

# The 1997-1998 fire event in Indonesia

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*In 1997, the entire Indonesian archipelago suffered from serious droughts associated with the climatological phenomenon known as El Niño Southern Oscillation. This resulted in an unprecedented fire episode where more than 9 million hectares of land were burnt in Indonesia. Smoke from the fires hung as a huge blanket over Southeast Asia, covering large cities such as Kuala Lumpur and Singapore, restricting traffic (air, sea and land) and causing a severe health hazard. The smoke originated mainly from fires in Sumatra and Kalimantan. Analysis of the number and distribution of fires (detected as 'hot spots' by NOAA satellite imagery) indicates that the distribution of fires in time in Sumatra was very narrow. Of the 31,500 'hot spots' recorded over a twelve-month period starting September 1997, one-third were recorded during a single week (12-18 October 1997). The spatial distribution also showed a narrow spread. Almost a quarter of all fires recorded from September 1997 until July 1998 were in the lowlands of the province of Sumatra Selatan. Although the term 'forest fire' was frequently used, there is no evidence that primary lowland or mountain forest suffered much from burning. What did burn however was swamp forest vegetation and secondary vegetation regrown after logging. The causes of these fires were multiple and different from one province to another. One of the main causes though, was land clearing for new plantations.*

**Figure 1.** Smog blanket over Southeast Asia, covering more than 4 million km<sup>2</sup>. Taken from NOAA-14 data for 26 September 1997.

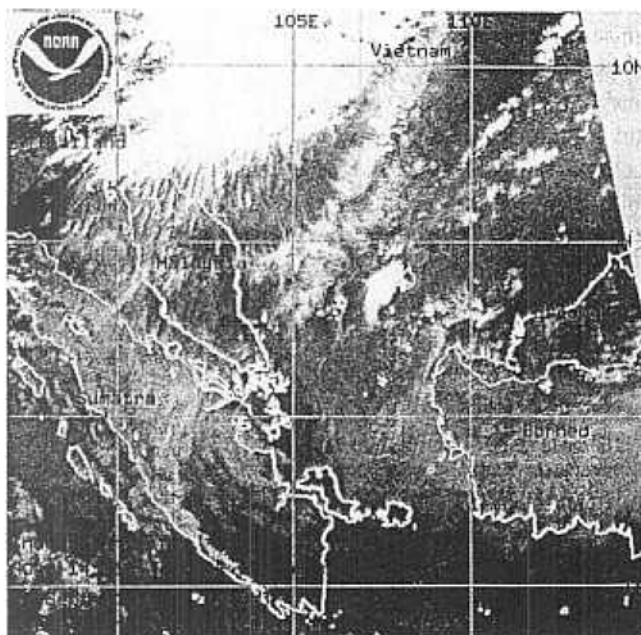


Photo: UNESCO/B. Ladley-Michael



In 1997 and 1998, extensive forest fires resulted in a smog blanket which covered an immense area of 4 million km<sup>2</sup> in Southeast Asia (Figure 1). The smog affected the lives and health of 75 million people in six countries, and turned day into night. It caused airports to be closed down, and was mentioned as the possible cause of an air crash near Medan, Sumatra and a tanker collision in the Straits of Malacca. Pollution levels went to previously unknown heights in Samarinda (East Kalimantan), Singapore and Kuala Lumpur, reaching extremely hazardous levels (4000 µg/m<sup>3</sup> total particulate matter as daily average<sup>1</sup>). The carbon gas emissions from the fires were estimated to be far in excess of the annual amount emitted by Western Europe's power stations and cars<sup>2</sup>. While the loss of biodiversity is still not known, many dead animals were found. Many individuals of such vertebrate species as orang-utan (*Pongo pygmaeus*) were directly killed by the fire or are threatened by habitat loss due to the fires. Economic loss due to fire and smoke was costed in one estimate to be around US \$4.5 billion in 1997 alone<sup>3</sup>.

Yet fires are no rare event. They occur in Indonesia and many other parts of Southeast Asia every year. They result from a combination of dry conditions and human activities such as traditional slash-and-burn agriculture, government subsidized large-scale land clearing for industrial plantations and forestry practices that leave forests vulnerable to fire. During pronounced El Niño years (four have occurred between 1982 and 1996), where conditions are unusually dry, fires and smoke problems tend to be much more serious. Such was the case for the year of 1997.

**Table 1.** Some Indonesian regulations concerning forests and burning. After Siswanto (1997)<sup>5</sup>.

- Government Regulation 28 of 1985. Forest protection.
  - (a) Nobody is allowed to burn forest except with valid competence.
  - (b) The public is encouraged to participate in forest fire management.
  - (c) Regional regulations arranged in accordance with ministerial directions.
- Decree of Ministry of Forestry (MoF) No. 523/Kpts-II/93. Forest protection in forest concessions. Concessionaires obliged to protect forests, including forest fire control.
- Decree of MoF No. 677/Kpts-II/93. Sub-directorate of forest fire prevention and suppression set up within Forest Protection Agency.
- Decree of MoF No. 260/Kpts-II/95. Guidance for forest fire prevention and mitigation.
- Decree of MoF No. 188/Kpts-II/95. Establishment of the National Forest Fire Control Centre.
- Decree of State Minister of Environment No. KEP-18/Menlh/3/1995. Establishment of the National Coordinating Committee of Land Fire.
- Decree of Director-General of PHPA (Department of Forest Protection and Nature Conservation) No. 243/Kpts/DJ-VI/1994. Technical Guidelines for Forest Fire.
- Decree of Director-General of PHPA No. 244/Kpts/DJ-VI/1994. Technical Guidelines for Forest Fire.
- Decree of Director-General of PHPA No. 245/Kpts/DJ-VI/1994. Technical Guidelines for Forest Fire.
- Decree of Director-General of PHPA No. 247/Kpts/DJ-VI/1994. Standardization of forest fire prevention.
- Decree of Director-General of PHPA No. 248/Kpts/DJ-VI/1994. Standard procedures of fire prevention.
- Involvement of local communities.
- Decree of Director-General of PHPA No. 48/Kpts/DJ-VI/1997. Forest fire suppression command system.

Early in 1997, scientists predicted a severe El Niño. Warnings of a pronounced drought were issued, without any great effect on popular or governmental perceptions and actions. It was only in September 1997 – when severe smog conditions over Singapore, Kuala Lumpur and large parts of Sumatra were reported – that world-wide attention was drawn to the fire situation, which was already largely out of hand by that time. The Government of Indonesia and many international and national organizations reacted and sent various forms of assistance<sup>4</sup>. Building on earlier regulations concerning forests and burning (Table 1)<sup>5</sup>, the Government of Indonesia banned fire as a land clearing tool and established a central agency for dealing

## THE 1997-1998 INDONESIAN FIRE EVENT AND THE WORLD-WIDE WEB

One of the factors that made the fire episode of 1997-1998 different from analogous earlier events was the enormous influence of data, news, opinions and facts published on the World-Wide Web (www). Government agencies, non-governmental organizations (NGOs), bilateral and multilateral agencies and research programmes and institutes of various kinds were among those that published facts and figures on the net daily. Information was published in Bahasa Indonesia and English, as well as almost real-time data on the extent and location of fires ('hot spots' from satellite imagery) and opinions and commentaries from Indonesia and elsewhere.

All told, during the fire episode, there were more than thirty web sites concerning the fires and El Niño and its impact on the regional and global climate. Useful sites included the following:

- Environmental Impact Management Agency, Indonesia (BAPEDAL). <http://www.bapedal.go.id>
- Centre for Remote Imaging, Sensing, and Processing (CRISP). <http://www.crisp.nus.edu.sg>
- US National Oceanic and Atmospheric Administration (NOAA). <http://oses1.www.noaa.gov/>
- Integrated Forest Fire Management Project (IFFM). <http://smd.mega.net.id/iffm>
- US Forest Service. <http://www.fs.fed.us/eng/indofire>
- European Space Agency (ESRIN). <http://earthnet.esrin.esa.it:8080/ew/>

with the fires. International aid included C-130 water bombers from the USA, water bombers from Australia and Canada, helicopters from Japan, fire teams and experts from Malaysia and Australia, and teams of specialists from the World Health Organization (WHO) and the United Nations Environment Programme (UNEP)<sup>6</sup>.

In spite of this flurry of fire-related activity and a general appreciation of the factors exacerbating fires, the precise causes of the fires were poorly understood. This was highlighted by the way that blame was variously attributed to different groups, such as small farmers, agricultural and land forest conversion schemes, forestry concessions, industrial plantation projects,

indigenous peoples and other land users. Many critical questions about the fires remain unanswered, for example: How much land has been burned? What was the previous land use? When did it burn? Who perpetrated the fires and why? What is the relative role of large land holders and smallholders in the fires? What is the impact of the fires on different ecosystems? What exactly burned? Was it really forest that burned and if so what type: production, protection or logged-over forest? The lack of basic information on questions such as these contributed to a general sense of confusion regarding the nature of the fires, their causes and impacts and the likely areas to be at risk in the future.

In part as a reaction to this sense of

confusion and ambiguity, a major effort was made by a number of organizations to post information on the fire situation in Indonesia on the World-Wide Web (Box 1). At the international level, there have also been several initiatives to upgrade the availability and exchange of information related to fire outbreaks<sup>7,8</sup> and to improve the quality of information that is available on the causes and impacts of fires in different regions of the world.

One such research initiative in Southeast Asia (Box 2)<sup>9</sup> provides the basis for the present article. It reviews the fire situation in the island of Sumatra, one of the areas of Indonesia most affected by the fires of 1997 and 1998. The assessment draws mainly on information from satellite imagery and broad-scale maps. Among the aspects described are the factors contributing to the susceptibility of vegetation to fire, the methods used to detect and monitor fires, and the distribution of fire outbreaks in time and space.

## THE 1997-1998 FIRES IN SUMATRA

## Susceptibility of vegetation to fire and burning

The occurrence of fires is related to a number of factors and conditions, including climate, vegetation type, land use, land cover change and population pressure.

In terms of the recent fires in Indonesia, a biophysical factor that set the stage for the events was the extreme drought that occurred in 1997, associated with the climatological phenomenon known as El Niño-Southern Oscillation or ENSO (Box 3)<sup>10,11</sup>. During pronounced El Niño years, conditions are unusually dry and fires and smoke problems tend to be much more serious than in other years. An earlier example was the El Niño event of 1982-1983, when an estimated 3.6 million ha burnt in East Kalimantan alone<sup>12</sup>.

But dry conditions is not a reason for fires. Rather, it is a prerequisite, which has long been exploited by man in clearing land for agricultural purposes.

## BOX 2

THE UNDERLYING CAUSES AND IMPACTS OF FIRES IN SOUTHEAST ASIA<sup>9</sup>.

In 1997, a three-year research project was launched on the underlying causes and impacts of fires in Southeast Asia. The project combines remote sensing data, GIS development and field information from biophysical and socio-economic studies, with a view to assessing what, where, when and why burning took place and the consequences for the communities involved. The results will feed in to policy formulations and working with local populations to prepare for the next El Niño event. The project is a joint initiative of the Center for International Forestry Research (CIFOR), the International Centre for Research in Agroforestry (ICRAF), UNESCO and the United States Forest Service (USFS), in collaboration with a range of institutions at the local, national and regional levels. The research is funded partly by the Asian Development Bank (ADB) and the United States Agency for International Development (USAID). The project builds on existing co-operation between CIFOR, ICRAF and UNESCO in an inter-agency project on Alternatives to Slash-and-Burn.