Sampling on a burned area to gather scientific evidence.
Photo: Bambang Hero Saharjo

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Law enforcement to control land and forest fires in Indonesia

Bambang Hero Saharjo

"Enforcement of court case judgements has helped to reduce the number of uncontrolled fires, but without scientific evidence, the cases are very difficult to win."

Introduction

In Southeast Asia, land and forest fires are very common, either intentionally set or due to negligence, causing adverse effects to land, resources and ecosystems (Saharjo 2022). Both smallholders and industrial agribusinesses use fire to prepare land for subsistence and economic activities such as converting forest to permanent agriculture or plantation crops. The negative implications of fire include regional transboundary haze pollution, an increase in greenhouse gas (GHG) emissions, and a reduction in the productivity and sustainability of peatlands, notably by reducing biodiversity and storage of terrestrial carbon. Land and forest fires cause damage to natural resources that is not only biophysical; the economic values of environmental services may be lost and may even be irreversible.

In Indonesia, the use of fire as a land management practice is regulated by law to counteract its illegal and excessive use, which is often the cause

of unwanted wildfires. However, it is often difficult to determine the exact origin of ignition. Perpetrators usually cover their tracks carefully, leaving little evidence, and judiciary processes by the police and other agencies take considerable time. Law enforcement has benefitted from the evolution of methods for monitoring fire incidents, using satellite imagery supported by field verification. This has helped to reveal the culprits behind fire incidents, who can then be sentenced to pay fines and compensate for the environmental losses they have caused, following trials that are based on scientific evidence.

Tracing the cause of fires

The causes of fire in Indonesia, as elsewhere in the tropics, are primarily anthropogenic, either accidental or deliberate (Bompard and Guizol 1999; Bowen et al. 2000). However, the extent of human ability to change fire regimes and manage fire remains somewhat uncertain. A key component to changing fire regimes in the tropics is to identify the sources of fire and the main land use/land cover classes associated with fire (Cattau et al. 2016).

Government Regulation No. 4 of 2001 (Article 17), and Law No. 32 of 2009 on protection and management of environment (Article 69, Paragraph 2) state that using fire to clear land may be carried out only by indigenous communities, and only where the fire does not spread to neighbouring land that does not belong to them. Meanwhile, the use of fire by private companies is permitted only for eradicating pests and disease, and only following authorization from official authorities, as regulated in Law No. 41 of 1999.

Establishing who is responsible for a fire remains highly contested (Dennis et al. 2005; Page et al. 2011). It often results in a chain of finger-pointing, with no clarity as to the cause of the fire, including those in rainforest (Goldammer 1991). Originally, the Indonesian government blamed smallholder shifting cultivators for wildfires. Later, however, it claimed that wildfires were more likely caused by large companies using fire to open up land for commercial oil palm, pulpwood and timber plantations. Some of these practices were supported by government policies and incentives (Brown 1998; Page et al. 2011).

Although some large landholders clear land using mechanical means, many use fire, which can escape beyond its intended boundaries. Burning to clear land has been a traditional practice of smallholders and indigenous groups, but there is evidence that in the past this use of fire was relatively small scale and well managed (Tomich et al. 1998; Bowen et al. 2000). However, this is likely not the case today. The scale of land cleared by fire has expanded, with increased use of burning by both smallholders and by larger-scale rubber and oil palm concessions (Stolle and Lambin 2003). Both smallholders and large-scale farmers have been seen as responsible for causing wildfires (Stolle and Lambin 2003; Page et al. 2011). Increasingly, the clearing of land for plantations is considered the main cause of wildfires, such as the 1997–98 blazes that were the worst in Indonesia's history. They burned almost 11 million hectares (FPCI 2021), and accounted for one-quarter of total global carbon emissions at the time.

Fire regulations and management

Activities that control land and forest fires follow Government Regulation No. 45/2004 on Forest Protection, amended under Government Regulation No. 60/2009. Regulations specific to fire are included in Chapter III: Forest Protection from Fire (Articles 18–31). This is divided into Part 1, general; Part 2, fire control, including (i) prevention, (ii) extinguishing, and (iii) post-fire handling, which includes rehabilitation of burned land and law enforcement; and Part 3, crime and civil responsibility.

Many efforts to prevent forest fires have been carried out, by individuals (including shifting cultivators), private companies and the government (Saharjo 2022). Government-led approaches have included awareness raising with communities through education and training, but unfortunately, many of these activities have failed due to a lack of coordination and of long-term commitment of resources.

Where fire prevention is not successful, the resulting wildfires must be controlled. Companies may try to do this themselves, or with support from other parties, such as Indonesia's forest fire brigades (*Manggala Agni*). However, if extinguishing the fire takes days, this raises the question of why the fire became so uncontrolled, when companies are supposed to reduce the threat of fire in accordance with applicable regulations. In such cases, it is necessary to undertake an investigation of the burned area to discover if the fire was set intentionally, if its spread was due to negligence, and which individuals or corporate actors caused the fire.

Those responsible for the fire must then work to restore the damaged environment. The recovery process, or post-fire management, must be carried out not only on burned land but also on the broader ecosystem. This is because fires result in the release of GHGs and cause ecological imbalances in the burned area and beyond,

Field verification through sampling, photography and measuring peat. Photos: Bambang Hero Saharjo.

especially on peat. In addition, restoration must be carried out immediately in order to mitigate the fire's negative impacts.

Collecting scientific evidence

According to the Decree of the Chief Justice of the Supreme Court No. 36 of 2013, to prove that a fire has occurred and therefore caused environmental damage, it is necessary for the prosecution to provide scientific evidence about the fire. For this reason, it is necessary to trace the source of the fire. This is done by studying satellite imagery and by analyzing samples taken on burned land at an accredited laboratory; the samples are then compared with controls and quality standards in accordance with Government Regulation No. 4 of 2001. Without scientific evidence, judges cannot make decisions.

Whether fires occur on community land, or land owned or leased by a corporation, scientific evidence is needed for use in the trial process, including information about any pollution and environmental damage that resulted from the fire. Data is collected in two ways: (i) through use of satellite imagery; and (ii) by field verification, including analysis of soil samples. Confirming that a fire occurred and determining what caused it are not always easy to do, especially if the fire happened several years ago.

Satellite images

A combination of low- and high-resolution satellite imagery is used to ascertain the extent of fires, and can help to assess whether a fire was intentional and if its spread was due to negligence. Images from low-resolution satellite sensors allow burned areas to be detected, and if overlaid on a company work map or other map, they can illustrate the ignition site and spread. Data on high-temperature events (representing active fires) can provide an indication of fire occurrence.

Nowadays, law enforcement is supported by the availability of high-resolution Sentinel satellite imagery from the European Satellite Agency. These images identify the location of active fires, which is very helpful in ascertaining the source of fires, and can reveal fire incidents from previous years, as an example see figure 1. Other instruments — such as Google Earth, Nullschool and Worldview — allow users to reconstruct events in sequence to see if a fire occurred in a previous year but in an area that has since been replanted.

Field verification

It is necessary to confirm findings from satellite data through a process of field verification, with representatives of the company or the land owner present as witnesses. This verification process doesn't just look at the area burned, but also evaluates the broader agroecosystem, such as forest types and staple crops growing in the area. In addition, it assesses the fire control facilities

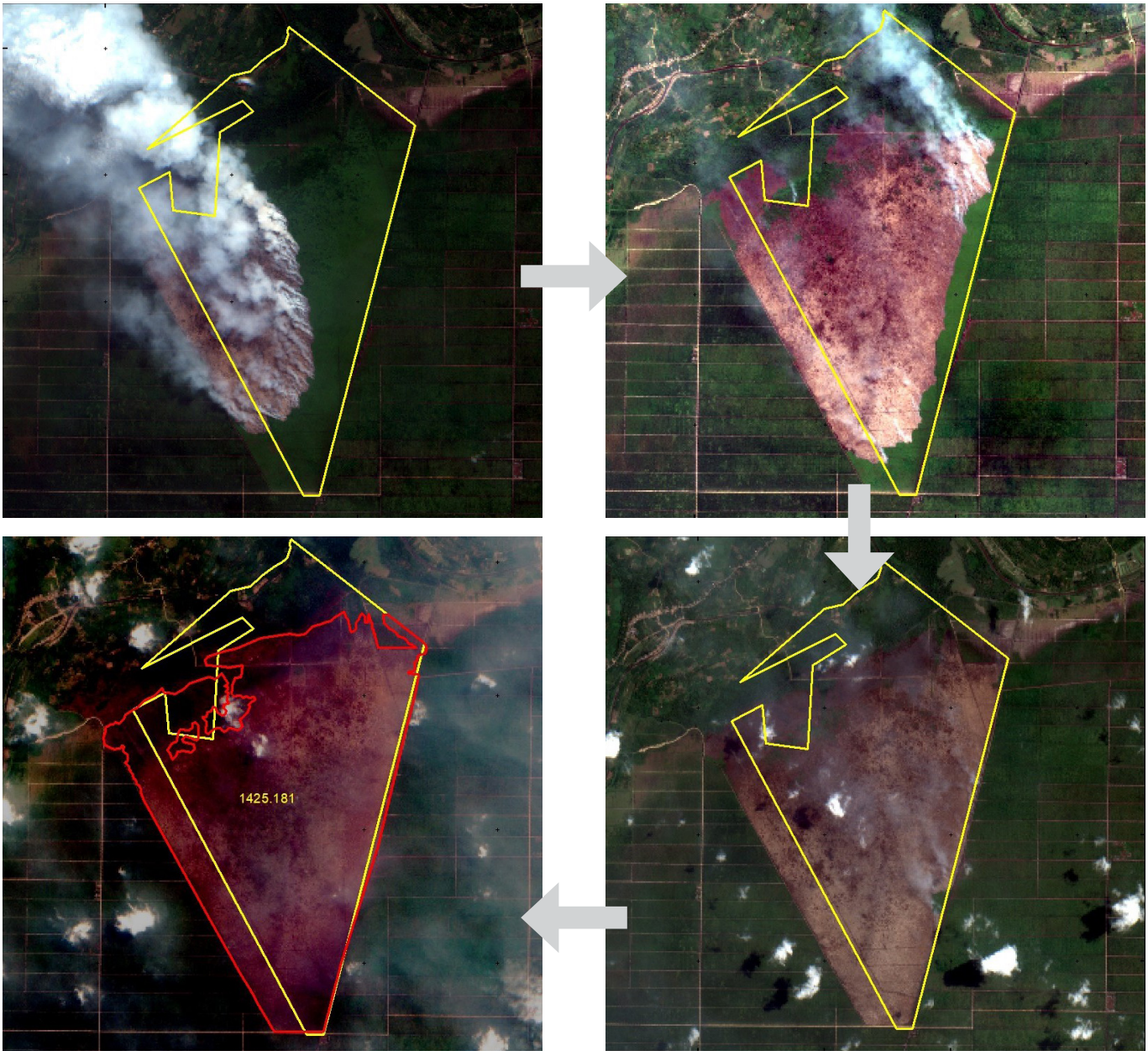

Figure 1. Tracking a fire in Jambi from soon after ignition using images from a Sentinel satellite. The yellow line indicates the boundary of a company's land, and the red line shows the limits of fire damage. Source: RFMRC-SEA

and infrastructure (in the case of a company) available to control fires, as required by applicable laws and regulations. For example, Regulation of the Minister of Agriculture No. 5 of 2018 (Article 17) stipulates that a team of 15 firefighters is needed for a plantation area of 1,000 ha, a team of 30 in areas of 1,000–5,000 ha, and a team of 45 in areas of 5,000–10,000 ha.

In addition, samples are collected for analysis in a laboratory. These can include burned soil/peat from surface and subsurface layers, and partially burned woody matter and ash (if any still remains), along with soil/peat from unburned areas for use as a control in comparing the changes. Also assessed are any vegetation regrowing on burned areas, peat thickness and groundwater depth. Field verification can be repeated as many times as required, even during the judiciary process, if more evidence is required.

A list of the samples taken during field verification are included in an official report. The report is signed by all parties, including company staff, land holders,

investigators, experts, and representatives from other relevant agencies who were present and witnessed the sampling. The investigator takes the samples to a laboratory for analysis to ascertain the impacts of the fire by comparing them to the available quality standards.

The judicial process

Cases of land and forest fires caused by communities are handled by the police, whereas the Ministry of Environment and Forestry adjudicates in corporate criminal cases and in civil lawsuits related to environmental losses. When cases are brought to court it can be difficult for the prosecution to accurately determine the answers to many questions. These include whether a fire actually occurred, and if so, when and where it started, if monitoring was carried out, , if the fire was extinguished properly, and whether the fire control facilities and infrastructure were adequate according to applicable laws and regulations. Other questions relate to what happened in previous years, what the motive was (if the fire was deliberately set), what economic and ecological damage was caused, what the cost of rehabilitation will be, and who should be responsible for paying that cost. To answer these questions, field verification data is cross-checked with satellite information, and the results are then overlaid on a company's work map.

Data obtained from samples are analyzed in the laboratory and then included in an expert certificate. Based on the information in this certificate, investigators conduct an examination to confirm that the fire did occur; to assess its origin, extent and impacts; and to ascertain whether it was intentionally set or occurred due to negligence. The file including all documentation is sent to the public prosecutor, who submits it during the trial. If there is still insufficient evidence, the police may need to undertake further investigations. During the trial, the defendants, through their lawyers, usually try to refute the evidence.

Examples of successful prosecutions

Haze pollution caused by fires has occurred for years, and was particularly bad in 2015. That year, more than 50 Indonesian companies were found guilty of causing fires that led to the haze that blanketed Southeast Asia (BBC News 2015). For the first time, the government began to revoke the licences of those companies found responsible, and although only a few companies have been named, the locations of 30 of the 56 companies that were punished are known.

In 2019, in an instance of a zero-tolerance enforcement approach against concession holders, an Indonesian court ordered palm oil company PT Arjuna Utama Sawit to pay the equivalent of USD 7.1 million in fines to the Ministry of Environment and Forestry and USD 11.5 million in compensation for environmental damages. This was in response to fires that razed 970 hectares of forest in Katingan District, Central Kalimantan province (Jong 2019). The company is a supplier to the Musim Mas Group, which has committed to a "no deforestation, no peat and no exploitation" (NDPE) policy to ensure the sustainability of its palm oil supplies. The group holds a concession to manage 16,600 hectares in the district.

Conclusions

Based on data tracking using satellite imagery, the source of fires and the distance they spread until they are extinguished can now be assessed with more certainty. This information is confirmed through field verification, a process that includes establishing whether a company has adequate fire control measures. The results of laboratory analyses of samples taken from burned and unburned locations help determine the impacts of fire on the soil and vegetation, the level of smoke pollution, and any other environmental damage caused. All of this scientific evidence becomes the basis for a court case and for a judge to make a decision about companies or individuals that are accused of being responsible for the fire. If the defendant is found guilty, the court will also then decide what restoration work is required and how much compensation must be paid to cover the broader costs of air pollution and ecosystem damage.

Since the enactment of Law No. 32 in 2009, and the use of evidence from satellite images and other instruments, most of the prosecuted cases have been won. There are still fires in palm oil plantations in Sumatra and Kalimantan, but their numbers have been greatly reduced: from 1.6 million ha in 2019 to 300,000 ha in 2021. This is due to vigorous legal action taken against companies, whether the fires were started deliberately or accidentally (FCPI 2021).

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