



## CHAPTER 4 FOREST AND LAND FIRES

### 4.1 From Normal to Abnormal Fires

One of the most visible results of the 30-year spiral of forest mismanagement discussed in Chapter 3 has been the increasing frequency and intensity of forest and land fires, particularly on Kalimantan and Sumatra. Undisturbed tropical moist forests, which are normally quite fire-resistant, will burn only after periods of extended drought. Logged-over forests, degraded forests, and scrub on deforested lands are much more fire-prone (Schindler et al., 1989).

Scientific evidence based on radiocarbon dating of charcoal deposits in East Kalimantan indicates that lowland forest areas have repeatedly burned since at least 17,500 years ago, during periods of extended drought that appear to have characterized Quaternary glacial periods (Goldammer, 1990). The earliest fires are thought to have had natural causes, but humans probably had a role in starting fires in

recent millennia, first to improve hunting opportunities and later to clear agricultural plots. But although fire has been a feature of Indonesia's forests for thousands of years, earlier fires were undoubtedly smaller and more spread out over time than those of the past 2 decades. As a result, these earlier fires did not cause significant deforestation, illustrated, for example, by the fact that most of Kalimantan was forested until relatively recently (Barber and Schweithelm, 2000).

The processes of forest degradation and deforestation discussed in Chapter 3 have transformed vast areas of Indonesia's forest estate from a fire-resistant to a fire-prone ecosystem. This fundamental change, combined with the periodic occurrence of the El Niño climatic phenomenon,<sup>32</sup> has set the stage for the massive outbreaks of fire over the past 20 years.

### 4.2 The Fires of 1982–1983 and 1994

The first great fire to result from the convergence of Suharto-era forest management and an El Niño event engulfed 210,000 km<sup>2</sup> of East Kalimantan province during 1982–1983. East Kalimantan was the first focus of Indonesia's timber boom and had been almost wholly divided into logging concessions during the 1970s. Logging practices were generally poor, leaving a vast accumulation of logging waste in the forest. Pioneer and secondary species grew rapidly in logged-over areas, forming a dense and fire-prone ground vegetation layer in place of the sparse ground cover characteristic of primary rainforests.

A severe El Niño-induced drought struck the area between June 1982 and May 1983, and fires started almost simultaneously across wide areas of the province at the end of 1982. They burned out of

control until the rains finally returned the following May. By that time, some 3.2 million ha had burned; of this area, 2.7 million ha were tropical rainforest. Damage varied from creeping ground fires in primary forests to complete destruction of newly logged areas and peat-swamp forests. Some 73,000 ha of commercially valuable lowland dipterocarp forests were badly damaged and another 2.1 million ha lightly or moderately damaged. The degree of fire damage was directly correlated with the level of forest degradation: only 11 percent of undisturbed primary forests in the areas affected by the drought and fires actually burned, damage was limited to ground vegetation and the forest had completely recovered by 1988. By contrast, in an area of nearly 1 million ha of “moderately disturbed” forest (80 percent of which had been logged prior to the fires), 84 percent of the forest burned and the damage was much more severe (Schindler et al., 1989).<sup>33</sup> One estimate put the costs of the 1982-1983 fire at some

US\$9 billion, of which nearly US\$8.3 billion was accounted for by the loss of standing timber (Hess, 1994).

Widespread fires reoccurred several times in the decade following the East Kalimantan fire, burning an estimated 500,000 ha in 1991 and nearly 5 million ha in 1994 (BAPPENAS, 1999). Haze from these fires affected Singapore and Malaysia as well as Indonesia, disrupting air and sea transportation and sharply elevating air pollution levels. In the aftermath of the fires, the government began developing new policies, 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.

### 4.3 The Fires of 1997–1998

When the next severe El Niño-induced drought struck Indonesia in 1997-1998, the results were catastrophic. By early 1998, nearly 10 million ha had been affected by fire (*see Table 4.1*) with damages estimated at nearly US\$10 billion. (*See Table 4.2.*) Smoke from these fires shrouded much of Southeast Asia in haze for months.<sup>34</sup>

It was clear by early 1997 that it would be an El Niño year in Indonesia but, despite warnings from the Environment Ministry, burning continued across vast areas of Sumatra and Kalimantan, primarily to clear degraded forest land and scrub for plantations. The use of fire for land clearance is not restricted to

**Table 4.1 Estimated Area Damaged by Fire in 1997-98 (ha)**

ISLAND	Montane Forest	Lowland Forest	Peat and Swamp Forest	Dry Scrub and Grass	Timber Plantation	Agriculture	Estate Crops	TOTAL
Kalimantan		2,375,000	750,000	375,000	116,000	2,829,000	55,000	6,500,000
Sumatra		383,000	308,000	263,000	72,000	669,000	60,000	1,756,000
Java		25,000		25,000		50,000		100,000
Sulawesi		200,000				199,000	1,000	400,000
Irian Jaya	100,000	300,000	400,000	100,000		97,000	3,000	1,000,000
<b>TOTAL</b>	<b>100,000</b>	<b>3,100,000</b>	<b>1,450,000</b>	<b>700,000</b>	<b>188,000</b>	<b>3,843,000</b>	<b>119,000</b>	<b>9,756,000</b>

**Source:** National Development Planning Agency (BAPPENAS), 1999. “Final Report, Annex I: Causes, Extent, Impact and Costs of 1997/98 Fires and Drought.” Asian Development Bank Technical Assistance Grant TA 2999-INO, Planning for Fire Prevention and Drought Management Project.

<b>Table 4.2 Summary of the Economic Cost of the 1997-98 Fires and Haze</b>			
<b>Sector</b>	<b>Estimated Economic Losses (US\$ millions)</b>		
	<b>Minimum</b>	<b>Maximum</b>	<b>Mean</b>
<b>Agriculture</b>			
<b>Farm Crops</b>	2,431	2,431	2,431
<b>Plantation Crops</b>	319	319	319
<b>Forestry</b>			
<b>Timber from Natural Forests (logged and unlogged)</b>	1,461	2,165	1,813
<b>Lost Growth in Natural Forest</b>	256	377	316
<b>Timber from Plantations</b>	94	94	94
<b>Non-Timber Forest Products</b>	586	586	586
<b>Flood Protection</b>	404	404	404
<b>Erosion and Siltation</b>	1,586	1,586	1,586
<b>Carbon Sink</b>	1,446	1,446	1,446
<b>Health</b>	145	145	145
<b>Transmigration and Buildings and Property</b>	1	1	1
<b>Transportation</b>	18	49	33
<b>Tourism</b>	111	111	111
<b>Fire Fighting Costs</b>	12	11	12
<b>TOTAL</b>	<b>8,870</b>	<b>9,726</b>	<b>9,298</b>
<b>Source:</b> National Development Planning Agency (BAPPENAS), 1999. "Final Report, Annex I: Causes, Extent, Impact and Costs of 1997/98 Fires and Drought." Asian Development Bank Technical Assistance Grant TA 2999-INO, Planning for Fire Prevention and Drought Management Project.			

Kalimantan and Sumatra: fires were reported from 23 of Indonesia's 27 provinces in 1997-1998. But plantation firms and government projects set an unusually large number of fires on the islands, clearing tens of thousands of hectares at a time. (*See Box 4.1.*) By July, the fires had created a blanket of haze that spread hundreds of kilometers in all directions. Deliberately set fires in grasslands and scrub lands escaped into adjacent logged forests that burned with greater intensity. The fires eventually reached drained peat swamps and burned beneath the surface long after above-ground fires exhausted their fuel supplies. Map 12 shows burned areas of forest under different kinds of land use in East Kalimantan.

Large-scale burning has produced persistent haze over large areas of Sumatra and Kalimantan during every dry season but the haze normally dissipates in September, when heavy rains extinguish the fires. This was not the case in 1997, however, when the rains failed, the fires intensified, and the haze thickened and spread to neighboring countries. Haze reached Malaysia and Singapore in July, and air quality deteriorated steeply in September, triggering an outburst of complaints that drew global media attention. By late September, approximately 1 million km<sup>2</sup> were haze-covered, affecting about 70 million people. 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.

## Box 4.1 The Oil Palm-Forest Fire Connection: Why Do People Set Fires?

The uncontrolled and destructive use of fire is closely associated with the development of oil palm in Indonesia for four principal reasons:

- Fire degrades the quality of forest lands and thus supports efforts to have areas of permanent forest estate (such as production forest) legally reclassified as forest areas available for conversion to plantation agriculture. With the availability of lands not classified as forest and suitable for oil palm plantation development declining, fire becomes a useful tool for increasing the stock of available land.
- In areas already allocated for oil palm development, fire is a cost-effective way of clearing the land. According to one firm operating in Central Kalimantan (Agro Indomas), land clearing by mechanical means is more than twice as expensive as setting fires.
- Oil palm fruits must be processed within 24 hours of harvest, so firms prefer to locate their processing facilities and transportation routes as near as possible to their plantations. But these accessible areas are usually already populated and farmed by local residents. To drive them out,

oil palm firms hire outsiders to set fire to the lands of local people whose lands they want to take over. The fires reduce the value of the land by degrading it, then the companies can more easily take over, paying only token compensation to the original inhabitants.

- In some cases, local inhabitants also set fires to protest the takeover of their lands by oil palm firms.

### Sources

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After comparing satellite images of fire “hotspots” with land use maps, the government determined that most fires were occurring in timber and oil palm plantation areas, although small farmers were also implicated. It then announced a total ban on burning, accompanied by threats to punish offending firms. Yet even as fires burned out of control into surrounding forests, peat swamps, and agricultural lands, plantation owners and farmers started new fires to take advantage of the extremely dry conditions. These fires intensified the haze, which spread farther, resulting in health alerts and transportation disruptions across the region.

Efforts to put out the fires were largely ineffective, even with assistance from Malaysian volunteers and fire suppression aircraft from Australia and the United States. Poor coordination (especially between air and ground operations), insufficient training, lack of equipment, funds, and water, and the remote location of many of the fires, were often cited as the reasons for failure. Aerial suppression by water bombers was also hindered by the lack of accurate land cover maps and infrastructure support, and land-based efforts were impeded by the reluctance of many rural people to fight fires on land that was not theirs. The number of fires began to decline during October and November, partly because of mounting pressure exerted by the government on plantation owners but also because by then they had burned as much land as they needed. Peat swamps were still burning in late November but were partially extinguished when rain finally began to fall in December.

The rainy season, which usually lasts at least 6 months in western Indonesia, began to taper off in less than 2 months. By the end of January 1998, hundreds of hot spots again appeared on NOAA satellite images as the drought carried over into a second calendar year. The pattern of 1997 was repeated in the swamps on Sumatra's east coast from January through April; in Kalimantan, the fires were concentrated in East Kalimantan, a province that had escaped extensive burning in 1997. The drought also began to cause food shortages because of below-normal harvests and a total failure of the rice crop in some areas. The plight of rural communities already reeling from the effects of the fires, haze, and drought was worsened by the growing economic crisis. The value of the Indonesian rupiah plunged throughout the second half of 1997.<sup>35</sup> Many farmers began to burn still more land in the hope that they could increase the next harvest to compensate for 1997 drought losses. Fears also arose that forest exploitation and related burning would increase as plantation owners tried to offset the effects of the economic crisis.

Fires continued to spread during the month of March. Efforts to fight them were hampered by the increasing scarcity of water because surface water dried up during the drought and the ground water level sank beyond the reach of wells. Haze once again blanketed Singapore and parts of Malaysia, and the fires did not end until heavy rains finally arrived in mid-May.

Analysts have encountered considerable technical difficulties in determining precisely the total area burned during the 1997-1998 fires and in estimating what kinds of vegetation types burned in which

areas. Based on the most recent analyses, however, it seems certain that at least 9.8 million ha burned. (See Table 4.1.)

The extent of the area affected by air pollution from the fires has been easier to determine. Indeed, the international news media were initially attracted to the 1997 fires by the spectacle of a "thousand mile shroud" spreading over an area of 1 million km<sup>2</sup> where hundreds of millions of people live. The impacts on human health could be considerable. The high levels of particulates inhaled and ingested by millions of people are likely to cause chronic, long-term respiratory diseases (Heil, 1998). Comprehensive monitoring of health impacts is difficult because rural Indonesians are unlikely to visit a hospital unless they are suffering from acute symptoms of illness. In many areas, they depend on traditional healers and herbal medicines for much of their health care. The results of one study that attempted to quantify health impacts of fire-related pollution exposure in eight provinces are presented in Table 4.3.

#### 4.4 Government Response to Forest and Land Fires

Several government agencies have fire prevention and control policies, but they are not well coordinated and are generally not enforced. A 1998 review by the State Ministry for Environment and the United Nations Development Programme (State Ministry for Environment and UNDP, 1998) concluded that the existing regulations "are apparently not effective to control fires." Prior to 1997, numerous Ministry decrees dealt with fire preven-

**Table 4.3 Health Effects from Fire-Related Haze Exposure in 8 Indonesian Provinces, September-November 1997**

Health Effects	Number of Cases
Deaths	527
Asthma	298,125
Bronchitis	58,095
Acute Respiratory Infection	1,446,120
Daily Activity Constraint	4,758,600
Increase in Outpatient Treatments	36,462
Increase in Hospitalizations	15,822
Lost Work Days	2,446,352

**Source:** State Ministry for Environment and United Nations Development Programme (UNDP), "Forest and Land Fires in Indonesia, Vol. I: Impacts, Factors and Evaluation." (Jakarta, Indonesia, 1998.)

**Note:** The provinces studied were Central Kalimantan, East Kalimantan, Jambi, Riau, South Kalimantan, South Sumatra, West Kalimantan, and West Sumatra.

tion in forest areas, but intentional burning was not strictly prohibited. In fact, an April 1997 decree legalized the practice of "controlled burning" and set out technical guidelines. This decree was revoked in October 1997 as a result of that year's disastrous fires, and a new decree prohibited all use of fire for land clearance on state forest lands. The Ministry of Agriculture had established a "zero burning" policy for land clearance by decree in 1995, and the Ministry of Transmigration and



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Settlement of Forest Dwellers established a similar policy for the preparation of transmigration areas in April 1997.

More generally, Indonesia has a variety of environmental and other laws that criminalize intentional burning, both nationally and at the provincial level. But these laws are rarely enforced. Even in the aftermath of the 1997-1998 fires, almost no legal action has been taken against companies implicated in setting fires and, at the time of writing, no substantial legal penalties have been handed down.

Institutionally, the Environment Ministry/UNDP report concluded that “Indonesia does not have a professional fire management organization. Fire suppression efforts are conducted on the basis of coordination amongst several related agencies. . . . Agencies involved in fire management do not have adequate mandates, level of competence and equipment to carry out their tasks.” The Ministry of Forestry was the only government agency with a specialized body for fire prevention and control, the Directorate for forest fires under the Directorate

General for the Conservation and Protection of Nature (KPA), (subsequently renamed the Directorate General for Forest Protection and Nature Conservation).

Some of the key weaknesses in Indonesia’s fire suppression and control apparatus identified by the Environment Ministry/UNDP review are duplication of functions across agencies, unclear institutional authority and responsibility, inadequate mandates, and weak local institutional capacities.

The failure to implement existing laws, according to the review, is the result of many factors: a lack of political will on the part of law enforcement agencies; lack of access by enforcement authorities to data on fires; lack of facilities and equipment to support field investigations; differing perceptions by various agencies on what constitutes adequate legal proof of intentional burning; lack of an 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 promotion of plantation and other agricultural products.

In April 2000, Indonesia’s Minister of Environment promised his counterparts from neighboring countries a “haze-free year.”<sup>36</sup> By July 2000, however, fires were burning again in Sumatra, the haze had crept over the Malacca Strait to Singapore and Malaysia,<sup>37</sup> and thick smog temporarily closed the airport at Medan (Sumatra’s largest city).<sup>38</sup> The Indonesian government reportedly had “no plan” to

fight the fires,<sup>39</sup> and indeed no fire suppression activities were being undertaken or suspects arrested.<sup>40</sup> With a “haze-free year” apparently not on the horizon, the State Minister of Environment told the press that he was “really ashamed every time my counterparts from Malaysia and Singapore call me to complain about the haze coming from Sumatra.” Further, he blamed the burning on plantation companies engaged in “organized crime which often involves government officials and military officers. . . . Many companies feel free to burn because government officials or military officers back their activities.”<sup>41</sup>

In February 2001, the government issued a new regulation on forest fires (Government Regulation No. 4 of 2001), which covers pollution and damage to the environment caused by forest and land fires. The new regulation sets out the respective responsibilities of central, provincial, and district governments in handling fires in an effort to stop the buck-passing among various branches of government that hobbled fire prevention and firefighting efforts in past years.<sup>42</sup> But by mid-2001, the situation had not improved. Extensive fires were already burning in parts of Sumatra and Kalimantan in July, spreading haze as far as Malaysia and southern Thailand.<sup>43</sup> 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.”<sup>44</sup> Prospects for an effective policy to counter the perennial fire problem thus appear dim.