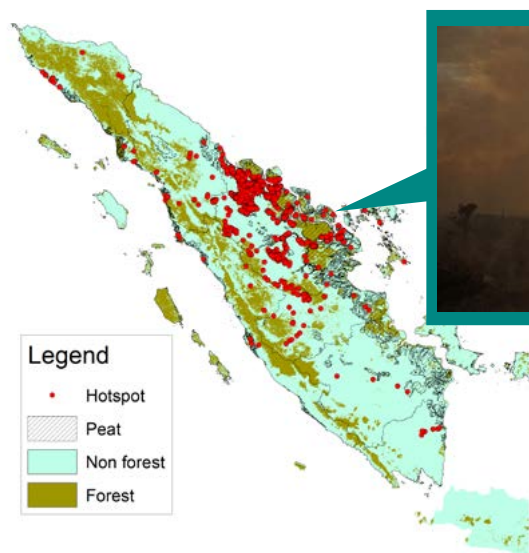


Hot spots in Riau, haze in Singapore:

the June 2013 event analyzed



Photos: Ulet Ifansasti, Ferina Natasya/Greenpeace

Key Findings

1. As well as small- and large-scale operators, a third category of 'local, mid-level entrepreneurs' has economic and environmental impact on Sumatra.
2. About half of the fire 'hot spots' in Riau province occur on land with an active permit for large-scale operations (industrial timber, oil palm and logging); the rest occur outside permitted areas for land-use conversion.
3. Hot spots are concentrated on the deepest peat soil, in areas that already were deforested before 2010.
4. On mineral soils, hot spots are most frequent in logged-over forests.
5. The hot spots are concentrated in three districts. The pattern points to large differences in governance within the province. Sufficient real-time data is now available for government agencies to act but data confidentiality still limits public discourse.

Implications

- Policies need to be adjusted to deal with new actors who acquire land for oil-palm expansion under local institutional frameworks that are outside of government planning and control.
- Holding concession holders accountable for hot spots within their boundaries would help reduce the problem but half of it is outside of their formal control (but not out side their spere of influence). The land-use dynamics on peatland and mineral soil require different policy responses.
- Haze and associated carbon emissions on peat are post-deforestation and technically outside the reach of international REDD+ mechanisms, but inside land-based NAMA. They are directly linked to land preparation prior to planting.
- On mineral soils, the gap between local and formal government classifications and interpretation of 'forest' is still a major part of the problem.
- As neighbouring districts with similar conditions have so far avoided the haze problem in 2013, the quality of local government in the affected areas seems to be the issue. More transparency on existing concession rights is needed to support active feedback and corrective public response.

<http://www.asb.cgiar.org>

The fire-haze episode straddling the Strait of Malacca in June 2013 has reignited debates that have been repeated for at least the last two decades. All allegations of causation are probably true: somewhere. None of them seem to be true as generalizations that can be stated with confidence. In the current debate, finger pointing still alternates between the small- and large-scale agricultural operators. The latter include companies with headquarters in Singapore and Malaysia, where ironically, the undesirable haze accompanies the financial returns on their investments. We analyzed the spatial data and, in combination with reports from the field, a new perspective has emerged.

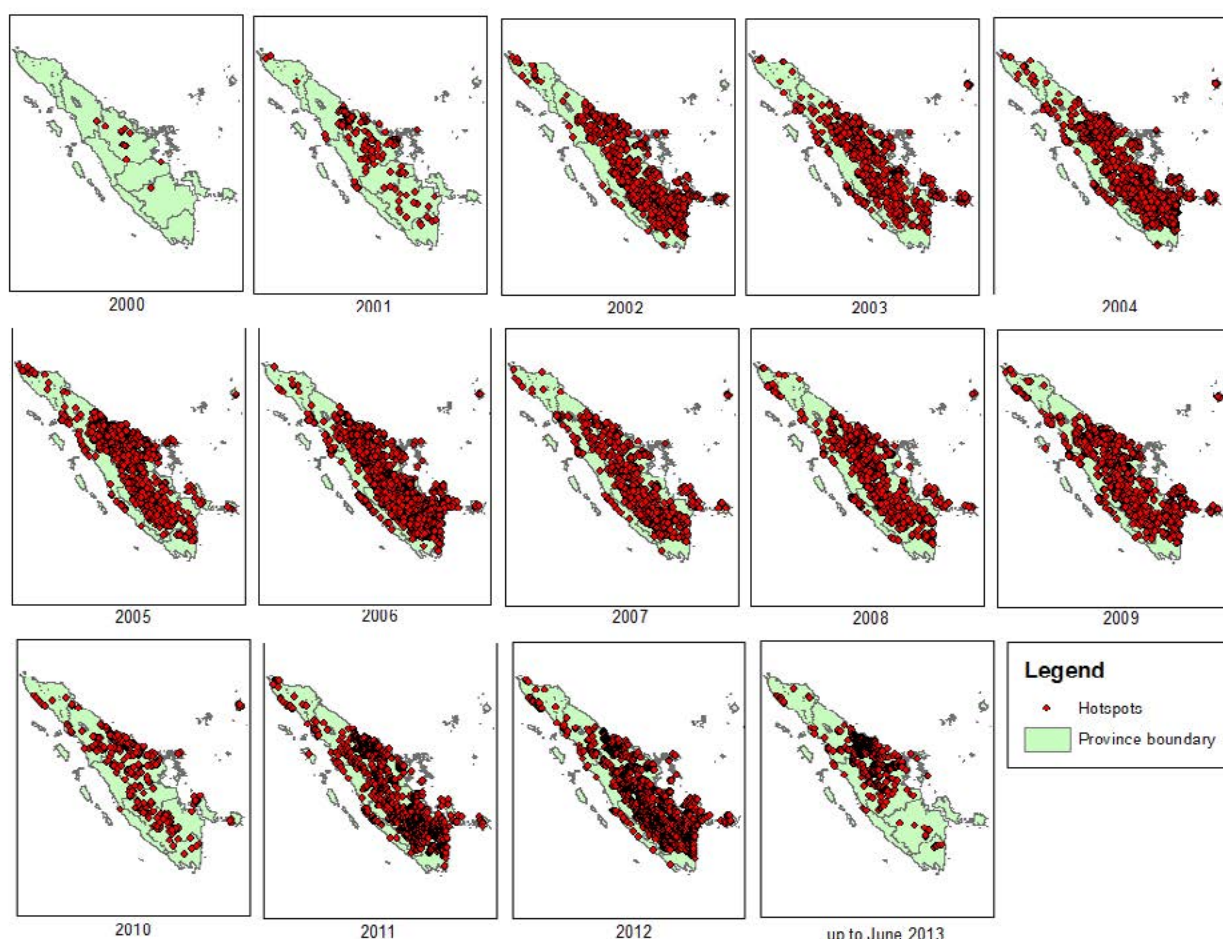


Figure 1. Time-series map of fire hot spots in Sumatra, Indonesia

Using a free data source from the Earth Observing System (<http://earthdata.nasa.gov/data/near-real-time-data/firms/active-fire-data>) and Indonesia's peat and moratorium map¹, as well as our own 2010 land-cover classification data (Ekadinata, 2011), we selected only the hotspots with a >90% confidence level² recorded. Hot spots are the most widely used indicator of surface fires, but need on-the-ground verification as there can be other causes of high temperatures being reflected to the satellite sensors (Arino and Rosaz, 1999).

The number of hotspots observed varies from year to year but the June 2013 event in Riau stands out from the pattern of the last 10 years.

1 Peta Lampiran SURAT KEPUTUSAN MENTERI KEHUTANAN REPUBLIK INDONESIA Nomor: SK.2796/Menhut-VII/IPSDH/2013. Skala 1:250.000: http://www.ukp.go.id/informasi-publik/cat_view/20-geo-spasial

2 MODIS Active fire detection datasets, for detail information please see : <https://earthdata.nasa.gov/data/near-real-time-data/faq/firms>

A total of 3270 fire hot spots on the island of Sumatra were detected for 2013, with over 90% in June and 2492 just for the week of 19–26 June; 78% (1942 hot spots) were found to be located on peatland and they are likely the main cause of persisting haze. More than 95% of the hot spots in Sumatra occurred in Riau province.

The two dominant trends of land-use change in the area are the development of plantation forestry for the pulp and paper industry and the expansion of oil-palm plantations. Both are implicated in the June 2013 fires, with hot spots occurring in oil-palm and pulp-and-paper parts of the landscape. According to a World Resources Institute report (Sizer et al 2013), 27% of the hotspots that occurred 12–20 June were inside timber plantations and 20% in oil-palm plantations. Mining concessions might be implicated as well but since details of the current concessions in Indonesia are not in the public domain further analysis is constrained.

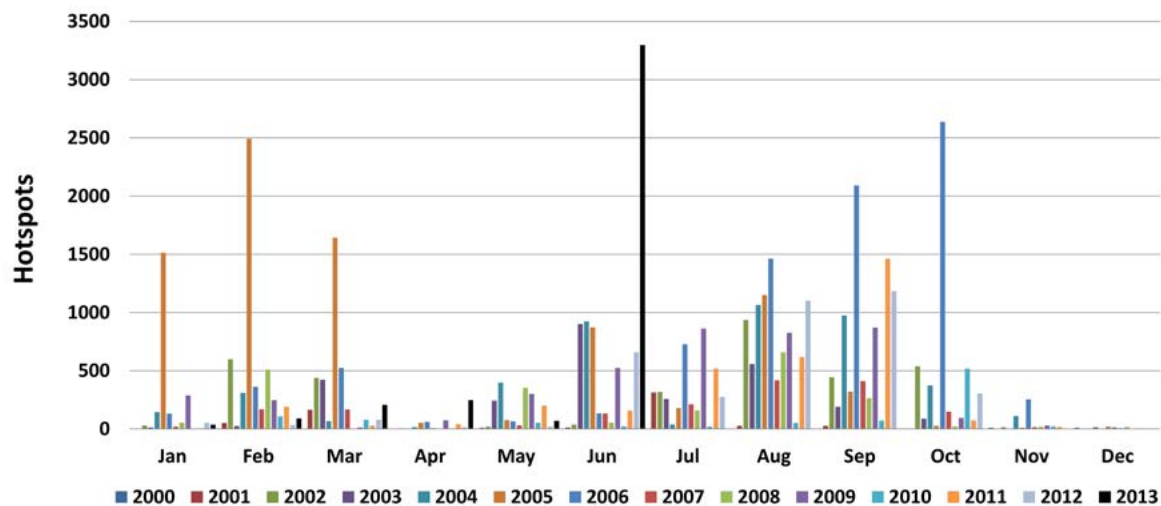


Figure 2. Number of fire hot spots on the island of Sumatra, 2000–2013

1. Local entrepreneurs form a third category of land users

Before the 1997/8 fires, the blame was exclusively on smallholders' 'shifting cultivation', with large-scale plantation operators and development projects protected from any criticism. The 1997/8 events and subsequent debate made clear that slash-and-burn methods of land clearing were the cheapest option for all and were widely used by large- as well as small-scale operators. There is now a third category that has appeared: local investors (often migrants) who acquire land under local rules and bring in their own labour to clear the land for oil-palm expansion, regardless of the formal land status and in the absence of any permits (see Box Tesso Nilo; Figure 4).

Box: Tesso Nilo

The Tesso Nilo National Park has been expanded into areas that were previously logged. Active conversion of this logged-over forest to other land uses, however, is taking place. Cultivation of oil palm by independent planters in the surrounding area and within what is now the national park started at the end of the 1990s, a few years before the national park was established by the Ministry of Forestry (Keputusan Menteri Kehutanan No. 255/Menhut-II/2004). Researchers investigating the dynamics need to gain the trust of local informants but then they are offered easy-to-get land, a couple of hundred hectares at a time. A simple ceremony is allegedly enough to become accepted into the local community which has claims on the land under traditional resource-use rights.

Observations in two villages in the vicinity of the national park revealed that some independent oil palm cultivation units operate in a couple of hundred hectares. The investors use their extended family networks in neighbouring North Sumatra province to bring in labour, usually with skill and experience in oil-palm plantation operations. There are two

systems employed: paid labour and share-cropping (30/70%). In the share-cropping system, each household receives 2 ha of land to be cultivated, which mirrors the rules of the Government's transmigration programs. The sharecroppers are responsible for land clearing, planting and crop care. The investor provides all the needed farm inputs and also, in some cases, housing within or surrounding the plantation. This practice operates in the contested zone between the traditional and formal government regimes that regulate land-use allocation: a well-known phenomenon in Indonesia. Qualitatively similar patterns of migration exist elsewhere but in Riau it has reached a new scale and requires policy responses. For example, Desa Kesuma grew from 430 inhabitants in 2000 to 4781 in 2010 (PODES 2001, 2011), an annual population growth rate of 24.09%. Most of this growth is linked to the development of independent oil-palm cultivation, mostly within the national park, which appears to exist on paper only. Based on monitoring carried out by WWF and the Balai Taman Nasional Tesso Nilo, until 2011 a total of 21,457 ha out of the total area (83,068 ha) had been encroached upon by non-park activities, with 15,714 ha for oil palm plantation (Tribune Pekanbaru, 24 January, 2013). The 2013 season will add to this, providing incentives for further expansion under a 'business-as-usual' regime.



Figure 3. Active fire hot spots in Tesso Nilo National Park, Riau province, Indonesia, June 2013

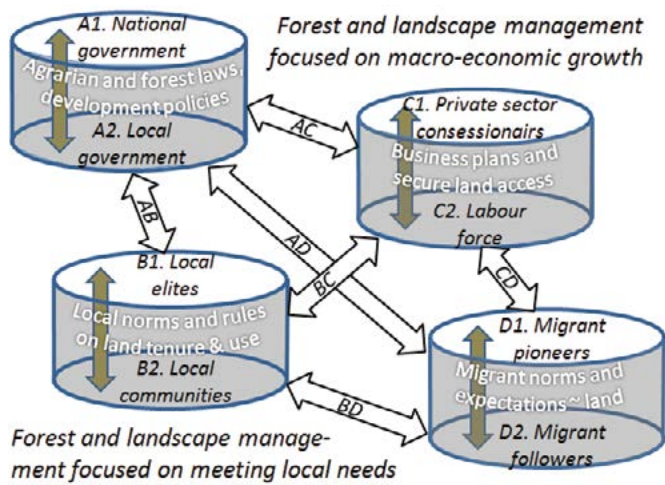


Figure 4. Complexity of social actors in the forest margins of Sumatra and their multiple interactions; migrant pioneers tend to acquire land from the local communities and invest in land use that targets the market channels provided by the large-scale concessions

2. Half of the hot spots are in large-scale concessions, half elsewhere

The frequency of hot spots on mineral soils and peatland, and areas covered by the Government's moratorium on forest conversion, tell a clear story (Figure 5A). The distance of hot spots to known concession boundaries (even though details of the concessions are not in the public domain), suggest that there is a spatial association. The odds ratio is around 1 in the 40% of Riau that is part of concessions, increases to a maximum at 5 km from the nearest concession and drops to low values at 15–20 km from a concession (Figure 5B).

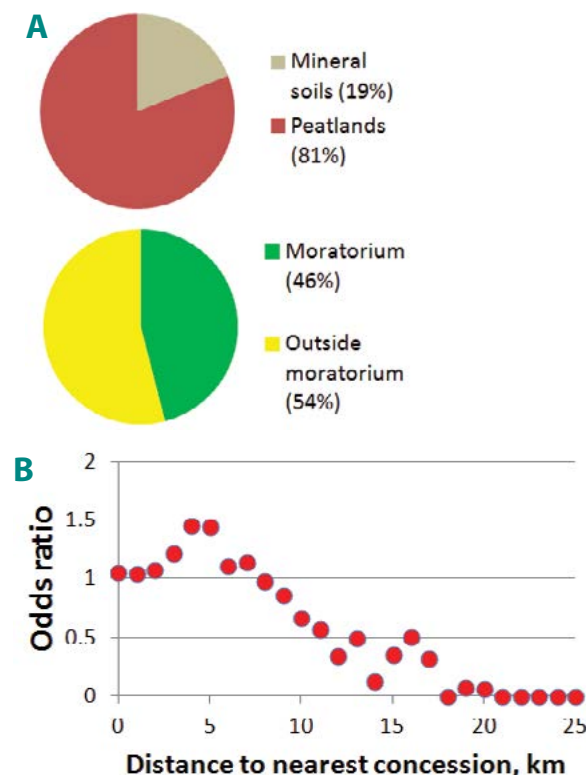


Figure 5. (A) Hot spots classified by soil type and by inclusion on the moratorium maps; (B) odds ratio of fire hot spots to distance to concession, Riau province, Indonesia

3. Hot spots on the deepest peatland in areas deforested before 2010

Odds ratios above 1 show that 'production forest' land is most likely to become a hot spot. The odds ratio indicates that peat soils of 4–8 m deep are twice as likely to be a hot spot, while shallow peat has virtually no hot spots (this land might have been converted already). Peatland with a depth of more than 3 m have since long been, legally, off limits for conversion to plantations but that protection has not been effective in Riau (Figure 6).

A closer examination of the hot spots in relation to the actual land cover in 2010, as analyzed by the Accountability and Local-Level Initiative to Reduce Emissions from Deforestation and Degradation in

Box: Odds ratio

Results of spatial association are expressed as an 'odds ratio': the probability that a point belonging to a certain class (for example, deep peat, production forest or at a given distance from the nearest concession) will be a hot spot, relative to the overall average probability.

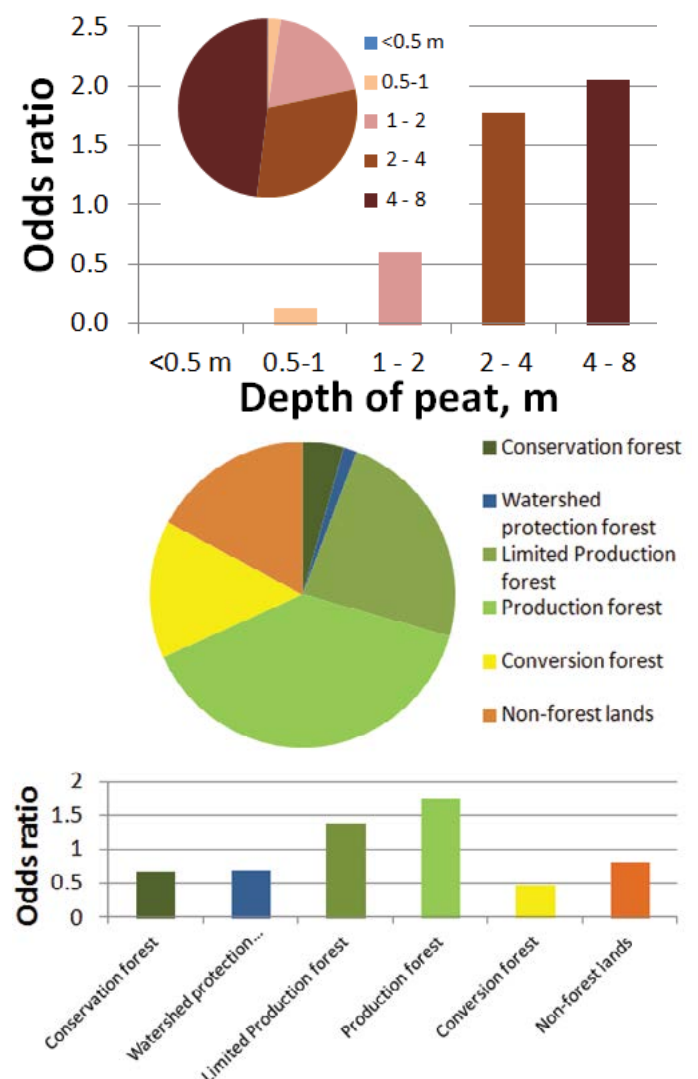


Figure 6. Odds ratio of land status and depth of peat, Riau, Indonesia

Indonesia (Project ALLREDDI 2012), shows very different patterns for peat and mineral soils.

On mineral soils, the highest odds ratio (3) is for logged-over forest, compatible with the Tesso Nilo National Park case discussed above (Figure 7). On peatland, however, the higher odds ratio (5) for land that had been deforested before 2010 and the second higher (4) for land categorised as 'estate crops' (mostly oil palm). This suggests that preparing land for planting, rather than primary deforestation, is most responsible for the fires. Interestingly "idle" shrub land is not a major target of this, although it is seen an alternative for further forest cleaning.

4. Sufficient real-time data is now available for government agencies to act

It is immediately clear from the maps which districts are mostly involved: Rokan Ilir, Dumai, and Bengkalis. These happen to be directly upwind from Singapore, hence, the haze has become an issue in international relations. Compared to earlier haze episodes, the continuous availability of 'hot spot' data has allowed a number of agencies to respond quickly with links to concession names (Sizer et al 2013). There is no lack of up-to-date information on hot spots and concessions to act on but the incentives to act are apparently too low and the

incentives to not act might be too high. Unfortunately, information available from government agencies on existing concessions is not yet in the public domain, which restricts public debate.

Wider implications: putting out fires with carrots, sticks or sermons?

Despite the zero burning policies for land clearing and several other regulations and measures to prevent and manage forest fires, the fires, especially on peatland, continue to occur. While the zero burning policy was enacted in 1997, variations in subsequent annual rainfall patterns relate to part of the hot spot frequency but current haze does not stem from exceptional weather. Despite the uncertainties in calibrating hot spots with fire occurrences, the patterns are apparent.

Policy responses have tended to focus on dealing with the symptoms rather than the underlying causes. The success of cloud-seeding to make rain is for others to judge but a focus is needed on increasing the disincentives for those who cause the fires, with a rapid response that allows a 'tit-for-tat' that hurts the financial motives of using the cheapest method for land clearing.

Clear standard operating procedures are needed between central and local governments for exchange of information and initiating remedial action, with media and civil society as watchdogs. There may already be substantially better practices in neighbouring parts of Sumatra, so the current haze-producing districts can learn from neighbours. 'Naming and shaming' is the approach indicated, with legal recourse that acknowledges incomplete data.

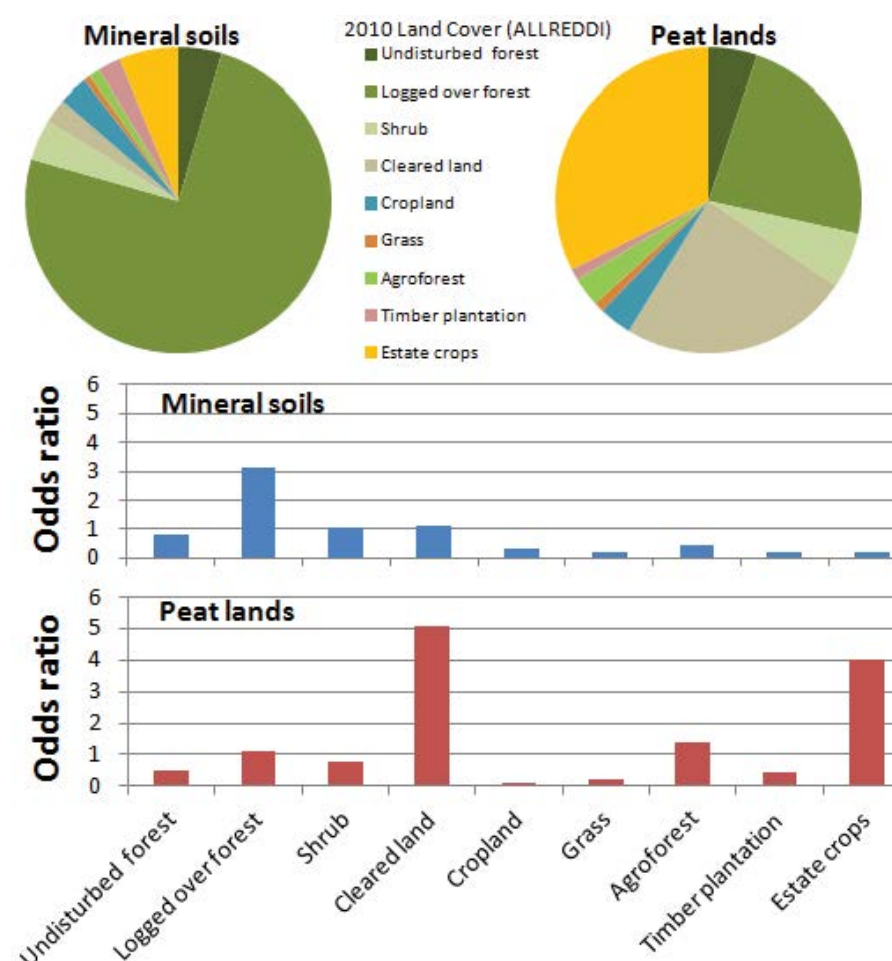


Figure 7. Odds ratio of fire hot spots on mineral and peat soils with types of land use, Riau, Indonesia

Box: Carrots, Sticks and Sermons

Instruments available to the Government can be labelled 'carrots', 'sticks' and 'sermons'.

Carrots

- Certification of legal and/or voluntary standards, giving access to market segments otherwise closed.
- Tax incentives for adherence to standards above the basic level.
- Use-rights conditional on ecological performance in sensitive areas.

Sticks

- Spatial restrictions supported by sanctions.
- Cancellation of use rights and permits.
- Boycott by actors down the value chain.

Sermons (suasion)

- Open channels for expression of public opinion.
- 'Naming and shaming' companies with hot spots on government web sites.
- Public, open interviews of parliamentarians with the actors involved.

Photos on page 1:

Smoke rises from fires on recently cleared peatland in the PT Rokan Adiraya Plantation oil palm plantation near Sontang village in Rokan Hulu, Riau, Sumatra. GP04N3V ©Ulet Ifansasti/Greenpeace

A woman in the city of Dumai, Riau, Sumatra wears a mask to protect herself from the air pollution caused by forest and peatland fires. GP04N34 ©Ulet Ifansasti/Greenpeace

Singapore's Pollutant Standards Index (PSI) hits an all-time high due to haze coming from Sumatra; measurements are classified as "hazardous" and can aggravate respiratory ailments; pharmacies sell out of masks within a day of the smog descending on the city. GP04N2O ©Ferina Natasya/Greenpeace

The ASB Partnership for the Tropical Forest Margins is working to raise productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services. ASB is a consortium of over 90 international and national-level partners with an ecoregional focus on the forest-agriculture margins in the humid tropics, with benchmark sites in the western Amazon basin of Brazil and Peru, the Congo Basin forest in Cameroon, southern Philippines, northern Thailand, and the island of Sumatra in Indonesia. The ASB Policybriefs series aims to deliver relevant, concise reading to key people whose decisions will make a difference to poverty reduction and environmental protection in the humid tropics.

References

- Arino O, Rosaz JM. 1999. 1997 and 1998 world ATSR fire atlas using ERS-2 ATSR-2 data. In: Proceedings of Joint Fire Science Conference. p. 177-82.
- Eco-business.com. 2013. *New palm oil innovation group set to address haze issue*. Available from http://www.eco-business.com/news/new-palm-oil-innovation-group-set-address-haze-issue/?utm_medium=email&utm_campaign=EB+Jul+4th+2013+newsletter&utm_content=EB+Jul+4th+2013+newsletter+CID_a7775334c2d3dc2252f73efdf2caea&utm_source=Campaign%20Monitor&utm_term=READ%20FULL%20STORY. (Accessed 6 July 2013).
- Ekadinata A, Widayati A, Dewi S, Rahman S, van Noordwijk M. 2011. *Indonesia's land-use and land-cover changes and their trajectories (1990, 2000 and 2005)*. ALLREDDI Brief 01. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program. 6 p.
- For a perspective on continuing efforts to achieve cleaner development pathways for peatland districts see: <http://blog.worldagroforestry.org-index.php/2013/07/04/reducing-emissions-from-all-land-uses-in-tanjung-jabung-barat/>. (Accessed 6 July 2013).
- Galudra G, van Noordwijk M, Suyanto, Pradhan U. 2010. *Hot spots of confusion: contested policies and competing carbon claims in the peatlands of Central Kalimantan, Indonesia*. ASB Policybrief 21. Nairobi: ASB Partnership for the Tropical Forest Margins.
- Gaveau D, Salim MA. 2013. *New data on Riau fires generate important insights*. Online. CIFOR Forest Blog. Available from <http://blog.cifor.org/17493/new-data-on-riau-fires-generate-important-insights/#.UdYjxDxBOqh>. (Accessed 6 July 2013).
- NASA FIRMS, 2012. MODIS Active Fire Detections. Data set. Available on-line <http://earthdata.nasa.gov/firms>
- Sizer N, Stolle F, Susan Minnemeyer S. 2013. *Peering through the haze: what data can tell us about the fires in Indonesia*. Washington, DC: World Resources Institute. Available from <http://insights.wri.org/news/2013/06/peering-through-haze-what-data-can-tell-us-about-fires-indonesia>. (Accessed 26 June 2013).
- Tomich TP, Fagi AM, de Foresta H, Michon G, Murdiyarso D, Stolle F, van Noordwijk M. 1998. Indonesia's fires: smoke as a problem, smoke as a symptom. *Agroforestry Today* 10(1):4-7.
- Wahyunto, S. Ritung dan H. Subagjo (2003). Peta Luas Sebaran Lahan Gambut dan Kandungan Karbon di Pulau Sumatera/Maps of Area of Peatland Distribution and Carbon Content in Sumatera, 1990 – 2002. Wetlands International - Indonesia Programme & Wildlife Habitat Canada (WHC).

Authors: Andree Ekadinata, Meine van Noordwijk, Suseno Budidarsono and Sonya Dewi.

Correct Citation

Ekadinata S, van Noordwijk M, Budidarsono S, Dewi S. 2013. *Hot spots in Riau, haze in Singapore: the June 2013 event analyzed*. ASB Policybrief No. 33. Nairobi: ASB Partnership for the Tropical Forest Margins. 6p.

Contact us at:

ASB Partnership for the Tropical Forest Margins,
P.O. Box 30677 - 00100 Nairobi, Kenya
Tel. +254 20 7224000
Email: asb@cgiar.org
<http://www.asb.cgiar.org>



**Research
Program on
Forests,
Trees, and
Agroforestry**