implementation of punishment and reward systems	H
d. Stronger monitoring and reporting systems	H
m. Establishment of an institution to monitor and record stakeholder compliance and violation	H
g. Expansion and promotion of the Fire Concern Community (FCC)	M
h. Legal establishment of and budget allocation for the Fire Concern Community (FCC)	M
l. Support and promotion of socialization activities to improve community awareness	M
n. Improvement to monitoring and recording systems	M
t. Empowerment of the supervising agency to identify individuals or firms responsible for forest or land fires	M
f. Establishment of an agency to find appropriate technology and suitably-profitable ways of utilizing land or forest areas for cultivation, keeping conservation in mind	L
i. Promoting community training to improve its role in and understanding of forest and land conservation, particularly forest fire prevention	L
j. Promotion of training and education for upholders of the law	L
r. Development of a super agency responsible for forest fires to prevent bribery and corruption	L
s. Development of an advocacy institution to help forest-dependent communities protect their rights	L
u. Expanding the role of Manggala Agni (fire brigade)	L

Six policies were considered to be of a low priority. These policies can be implemented in the long term. Although these policies have significant contributions to make to the improvement of land and forest fire policy they require more intense preparation and consolidation before they can be effectively implemented. For these policies to be effectively implemented the higher priority options need to have been already implemented.

6.4 Predicted Cost of High-Priority Policy Options

As a complement to the above analysis, the alternative policy options were subjected to an estimation of their cost. This step was created to estimate cost components and their values. All nine policy options that were identified as being high priority had their implementation costs estimated.

Firstly, interviews with key informants were used to try to estimate the cost of existing government policy (the status quo). Secondly, interviews with key informants were used to estimate the additional costs of implementing high priority policy options.

Cost estimates of the status quo provided by key informants varied greatly. They ranged from 2,400 million rupiahs up to 16,240 million rupiahs. The average value of their estimate was 7,546 million rupiahs. Table 5 shows all the high priority options with their average estimated costs, from the smallest cost up to the highest cost. The table provides both percentage and absolute values.

Table 5. High-Priority Options with their Estimated Costs

Policy options	Rank	Estimated Cost	
		% of SQ*	Value**
e. Promotion of the delegation of authority and power from central government to local institutions	H	10	8,301
c. Introduction of fire permits for land clearing	H	15	8,678
b. Stronger implementation in the field	H	20	9,055
v. Workforces and institutions need to be formulated to Kabupaten (district) level	H	20	9,055
w. Appropriate and adequate budget allocation to support the functions of workforces or of institutions	H	30	9,810
a. Smaller units of executing agencies	H	40	10,564
o. Implementation of punishment and reward systems	H	50	11,319
d. Stronger monitoring and reporting systems	H	60	12,074
m. Establishment of an institution to monitor and record stakeholder compliance and violation	H	70	12,828
		315	91,684

*SQ = Status Quo. Cost is expressed as a percentage increase of the status quo budget

**Value is in million rupiahs

Table 5 shows that the policy which requires the lowest additional funding for its implementation is the one that seeks the promotion of the delegation of authority and

power from central government to local institutions. Very little funding is required to implement this policy – just 8,301 million rupiahs, a slight increase (of 755 million rupiahs) to the current budget (which is 7,546 million rupiahs). The most important element required is a commitment, particularly a commitment from central government, to cede a significant amount of power and authority to local institutions so that they have the ability and authority to react to fire problems.

Table 5 shows that the most expensive policy option is the establishment of an institution to monitor and record stakeholder compliance and violation. This option requires more than 5,000 million rupiahs of additional cost. In absolute values it requires 12,828 million rupiahs. The establishment of this institution would involve the re-allocation of human resources so that training could take place to ensure that all parties understand their role in the new institution, as well as some socialization to place the institution in context for forest and land fire stakeholders.

If the Indonesian government agreed with all of the high priority options and decided to implement them all at once, the estimated cost would be about 310 percent of the existing budget for land and forest fire management. In absolute values the cost required on the top of the current budget would be 84,138 million rupiahs. The total budget for this route would be 91,684 million rupiahs.

6.5 The Proposed Alternative Policy Options

This information was once again taken to a workshop. This second workshop was conducted on 26 January 2009 in Bogor. Key informants and workshop participants agreed alternative policy options which will be recommended to the government of Indonesia.

The workshop used the policy options identified as the starting point for discussion, (see Table 5). The workshop participants then used their knowledge and experience to assess and evaluate the options. A wide range of stakeholders provided their views based on their own experiences. Stakeholders included government institutions, universities, research centres, and others. Three important points came out of the workshop.

Firstly, there is some overlap between the newly-designed policy options. The number of options can be simplified by removing the overlapping policies. The workshop agreed that “promoting the delegation of authority and power from central government to local institutions” already includes the “smaller units of executing agencies” option. The workshop also believed that this option did not require too much funding – only 10 percent additional funding would be needed to implement this option. The workshop participants also agreed that the w. option (appropriate and adequate budget allocation to support the functions of the workforce or of institutions) was actually part of the v. option (workforces and institutions need to be formulated to Kabupaten level), and that they should be combined as one option and that the funds required for implementation would require an additional 20 percent on top of the existing policy’s budget. In addition the d. option (stronger monitoring and reporting systems) was thought to be better represented by the m. option (the establishment of an institution to monitor

and record stakeholder compliance and violation) and the budget for this was estimated at an additional 70 percent of the current budget.

Secondly, there were some options that required minimal additional funding for implementation. The workshop participants agreed to combine these options into one. Individual options to be combined were as follows:

- a. Promotion of the delegation of authority and power from central government to local institutions
- b. Introduction of fire permits for land clearing
- c. Stronger implementation in the field
- d. Workforces and institutions need to be formulated to Kabupaten (district) level

All of these options were rolled into one called improving policy implementation in the field. The funding from each original individual option was combined to create a cost estimation of a 65 percent increase in the current budget.

Finally, the recommended alternative policy options can be summarized as follows. These options are presented with an estimation of the required costs of their implementation, both in terms of a percentage increase of the existing budget and in terms of absolute value.

1. Improving policy implementation in the field (65 percent or 4,905 million rupiahs)
2. Implementing a reward and punishment system (50 percent or 3,773 million rupiahs)
3. Establishment of an institution to monitor and record stakeholder obedience and violation (70 percent or 5,282 million rupiahs)

Should the authorities implement all of these options, which in fact are all of a high priority, the additional funding needed would be 185 percent on the top of the existing budget. In absolute values the additional funding needed amounts to 13,960 million rupiahs.

7.0 CONCLUSION AND POLICY IMPLICATIONS

7.1 Conclusion

Indonesia loses nearly 2 million ha of its beautiful forests every year. The frequency and intensity of forest and land fires, particularly on Kalimantan and Sumatra has increased. Tropical forest has a high moisture content which makes it fire-resistant, unless there has been a period of extended drought. However, the existence of El Niño has significantly contributed to the fires. In addition, over-logged forests, degraded forests, and scrub on deforested lands have conspired to make the land more prone to fire. Almost every year, from February to March and from August to October, the forest fires and the haze created by the fires places additional burdens on social and economic activities in Indonesia.

The causes of the fires are varied and the solutions are complex. The causes can be classified into several groups that include weather-related issues, land-usage issues, illegal activities, and weak regulation. Looking at land and forest fire problems it is obvious that the root cause of the problems is weak regulation – the other problems can be addressed if regulation is appropriately designed and implemented.

Current government policies for forest management are based on establishing forest areas and legally safeguarding the conservation of natural biological resources, supported by strong institutions that are able to deliver optimal benefits to affected communities. Several institutions have been created to achieve these ends. The institutions form five directorates and each of these directorates manage different areas. Policy implementation is incorporated into three main programs, namely institutional development policy, technical operational policy, and community participation and empowerment policy. Implementation is managed via a package of strategies. The following strategies have been developed by the Ministry of Forestry; (1) strengthening coordination and cooperation between institutions at both national and local level; (2) establishing effective forest fire prevention, suppression and post-suppression controls, and (3) supporting stakeholder empowerment and participation in land and forest fire controls.

Despite its achievements so far, there are weaknesses in current government policy in Indonesia which have made efforts to address forest fire problems unsuccessful. These weaknesses have created gaps in policy implementation meaning that policy options that can address these weakness are needed. The weaknesses vary. For the purposes of analysis we created categories in five fields: rules and regulations, method and operational, skills and capacity, compliance and enforcement, and mismatch between power and authority.

Alternative policy options need to be able to address the weaknesses described in these categories. The options have to be able to remove or eliminate weaknesses from each category. Twenty-five criteria were used to assess the policy options. If a policy met the criteria then it was judged able to address a gap or a weakness in current government policy. Each criterion was measured to ascertain how an alternative policy option was better compared to others.

The analytical framework for formulating recommendations on policy options was as follows. Current government policy was reviewed and evaluated in order to understand its relationship to forest fire problems. Based on these evaluations, a list of the problems that arose was compiled to highlight weaknesses in current policy. The weaknesses indicated that policy gaps exist. The next step was to collect information. This included collecting examples from other countries, from interviews with key informants (KIs), and information collected through the case study. The collected information was then used to create several alternative policy options. The options were then taken to a workshop. The workshop came up with alternative policies that could possibly be adopted by the government. The next step was to assess these alternatives using the agreed criteria. At this point every alternative policy option was evaluated via the 25 criteria from five categories previously described (pages 22-3). Scores were used to help rank the options. The research suggested staging the implementation of the recommended options: high priority (within one to two years), medium priority (within three to five years), and low priority (more than five years). As a complement to this analysis, cost estimates were made of the alternative policy options. This information was then once again taken to a workshop. This workshop produced policy options that were agreed among the key informants and other workshop participants, and these policies will be offered as recommendations to the government.

Of the 24 suggested alternative policy options there were four that applied to more than one category, so looking at the options regardless of their categories there are only 20 different options. Out of these options nine were judged to be of a high priority, five of medium priority, and six of a low priority. Considering the estimated cost of implementation and using insights from the second workshop, the recommended alternative policy options are: improving policy implementation in the field (65 percent or 4,905 million rupiahs); implementing a reward and punishment system (50 percent or 3,773 million rupiahs), and the establishment of an institution to monitor and record stakeholder compliance and violation (70 percent or 5,282 million rupiahs).

7.2 Policy Implications

The three recommended policy-options have undergone several layers of analysis, including cost and scheduling considerations. Out of all the initial alternative options, analysis has taken place to identify the priority options. All three recommended options are high priority, therefore there is an urgent need for the government to implement these alternative options at once. In addition, implementation of the three options at once would be more efficient. Some aspects of the policy options only need to be done once.

The problem, however, is that the implementation of all of the options would require a higher budget compared to choosing only one of the options. Implementation of all the options would require the government to obtain strong support from parliament because budget approval would be needed. Consequently, it is important to make parliament aware of land and forest fire problems and for parliament to have some understanding of what policies are needed to address the problems. Support from a wide range of stakeholders is also key because their voices could help to convince parliament to support the appropriate policies.

It is important that, as a first step, central government takes the initiative to engender a strong commitment to addressing land and forest fire problems across all levels of government, from central government, to local government, down to the local agencies who deal directly with the problems. This commitment needs to encompass an understanding of the fact that as soon as forest fires start they require a rapid and appropriate response. In order for this to happen a proportion of central government's authority, skills, capability, and budget will need to be delegated to local government.

The second step is for government at all levels to approach parliament and a wide range of stakeholders to raise awareness and to gain support for the allocation of an adequate budget for addressing fire problems via the implementation of the three high priority options.

The third step is the implementation of all three options. Out of all three options, the establishment of an institution to monitor and record stakeholder compliance and violation will probably require the most time. Therefore, it would be best if this option were implemented first. Furthermore, a monitoring institution will play a significant part in the implementation of the other two policy options. The improvement of the application of policy in the field will need the help of a reliable monitoring system. Monitoring will also help to locate problems with implementation and will support the enforcement of a reward and punishment system.

Above all, there is one very important point that needs to be taken into account for the successful implementation of the policy options; stakeholders have to work together to avoid bribery, corruption, and collusion of all kinds from taking place. One effective way for this to happen is for transparency to be promoted and for the local community to be empowered in a monitoring capacity, as well as NGOs, and field officers, who are often the first people to come into contact with the causes and problems of land and forest fires.

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