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## **INDONESIA AND THE 1997-98 EL NIÑO: FIRE PROBLEMS AND LONG-TERM SOLUTIONS**

**Neil Byron and Gill Shepherd**

*The 1997-98 El Niño is among the strongest recorded and low rainfall in Indonesia set the conditions for widespread fires. At the same time, it is clearer during this particular El Niño than it has been in the past that many fires are being deliberately set. They must be understood in the context of competing land-claims from government and private companies on the one hand, and local people with customary rights to land on the other. The 1997 El Niño is the first in which the resources of Land Satellite imagery and the Internet have been harnessed to demonstrate quite clearly where the fires are taking place, and why.*

### **Policy conclusions**

- While the weather conditions that create drought and flammable forests are quite natural, the factors which have turned those events into a disaster are man-made.
- They are the result of social, economic and political decisions to encourage the conversion of forests into tree-crop estates and rice-fields, and to ignore the value of the forests to local communities, whose preferred land-use would be to retain them. They are also the result of deliberate policies of unpreparedness and inaction in the face of fires.
- The adoption of better policies to improve standards of land stewardship is required when new areas for agriculture are selected.
- Fire hazard should be especially feared where peat-land areas are cleared. Soil fertility is usually low in these areas, and the best long-term economic use will often be to retain the area as forest.
- The media and the Internet have, for the first time, played a decisive role in this particular El Niño event.
- The events of 1997-98 demonstrate how research and a more effective action plan should be designed in readiness for the next El Niño.

### **Introduction**

The great Indonesian fires of 1997 attracted the attention of the world. Yet despite dozens of international evaluation and assistance missions, hundreds of news

commentaries, and a history of El Niño-related fires spanning centuries, surprisingly little analysis took place of the social and political origins of the disaster or of what governments should do next time El Niño conditions occur.

## Understanding what happened

Many people in Indonesia, Southeast Asia and around the world expressed deep concern at the extent and severity of fires in forested areas of Sumatra and Kalimantan in the late 1997 dry season. Concerns escalated as fires resumed in early 1998 after an abnormally short wet season. These fires highlight the deficiencies in both forest management systems and the policies and regulations that are supposed to control the clearance of forest land for agriculture.

The extent of the smoke haze covering much of Indonesia and neighbouring countries suggests that the area burning must have been enormous. Yet in the midst of the crisis it was surprisingly difficult to determine accurately how much had been burnt, or even where the fires were and how fast they were spreading. The government states that only about 170,000 ha of forest was burnt, while estimates by environmental NGOs are up to ten times higher.

There was also much confusion about what sort of vegetation was on fire, and on whose land. Media reports were generally uninterested in distinguishing between 'virgin rain forests', peat swamp forests, treeless *Imperata* grasslands, the complex patchwork of homestead gardens, tree-crops and fallows owned by small farmers, and the severely degraded forest areas which have been officially zoned and sanctioned for conversion to oil-palm, rubber or timber plantations. WWF's decision to use the fires for widespread campaigning for the protection of orang-utangs certainly encouraged the belief that the loss of primary rainforests was the main risk.

Yet keeping all these distinctions clear makes a great difference both in assessing the type of damage caused and the social and economic costs of the fires, and also in understanding their real causes. Only with this knowledge can future fire and haze damage be minimised effectively.

It is generally believed that the health of over 20 million people was adversely affected in Southeast Asia in late 1997, particularly through upper respiratory tract infections and asthma. The young, the old and the infirm suffered particularly. The economies of Indonesia, Singapore and Malaysia were seriously affected through business shut-downs and absenteeism, airport delays, accidents, and depressed tourism revenues, in addition to the direct costs of fire damage. Finally, millions of dollars were spent on attempts at fire suppression which were often futile, because causes were not well analysed first.

## Fires and haze - why so serious?

A hot dry summer across Southeast Asia and New Guinea was confidently predicted at least six months in advance (see Box 1). Yet few effective precautions were taken in Indonesia before the onset of the drought. Fires were lit as usual during this season by migrants, small farmers, and large plantation companies alike. Indeed, it was seen as a particularly good year for burning off and clearing land for future agriculture, after two wetter-than-average years. There are few reliable data on how many fires normally occur in an average year in Indonesia, or what area is normally burnt

annually. It is therefore difficult to say what proportion of 1997's fires must be regarded as above average. An easier question to answer, perhaps, is how much worse 1997 was than other El Niño years.

### **Box 1. The history of ENSO and fires in Indonesia**

The first time many people in Southeast Asia heard about the climate phenomenon known as the El Niño Southern Oscillation (ENSO) was in the context of the Indonesian fires of 1997. Our understanding of global climate patterns and inter-relationships between an area of abnormally warm water in the Pacific Ocean off the coast of Peru, and fires in Indonesia and Southeast Australia, floods in the Horn of Africa, storms in Europe and abnormally mild winters in North America, has expanded greatly over the past decade.

ENSO is no new phenomenon. The log books of Portuguese and Dutch explorers in Southeast Asia in the 15th and 16th centuries report fires in peat swamps in southern Borneo, and a choking smoke haze that extended as far as where Singapore is now. Singapore newspapers carried frequent reports of smoke and haze problems in the nineteenth century. Careful historical analysis has correlated these with what we now know to have been ENSO years. (Brookfield *et al* 1995).

There have been 20 ENSOs in the 120 years since 1877. There is much debate now about whether the frequency and intensity of ENSOs is increasing. Drawing on a comprehensive statistical analysis, Trenberth and Hoar (1997) conclude that the tendency for more El Niño events since the late 1970s is highly unusual and unlikely to be accounted for solely by natural variability.

### **How were the fires started, and why?**

#### **The role of 'traditional' land use**

Fire is an essential part of the traditional swidden cultivation systems that characterise many tropical forest areas. Careful use of fire in humid, largely forested areas by people who feel secure in the ownership of their land has occurred for centuries (Ellen & Watson 1997; Smith & Dove 1997). Small-holder traditional shifting cultivation is not of itself to blame, though even indigenous people occasionally misjudge the meteorological or fuel conditions, and light fires that escape.

Even if the exact location of all fires were known, we could never be absolutely sure who lit all of them and why. Almost all rural people have reasons for burning, and have little incentive either to help prevent or to extinguish the fires lit by their neighbours. They may complain at times, but the use of fire is normal, and we can be sure almost all are deliberately lit.

#### **The link between land-tenure conflicts and fire**

Similarly, not all fires which get out of control have done so accidentally. A well-aimed fire is a traditional method of expressing a grievance or settling old scores or perceived injustices, especially among poor rural people who have few other means of redress.

In the current context, people's incentives to burn could be substantially reduced if Indonesia were to move ahead more rapidly in reconciling the contradictions between traditional 'adat' (customary) land law and the official (central government) forest and land use laws. Much reporting in the international media has underestimated the extent to which the burning is deliberate. Local people fear that if they do not secure rights to their traditional lands, they will lose them in a race against migrants and big companies for land at the forest frontier. Since government acquires land for large-scale agricultural, tree-crop or forestry development programmes by using fire and then planting, so local people have decided that they must clear forest and plant cash-crop trees as a mechanism for confirming local land-use rights in a way recognised nationally.

Clearer land tenure laws could lessen the incentive people currently have to burn forest and plant crops, as their way of registering the land they regard as theirs. Experience in other tropical regions has shown that if people have security of access to forested land they value, they have less incentive to clear it.

### **Why have fires become more frequent and intense in the last 25 years?**

While there is a centuries-old baseline level of fires in Indonesia, the frequency and intensity of fires has increased post-1970. This is due to three factors:

- the extent of logging, which pre-disposes the forests to burn, because of the logging debris left behind, greater openings in the canopy, reduced forest density, etc;
- the increasing numbers of transmigrants, who often use fires carelessly to clear additional land when their allotted land-area proves too small or too infertile to support the household;
- the conflicts created by the imposition of these two newer kinds of land-use on the original population and its own right to forest, which is reasserted through fire.

As the forests are opened up by government, ways have to be found to help people deal with the drier conditions and resultant greater flammability of the forests that accompany logging, the activities of recent migrants and the development of industrial timber plantations.

### **The contribution of commercial tree-plantations**

The recent thrust into very large-scale clearing (mainly of degraded forests) in order to establish plantations of oil palm, rubber and industrial pulpwood, has completely changed the nature of what is burnt, where, and how. Most of the smoke and hazardous haze has stemmed from the burning of debris piled up into wind-rows in huge areas being deliberately cleared for commercial agriculture in two regions: the Sumatran provinces of Riau and Jambi, where large oil-palm plantations are being established; and the one million hectare project to convert peat-swamp to rice-fields in Central Kalimantan.

It is important to recognise that the government's own five-year economic plan (REPELITA VI) calls for the establishment of 700,000 hectares per year of additional oil palm plantations, and for very substantial new areas of other tree crops. Virtually all areas to be converted to plantations will be burnt, as it is much cheaper than any

alternative form of land preparation. Because land-clearance is not only sanctioned by the Indonesian government, but also in many cases subsidised by it, and because the owners of the companies are well-connected at the highest political levels, there has been little interest in fire prevention and suppression in many government quarters, despite the public health, ecological and economic costs. Outspoken government leaders - the Ministers of the Environment and of Forests strongly supported measures to control fires and rein in the perpetrators - have faced very powerful opposition, and have been able to achieve only limited success.

The properties of the big plantation companies are not at great risk from the fires, as they generally have moderately good fire protection activities to safeguard their multi-million dollar investments. It is usually on government forest land that fires get out of control. Since such burnt-out land is likely to be offered to the plantation companies subsequently, one can infer that companies looking for more plantation land have little reason to be concerned if natural forest, of little commercial timber value, is damaged by fires.

### **Why has smoke haze become worse?**

One reason why the smoke haze has become much more damaging to public health is that many recent fires are now 'dirty' fires. Much soil, green vegetation and debris had been casually and carelessly pushed up into heaps by contractors working for estate companies, and can only burn slowly and with much smoke. The sort of smoke that a fire gives off naturally depends on the type of fuel as well as the intensity of the fire. A hot fire of dry fuel (as practised by most traditional small farmers in Borneo and Sumatra) gives off very little smoke or haze.

Thus while the weather conditions that make forests more flammable are quite natural, the factors which have created a 'disaster' are very much man-made - the outcomes of social, economic and political decisions to encourage conversion of forests to tree-crop estates and rice-fields, and of deliberate policies of unpreparedness and inaction in the face of warnings of extreme fire danger.

### **Costs and consequences**

Television pictures vividly illustrated different types of costs - from choking smoke haze, closed airports and whole towns shut down to the loss of livelihoods for millions of rural people who usually derive their food and their livelihood from the forests. But we still have very little idea of the relative magnitudes of all these social, economic, public health and environmental costs.

Others bore the costs of the probably futile attempts at suppression (the fire-fighters, aircraft, cloud-seeding, and so on): the Indonesian government itself, together with much more substantial inputs from outside, especially from Malaysia, France, Japan, Australia and the USA. While plantation companies were making modest reductions to their clearance costs per hectare through the use of fire, they were causing billions of dollars of damage to the citizens of both Indonesia and neighbouring countries.

The impacts of the fires have been even more significant in areas where forests overlie deep deposits of peat. These peat deposits have accumulated over the last five to ten thousand years and represent a huge store of carbon, significant at a global level. Burning this stored carbon has far more severe environmental impacts than

simply burning the annual accumulation of plant material which has traditionally been burnt. Burning peat contributes to the build-up of greenhouse gases in the atmosphere, and also releases particulate matter and sulphur and nitrous oxides, making the haze a threat to human health.

What should the international community and the Indonesian government do about fires and smoke haze in future?

### **Lessons from previous El Niños**

After the devastating Borneo fires of 1982-83 - coinciding with another El Niño - there was a flurry of interest in fire prevention, detection, management and suppression. A five-year German-supported study produced an excellent assessment and powerful recommendations - yet to be adopted. The Finnish and Japanese aid programs invested millions in fire detection, management and suppression techniques. USAID, the US Forest Service and Finland provided training in fire management and suppression for hundreds of professional foresters and trainers from Indonesia. The International Tropical Timber Organisation, the World Bank, the Asian Development Bank and many others sent evaluation missions and funded advisory projects. Most made very similar, very sound recommendations, which have generally remained unimplemented. None of this international effort was translated into the implementation of an effective system for collecting information about fires, for prevention or for public education about the dangers of fires in extreme weather conditions.

The 1991 El Niño produced fires across much of Indonesia but, again, little interest in reform or developing a national fire management system once the rains came and the fires went out. In the wake of the fires, various international teams conducted *post mortem* analyses of the underlying causes of the fires and made (sound and by now quite familiar) recommendations to prevent recurrence of the disaster.

The 1994 El Niño was slightly worse - Singapore was blanketed with smoke while some airports across the region were closed for a month. Despite the national embarrassment of the President having to apologise to neighbouring countries, and an ASEAN Committee being set up, plans for action faded rapidly once the immediate crisis had passed. The Committee has been virtually invisible during the 1997 crisis, which is unlikely to be over yet (see Box 2).

### **Box 2. The length of a typical El Niño event in Indonesia**

There is compelling evidence that the typical El Niño event takes about a year in all, starting and finishing around March-May. However, some El Niños have lasted only six months and twice in the past 120 years there have been continuous ENSO conditions for 24 months.

In almost all known cases of fires and droughts in Kalimantan associated with ENSO, there have been serious fires in August, September and October, followed by widespread scattered storms in November (but still substantially less rain than in a normal November). Then, rather than continuing rains until March-April, the rains simply fade out. By January, the drought is back in force and, in most ENSOs, the

January-March period has usually been much worse than the preceding August-October period. For example, most of the area burnt in the 1982-83 Borneo Fire burned during the first three months of 1983, rather than late in 1982.

That is the historical pattern from numerous sources. The long term forecast from the US Oceanographic and Atmospheric Administration (see <http://nic.fb4.noaa.gov:80/products>) stated in October 1997 that all their forecasting models are independently predicting an ENSO of record strength, with record statistical confidence, continuing to at least March, maybe April, 1998. During the April to August 1998 period, they expect the sea surface temperature (SST) anomaly off the coast of Peru to disappear and for the ENSO event to be followed by La Nina - a much wetter than average year for Indonesia starting about September.

This, then, is the likely pattern for the next few months. The rainfall records for November and December each week were all well below (up to 40% below) the long-term trend values for each period. The evidence from Australian, Indonesian and US Bureaux of Meteorology gives little basis for optimism that ENSO is already over.

Similarly, in 1997, many well-intentioned Western governments extended emergency assistance in the crisis months. Unfortunately, much of this was based on what Americans and Europeans imagine a forest fire is like, and on presumptions that these are uncontrolled wild-fires threatening to consume homes and infrastructure, rather than deliberate and targeted at land clearing. Some in Sumatra were deliberately re-lit after the Malaysian fire-fighting teams had extinguished them.

Many western techniques of suppression proved to be quite ineffective in the face of very hot fires and underground peat fires, which continue to burn at least until the swamps are inundated in the next wet season. (Some peat and underground coal fires are still burning in Kalimantan from the 1982-83 fires.) Such fires cannot readily be put out by fire-hoses, aerial drops or light rain from cloud-seeding.

## Solutions

Short-term solutions to the problems of these fires will generally be insufficient. Resources deployed in attempts to extinguish fires, though laudable, have only marginal impact. The real solution is the adoption of better long-term policies and regulations to improve general standards of land stewardship and ensure that fires of this magnitude do not recur when the next El Niño event comes, probably early in the 21st century.

An important long-term goal must be to ensure that programmes to open up new areas for agriculture take into account the consequent fire hazards. In general, caution should be exercised in allocating any peat-land areas for agricultural development. There are enormous problems in maintaining soil fertility on these sites and in many cases the best long-term economic use will be some form of forestry. Decisions about large-scale land clearing have often been made in the absence of a full appreciation of the value of the land under forest. This is particularly true of the value of the forests to local communities who typically derive a substantial proportion of their livelihood from the forest.

It is essential that we learn the lessons of the 1997 fires. The fires in 1983 and 1994 provoked considerable international short-term interest. But the measures taken were palliative and did not address the root causes of the problem. We must take advantage of the 1997 fires to understand exactly what happened and what factors motivated people to set the fires. Research is needed which involves all those actors implicated in the fires, to understand the measures that could be taken and to create situations in which such fires do not inevitably accompany every El Niño drought.

The conclusion is inescapable - our ignorance about these fires is still immense. It is counter-productive to set up expensive systems for 1999 if we already know that next year will be wetter than average. Ideally, by the time the next ENSO is identified, there ought to be already in place a consensus on the political, social and economic (as well as physical) causes of the current fires, and a definite action-plan based on that consensus ready for implementation. The role of the international media, and also increasingly of the international availability of all kinds of information, means that such a set of actions is far more likely to be agreed now than it could have been in 1983 (see Box 3). Many now realise that the best response to the Indonesian fires of 1997–98 is to work in more effective preparation for the next El Niño, which will be in about another five years time.

### **Box 3. The role of the media**

Few analysts doubt that Indonesia's fires would have remained an internal and largely unreported issue, but for the detailed and extensive coverage of the public health effects in Singapore and Malaysia. Public health was much more seriously endangered in towns and rural areas in Indonesian Borneo and Sumatra than in these other countries, but went largely unreported locally, owing to the suppression of media coverage.

But international media coverage has had a great impact, on this occasion in changing the nature of the public debate about the fires. In every other ENSO/fires/haze occurrence in recent memory, it had been possible for governments to point to the traditional burning practices of indigenous people as they cleared their fields for cultivation and to attribute much of the blame to them. This time, however, international media crews, drawing on satellite imagery among other sources of information, were able to show clearly that far more of the damage was emanating from deliberate commercial clearing activities, for oil palm in particular.

The role of the internet was also very significant for the first time, as websites such as those of the CRISP centre in Singapore and the US Forest Service clearly displayed satellite imagery which offered incontrovertible and independent data showing the origins of the fires and the haze.

As a result, the Indonesian Ministers for Forests and for the Environment explicitly recognised the major culpability of politically influential figures owning large plantations, and the nature of the political and technical debate was fundamentally changed. For the first time in Indonesia, it was clear that the fires were not escaped wild-fires resulting from the 'careless behaviour of ignorant small farmers', but rather deliberate land-clearing activities, often under government-sponsored or protected

schemes, which ignored prohibitions and pleas not to use fire.

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Neil Byron is Assistant Director General of the Centre for International Forestry Research (CIFOR) in Bogor, Indonesia.  
*Email: n.byron@cgnet.com*

Gill Shepherd is a Research Fellow in the Forestry Programme at ODI.  
*Email: g.shepherd@odi.org.uk*

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Design: Peter Gee  
Administrative Editor: Melanie Birdsall  
Series Editor: John Farrington

**Stag Place  
London SW1E 5DP, UK**

**Telephone +44 (0)171 393  
1600**

**Fax +44 (0)171 393 1699**

**Email: [nrp@odi.org.uk](mailto:nrp@odi.org.uk)**



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