

The Underlying Causes and Impacts of Fires in South-east Asia

Site 6. Sanggau, West Kalimantan Province, Indonesia



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In collaboration with Pancur Kasih West Kalimantan

Site Report



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by

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Cover photo: Reoccupation of Timber Plantation Land by People of Sungei Omang and
Sebuda Village (in *Desa Sape*).

Photo by: Judith Mayer

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ABBREVIATIONS AND TERMS

<i>Adat</i> rights	Customary ownership or use rights recognized by local customary law
AVHRR	Advanced Very High Resolution Radiometer
ERS	European Space Agency Radar Satellite
EU	European Union
EU-JRC	the Joint Research Centre of the European Union
GIS	Geographic Information System
Ha	Hectare
Kanwil	<i>Kantor Wilayah</i> (Provincial Office)
Kecamatan	Sub-district
Km	Kilometer
Landsat MSS	Landsat Multispectral Scanner. An imaging system found on the first five Landsat satellites. The system collects multispectral data in four non-thermal radiation bands with a spatial resolution of 79 x 79 m.
Landsat TM	Landsat Thematic Mapper. A multispectral scanner imaging system on board the Landsat 4,5 and 7 satellites. The imaging system collects multispectral data in seven bands. The six non-thermal bands have a spatial resolution of 30 x 30 m, whereas the thermal band has a spatial resolution of 120 x 120 m. The temporal resolution is 16 days.
M	meters
MOFEC	Ministry of Forestry and Estate Crops
NES	Nucleus Estate Smallholder project, a government-sponsored plantation development program in which transmigrants receive title to a portion of the developed plantation project
NOAA	National Oceanic and Atmospheric Administration, USA
RTRWP	Provincial land use planning
Stakeholders	People or groups of people interested or responsible for forest management, including landowners, local communities, industry and government organizations.

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SUMMARY

This report provides an analysis of causes and impacts of vegetation fires in the Sanggau area, West Kalimantan Province, Indonesia. The Landstat TM Image level analysis indicated that during the period 1991 – 2000 there were considerable changes in the extent and quality of the natural forest. The reduction in total area of forest was 42% over this 9-year period, or an average of 5 % per annum. The forest type most affected was high-density forest, which was reduced by 10,039 ha, or 44 %. Low-density forest was also reduced by 37 % from 1991. Primary forest cover in this region declined precipitously from the 1950's to the 1970's with frontier-style shifting cultivation and settlement patterns. Fire has been a significant factor in most major landscape transformations at the Sanggau site.

Socio-economic research at the landscape level in the Sanggau site focused on fires that occurred during the 1990s, with background data on settlement and landscape histories from prior periods. Fires that village residents, plantation managers, and government officials in this area considered significant in the 1990s had various causes, according to local accounts and narratives documented in this field research. These included (1) accidental and generally “unwanted” fire (“*kebakaran*”, most often tied to agricultural burning under high risk conditions without appropriate safeguards; (2) fire generally recognized as “legitimate” by all parties; and (3) contested fire (fire considered legitimate or appropriate by some people but not by others, including [a] burning for commercial plantation land clearing, and [b] burning in retaliation for land or resource expropriation).

1. INTRODUCTION

The Sanggau site represents a region of Kalimantan that experienced a relatively large number of hot-spots as detected by satellite imagery, but had a relatively low incidence of reports of wildfire or accidental fire during the study period. Most of the landscape transformation in this area to agro-industrial plantations and small-holder crops during the 1980s and 1990s has involved burning.

Village-based incentives to control fires used in shifting cultivation remain relatively intact, and several communities have embarked on efforts to codify, update, and reinforce customary rules and practical norms aimed at preventing the spread of wildfire. The largest plantation in the region, an international joint venture pulpwood plantation, has attempted to maintain a “no burn” policy for land clearing since its inception, in 1994. However, land reallocation in the wake of recent reform initiatives toward devolution of land planning authority to sub-provincial levels has led to many overlaps and conflicting land claims. The land conflicts have weakened incentives and institutions that contribute to effective control of wildfire, undesirable fire, and illegitimate use of fire.

2. SITE DESCRIPTION

The Sanggau study site is located in the central part of West-Kalimantan province, between the cities Sanggau and Sintang, mainly to the north of the Kapuas River (see Figure 2-1). The Sanggau study-site is located in the plains and rolling hills, and includes indigenous land uses, transmigration sites, timber plantations, oil palm plantations, and wetlands and is bordered by a National Park on the Southwest. The site includes parts of 3 *Kecamatans* (Subdistricts) within Sanggau *Kabupaten* (District), West Kalimantan: all of Belitang Hilir, eastern Jangkang, and northern Mukok (see Figure 2-2). The 211,808 ha site is defined to permit study of a historically fire-prone swathe located on the western border of Belitang Hilir with Jangkang and Mukok, an area between the Belitang/Ayak and Engkatat/Mengkiang watersheds (all tributaries to the Kapuas). Rolling hills alternate with broad alluvial valleys within much of the site. Hill soils are largely red-yellow podsollic soils, while many of the alluvial valleys include *kerangas* soils (i.e. highly acidic quartz or white sand soils (MacKinnon *et al.*, 1996) over clay pans, limiting water absorption and creating seasonal wetlands that include peat soils in some areas.

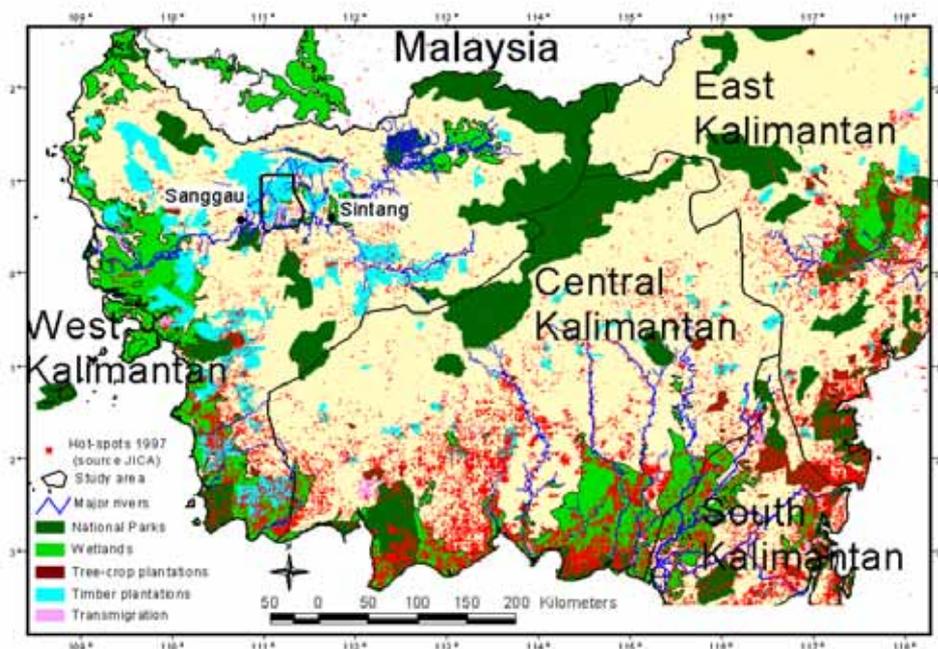


Figure 2-1 Overview of the study site along with the 1997 hot-spots

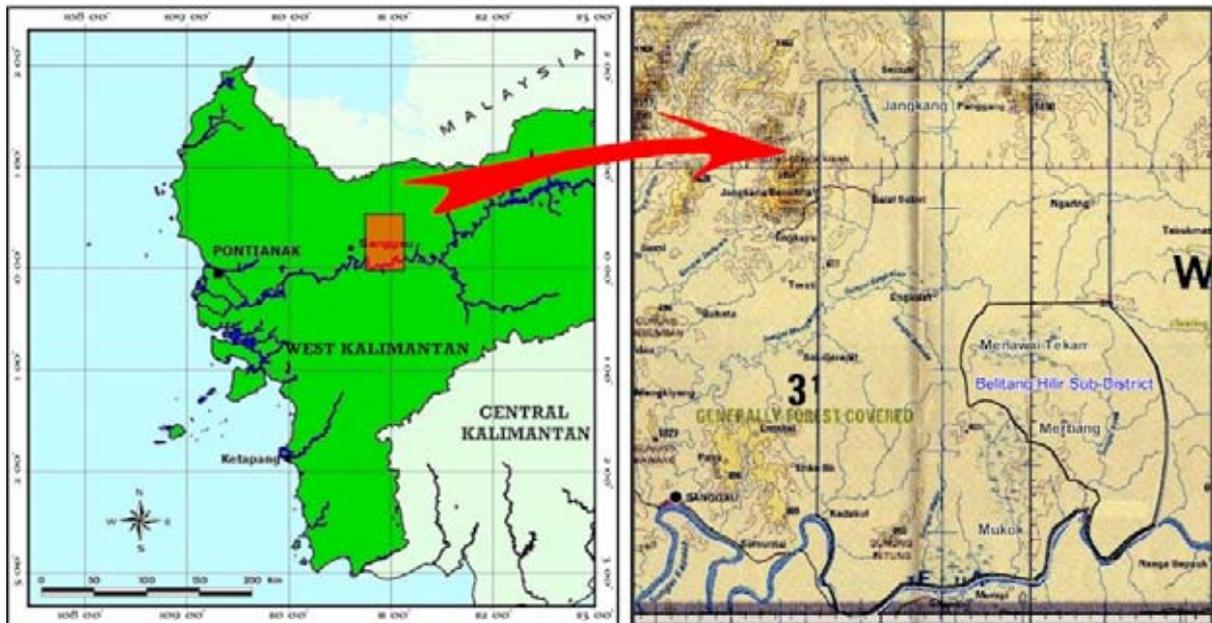


Figure 2-2 Location of the study site

The landscape within this site includes mosaics of indigenous shifting cultivation and agroforestry, along with several plantation and transmigration projects at various stages of development. Only a few islands of primary forest remain in the northern areas of the site, significantly less than in the late 1980s. A fire-prone swathe bisects the site, along the border between major watersheds, which also represents the contested historic frontier between the Mualang and Jangkang Dayak peoples. The extensive grasslands and brushlands in this border region were formed mainly over the last century, resulting largely from a combination of fires used for hunting and little motivation to control shifting cultivation fires in this area of ambiguous and contested land rights.

Two timber plantations operate in the area (which are legally combined in some aspects), PT Finnantara Intiga (occupying 727 km² of this study site, with operations beginning in 1994) and PT Inhutani III (occupying 363 km² of this study site, with planting beginning in 1992). There are 4 transmigration areas that started in 1991 (occupying 158 km² of this study site), and 3 that started in the mid-1980s. There are also 2 active oil palm plantations in the area, PT Patriot Andalas in the Southeast, which began operations in the late 1990s, and a “regionally approved” multi-site operation, Citra Nusa Inti Sawit (CNIS), which began operations in 1998/99. One logging

concession, PT AnuRaga, operates a north-south corridor road (built in 1995), which bisects the site. PT AnuRaga has since contracted with local communities to log remnant primary forests within the site, outside of its concession area.

3. METHODOLOGY

3.1 Socio-Economic Study Methods

The Sanggau site was selected to represent an area where uncontrolled fire incidence has been relatively low, and where commercial plantation development was not obviously the major underlying cause of “fires” (“*kebakaran*”) that did occur during the 1990s¹. Selection of a site in southeastern Sanggau took advantage of the existence of previous social research and community resource mapping and landscape history documentation in selected areas, compatible with the present research. The social research design for the Sanggau site builds on prior work performed by academic and project researchers, regional NGOs, and community members themselves, as well as by timber plantation companies active in the area. Research design combined methods developed by CIFOR and ICRAF staff in cooperation with staff of PPSDAK-Pancur Kasih in Pontianak, and in consultation with members of communities within the study site.

Site boundaries were extended beyond communities that had been involved in previous research or community resource mapping for land rights advocacy to minimize bias toward communities whose members had already engaged in unusual degrees of collective action to defend customary land rights or reduce fire risks. This research was also designed to obtain sufficient information to trace fire incidence within commercial concessions where land is nominally managed by agro-industrial plantation and resource extraction companies, though members of local communities may continue to exercise some rights over land or resources within their customary boundaries. Thus, information on fire in general and specific fire events within the Sanggau site is uneven, with more detailed accounts from “core” research areas within the site, and only general information elsewhere.

¹ “Fires”, in this case, refer mainly to *kebakaran*, in Indonesian, in this case referring to burning which some party considers accidental, uncontrolled or illegitimate, as opposed to deliberate, controlled burning generally (*pembakaran*), or any burning which most parties recognize as legitimate.)

Detailed information on specific “unwanted” fire events from 1990 to 1999, including GPS points for fire locations, was collected in some 10 customary villages (*kampung*), located within 3 administrative villages (*desa*) in Belitang Hilir and Jangkang. Fieldwork was conducted between May 1999 and July 2000 by a CIFOR consultant, NGO collaborators (PPSDAK-Pancur Kasih), and an ICRAF staff member.

Social research on fires at the Sanggau site highlights areas affected by fires that have been of particular concern to local communities and to plantation companies. Early in this research, the Sanggau site had been limited to two administrative villages within the *Kecamatan* of Belitang Hilir, and small areas of two administrative villages to the west, in *Kecamatan* Jangkang. The site was initially defined around places where community-based mapping and previous research provided a baseline of landscape history, on which the present research could build. It was later expanded to land between and around these locations, facilitating research on underlying causes of fire in the “frontier” areas between watersheds, ethnic/language groups, and political/administrative boundaries, which appeared to be particularly fire-prone. This “no-man’s land” lies within the customary boundaries of several communities which control access to land and resources to varying degrees under local customary rights. In the early 1990s, the government designated much of this land for conversion to industrial timber and oil palm plantations. In addition to unwanted fires spreading from “traditional” shifting cultivation practices, research methods aimed to document causes of fires stemming from land use conversion and plantation development, with associated increases in fire risks due to vegetation changes and social tensions.

Through the social research at the Sanggau site, narrative data were collected on approximately 100 “unwanted” fire events (*kebakaran*) during the 1990s, from both village residents and plantation staff. Although these fires do not form a statistically representative sample of all fires within the study site, they do represent the major types of fires of local concern. Narratives of underlying causes, and immediate and long-term effects, represent a cross-section of the types of situations that should be addressed by future fire management and wildfire prevention and response programs.

3.2 Remote Sensing and GIS

3.2.1 Site-wide methodology

Through the use of remote sensing and Geographic Information System (GIS), burn scar size and distribution were determined and the historic and current patterns of land cover and associated land use change were analyzed. Selection of satellite imagery for the Sanggau site (see Table 3-1) was simplified by the fact that it fell completely within the boundary of one Landsat image scene.

Date	Sensor	Scene (path/row)
16 September 1991	Landsat TM	120/60
8 March 2000	Landsat TM	120/60

Table 3-1 Remote sensing imagery analyzed

The Landsat TM September 1991 image was completely cloud free and of excellent quality (see Figure 3-1). The next image in the time sequence, Landsat TM March 2000 was almost cloud free and of good quality. An image for September 1991 was also purchased, but the image covered less than half of the study area. The imagery for 2000 was purchased from the Tropical Rain Forest Information Centre at Michigan State University.

The images for the Sanggau site were geo-referenced using 1:50,000 topographic base maps. The 1991 Landsat TM was used as the base for geo-referencing and the remaining images were co-registered to it. The map projection used was UTM zone 49N with the WGS 1984 datum. Prior to classification, all images were spectrally enhanced and various band combinations assessed. Bands 4, 5, and 7 were preferred as they highlighted vegetation as well as recent burn scars.

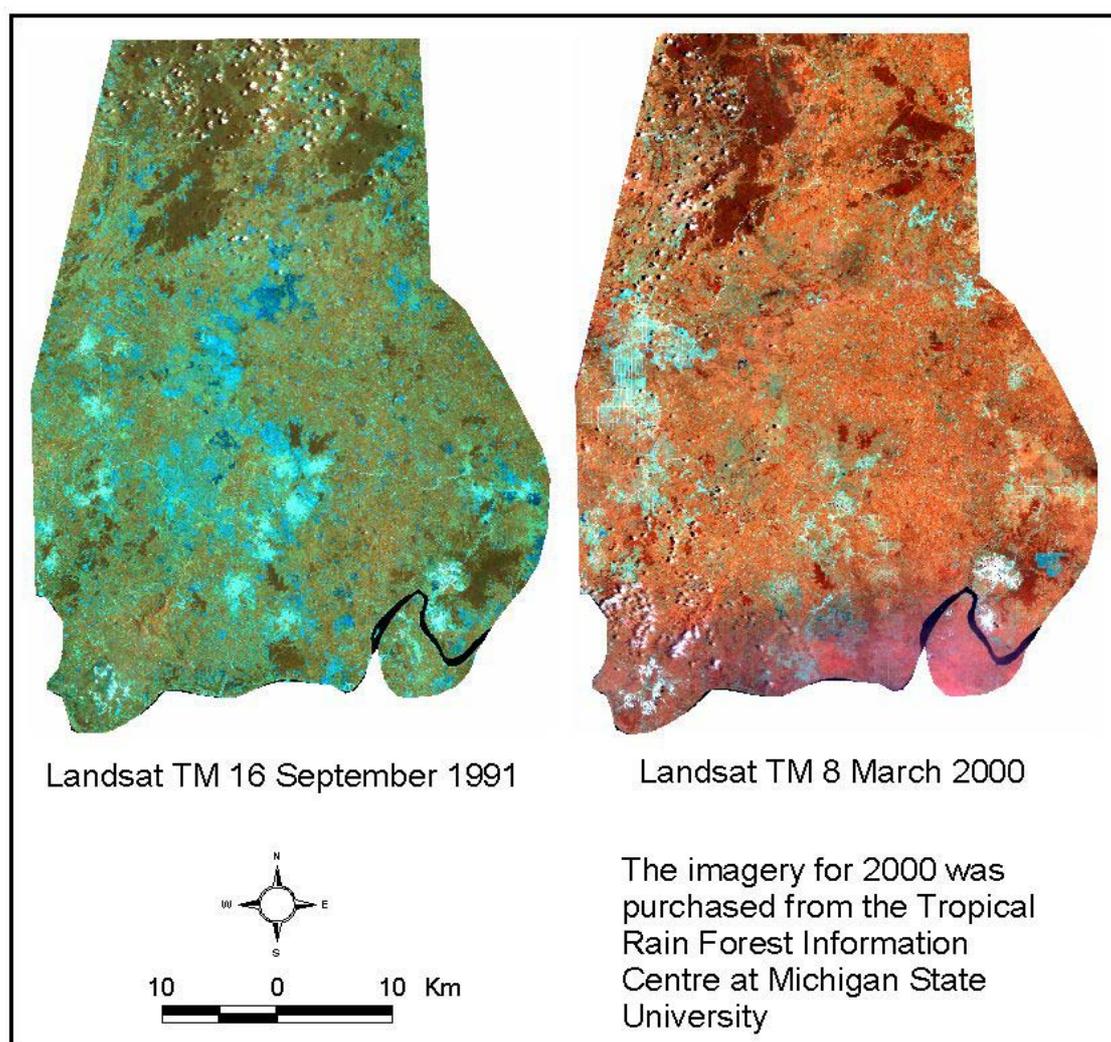


Figure 3-1 Satellite imagery selected

The next stage in the process was to identify land cover types, and to analyze the imagery into land cover classes, using on-screen digitizing. The 1991 image was the first to be classified, and the result was then used as a template for identifying the changes in the 2000 image.

3.3 Integration of Social Science and Remote Sensing

In order to improve the analysis of underlying causes of fire, a methodology was developed that integrates some of the results of the socio-economic research with the results of the remote sensing-based change analysis. A GIS was used for this integration. Not all outputs from the socio-economic research are compatible with a GIS

and from site to site, the types of outputs vary slightly. For the Sanggau site, the focus was on integrating local people's narratives with land cover change and burn scar maps at the village and plantation concession level. At the landscape level, land cover change and burn scar analysis was carried out. The results from the village/plantation and the landscape level were then compared. Using the GIS, it was possible to calculate the types and size of land cover changes in relation to the territory historically used or claimed by a village. Local people's narratives were added to these land cover change results to provide an insight into how and why changes occurred.

4. RESULTS

4.1 Fires

4.1.1 Landscape level

Both immediate and underlying social causes of unwanted fires and resulting landscape change at the Sanggau site show considerable variation. Since the mid-1990s, a significant portion of serious fires have stemmed from a vacuum of effective responsibility in areas that corporate plantations had recently negotiated to take over from their customary owners, or which they had cleared without customary owners' permission. Some of the fires associated with commercial plantation expansion were deemed to be arson by local populations. Other serious fires, or concentrations of unwanted fires, resulted from ongoing processes of "frontier" expansion by indigenous Dayak populations, as well as from decreasingly effective accountability or liability for damages resulting from "traditional" indigenous shifting cultivation/agroforestry fire practices within an increasingly fire-prone landscape. While these fires represent only a portion of those that occurred during this period in the entire study area, they appear to be representative of the types of underlying causes encountered within the Sanggau site, and which are also likely to operate in comparable areas.

4.1.2 Burn scars

Within the areas most thoroughly researched at this site, recent burn scars from fires other than on the small shifting cultivation plots are concentrated along the boundary between *Kecamatan* Belitang Hulu and *Kecamatan* Jangkang. This is also the watershed between Engkatat/Mengkiang and Belitang River systems, as well as the historic boundary between the Mualang and the Jangkang peoples. Much of this swathe of fire-prone land had been taken over for timber plantation development by the year 2000, especially in the middle/southern portion of the site. Many of the areas that burned in the early 1990s had not been planted with industrial timber by the year 2000, since these areas represented some of the most degraded soils in the site, and plantation companies

chose to concentrate their investments in areas more likely to produce healthy timber crops. Extensive burn scars dating from 1998 and 1999 are located in the northern part of *Kecamatan* Belitang Hilir. Many of these areas had previously burned in 1991. One very extensive area that had burned accidentally in 1991 by an escaped swidden fire appears to have been covered with medium-aged small-holder forest gardens and timber plantations by the year 2000.

4.1.3 Fire information from hot-spots

Hot-spot data for 1992 - 1993 were obtained from European Space Agency/European Space Research Institute (EU-ESA/ESRIN) and from the Centre National Recherches Meteorologiques (CNRM). Data for 1997-1999 were obtained from the Japanese International Co-operation Agency (JICA) based in Bogor, Java. There are 534 hot-spots recorded between 1992-1993, and 1997-1999, with an overall hot-spot density of 24.3 hot-spots per 100 km² (see Figure 4-1).

The Sanggau study site has a very high fire density compared to other sites (Danau Sentarum site had fire density about 1.5). Among the 8 sites selected for this study, fire densities as high as 1.5 is normally only recorded in wetland areas near the coast. However, unlike the other sites, the most significant fire period in this area was in 1999 with almost 61 % of the hot-spots recorded in that year.

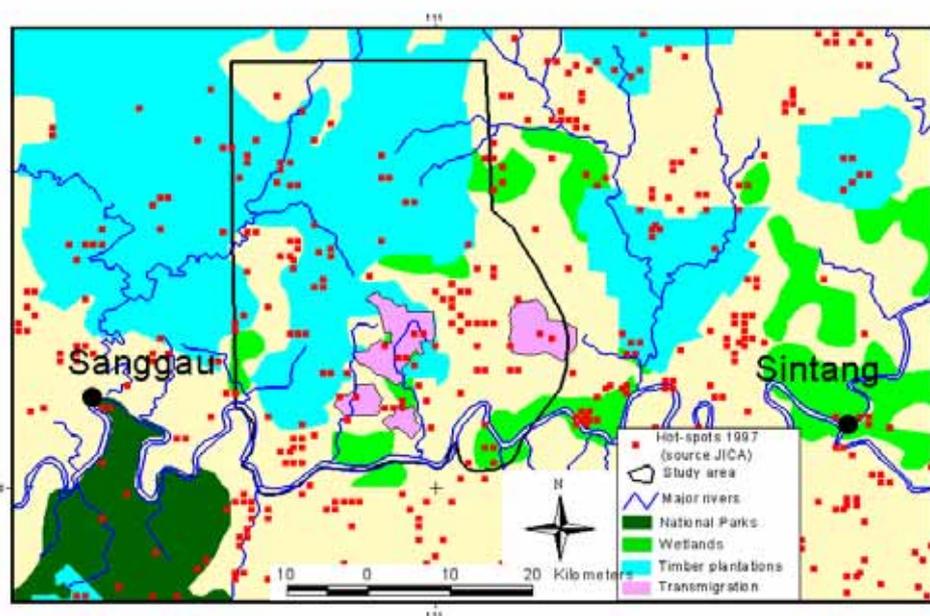


Figure 4-1 Sanggau study site with 1997 hot-spots

The highest hot-spot density was recorded in dry land smallholder areas, i.e. areas outside the boundaries of agroindustrial concessions (timber, oil palm, etc). (see Table 4-1). The year 1999 is a truly exceptional year in the study area, where all land uses show the highest fire densities. This contrasts with fire densities in West Kalimantan overall, where all land uses show the highest hot-spot densities in 1997. Based on mean annual precipitation data for the study area (between 110° and 112° longitude and -1° to 1° degrees latitude), the year 1999 does not appear to be a particularly dry year while 1997 is an extreme drought year. Apparently, since drought does not explain the incidence of fires in this area, a different set of processes must operate.

Year	West Kalimantan					Sanggau Study Site				
	Province	Timber plantation	Trans-migration	Wet-lands	Other	Study site	Timber plantation	Trans-migration	Wet-lands	Other
1992	0.9	1.2	0.9	0.8	1.2	1.4	0.9	1.3	1.7	2.2
1993	0.3	0.5	0.0	0.7	0.3	0.8	1.0	0.0	0.4	0.7
1997	6.2	11.2	12.3	18.7	5.1	5.6	3.6	6.3	4.6	7.6
1998	1.2	1.5	6.2	1.7	1.4	1.5	0.8	4.4	3.3	1.5
1999	3.9	6.2	4.1	3.6	5.3	15.0	13.9	10.8	13.4	17.2

Table 4-1 Hot-spot densities (hot-spots per 100 km²)

The Indonesian government's policy to expand timber and other plantations in the 1990s could account for the different patterns of fire incidence in this area, where 40 % of the study site is within timber plantation concession borders. The higher fire density in smallholder areas may indicate that timber plantations are expanding into smallholder lands or that timber plantations are less vulnerable to fire than smallholder areas. In 1999, it may also indicate accelerated smallholder conversion of land to perennial crops, which would reinforce customary land claims under both local customary law and national land use.

In 1997, 15 % of the hot-spots in smallholder areas were located within a kilometre from the border of a timber plantation concession, while in 1999, 58 % are similarly located. Inside the timber plantation concession, 23 % of the fires in 1997 and 17 % in 1999 are less than 1 km from a timber plantation concession border. This suggests that fires were related to expansion of the plantation, but it indicates nothing about the nature of these relationships. The high concentration of hot-spots in plantation border areas could also indicate a number of other possibilities. These include deliberate burning as a tool or "weapon" in land disputes, or fires allowed to burn out of control in the vacuum of responsibility in areas of multiple « overlapping » claims on the borders of the plantations. Local « re-occupation » of land formerly cleared by a timber plantation has been another cause for fires, including some wildfires, as people re-clearing land they had previously ceded to a plantation where operations had apparently stopped, have little incentive to control their land clearing fires. Another cause of fires in this area has been burning to clear land for new regionally-approved palm oil plantations, or expansion of smallholder cash cropping (e.g., rubber) in areas near recently-improved roads.

A significant proportion of the fires that local people and/or plantation enterprises consider highly problematic are not represented in hot-spot locations. Examining locations of hotspots in the late 1990s indicates that in areas of *recent* settlement and in those of very recently developed plantations in the southern portion of the site, hotspots clearly tend to be concentrated along recently constructed or recently improved roads, such as the road between the Mukok transmigration site and Belitang Hilir. Concentrations of fires that indigenous shifting cultivators consider to be desirable and

legitimate during the traditional burning season do not necessarily show up as hot spots in remote sensing imagery. These shifting cultivation fires are generally relatively cool, and low (since vegetation has all been slashed or felled before burning), quickly extinguished, and represent small burn areas of 1 to 5 ha at a time, which are usually well-separated from one another.

4.2 Land Cover and Land Use Changes

4.2.1 Landscape level

Fire has been a significant factor in most major landscape transformations at the Sanggau site. Fire in “traditional” shifting cultivation integrated with indigenous agroforestry systems is used in re-clearing secondary forest fallows at various stages of regeneration; little primary forest is directly affected. However, accidental fires originating in shifting cultivation practices burned significant extents of land between 1991 and 1999.

From 1992 to 1995, land clearing for an industrial timber plantation employed fire, mainly to clear relatively young secondary forest and some rubber-based agroforestry gardens, especially in the central and northern portion of the site. Thus, from 1990 to 2000, much of the scrub forest land and some rubber gardens in the central portion of the site were planted with fast-growing timber species, though tree survival rates for these timber plantations have been low (see Figure 4-2). Fire was also used to clear land for two palm oil plantations, one in the southwest part of the site, the other in the northeast. The plantation land clearing in the southwest started in 1999, including areas that had previously been planted as part of the industrial timber plantation project².



Figure 4-2 *Acacia mangium* timber plantation next to scrubland, in *Desa Menawai Tekam, Kecamatan Belitang Hilir*

From 1992 to 2000, much of the land on the borders between *Kecamatan* Belitang Hilir, Jangkang, and Mukok was “filled in” with industrial timber plantation development and agricultural plantings associated with the transmigration settlements at the southern end of the Sanggau site. Large-scale oil palm planting began at the far north of the site. In much of the remainder of the site, managed under local customary land and resource tenure, the ongoing trend of converting land from relatively short-term shifting cultivation cycles to long-term agroforestry continued (especially mixed-species gardens dominated by rubber) (see Figure 4-3). Primary forest cover in this region declined precipitously from the 1950s to the 1970s, with “frontier” style shifting cultivation and settlement patterns. By 1990, the largest primary forest expanses were already limited to a few areas of 300 ha to 2,000 ha, in the northern part of the site. By the year 2000, these forest “islands” had been even further cleared for cultivation. Many

² The legality of these uses of fire was a “gray area” in 1999 and 2000, since plantation companies contracted land clearing out to local residents, including customary land owners who clear and burn their own land immediately before ceding it to the plantation.

remnant primary forest “islands” had been seriously degraded by the commercial logging facilitated by road development, plantation expansion, and development of government public works.



Figure 4-3 New smallholders Rubber garden in Pakit Engkuning

4.2.2 Quantitative landscape level changes

Quantitative assessment of land cover change at the landscape level was carried out for the time period September 1991 to March 2000. Quality of the 1991 and 2000 imagery was good. The results of the image classification can be seen in Figure 4-4.

Cumulative figures and percentages of different land cover classes were compared between years, thus providing an insight into the predominant land cover change processes. Change trajectory matrices were also calculated (see Appendix I).

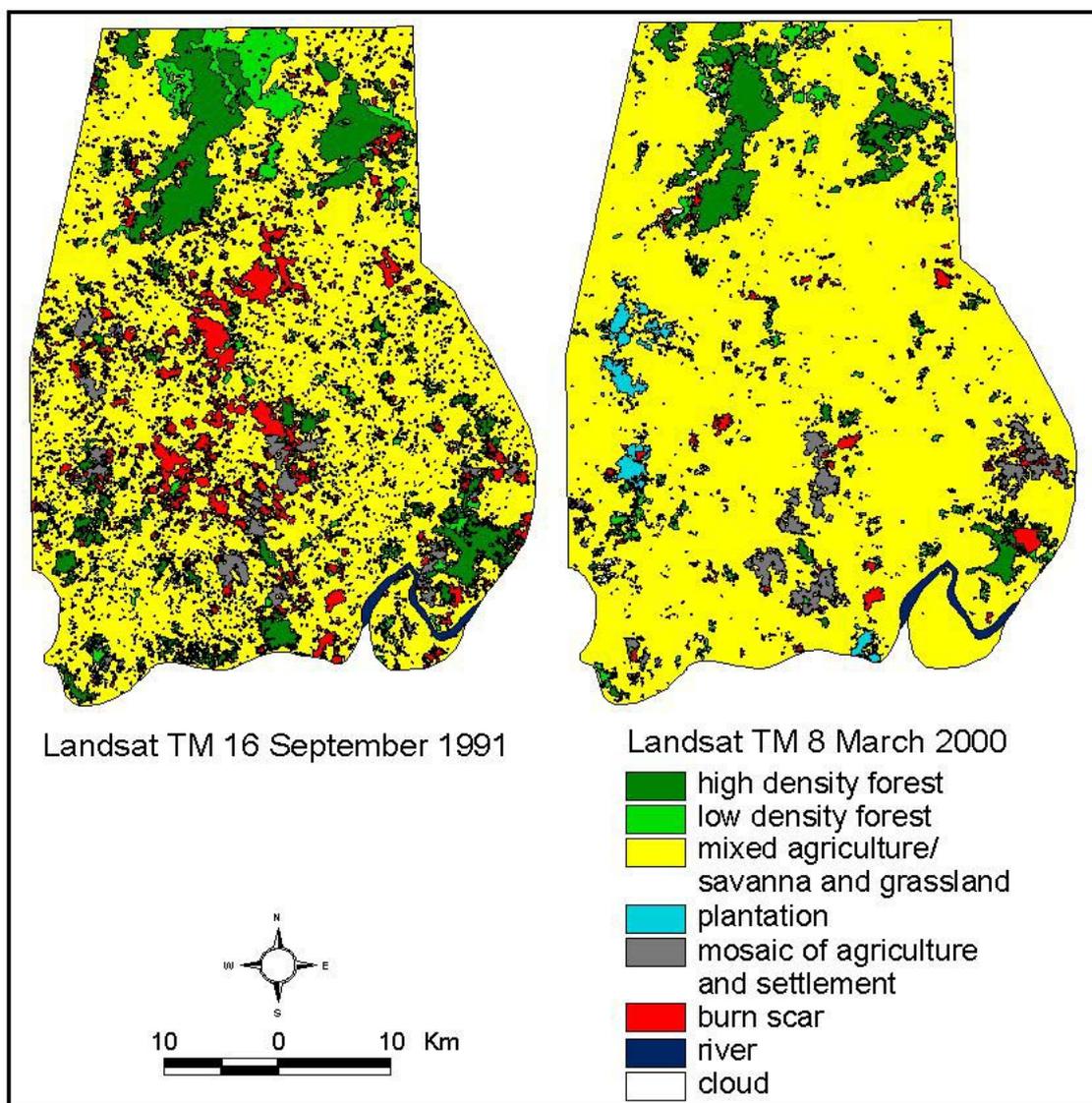


Figure 4-4 Land cover classifications 1991 and 2000

During the period 1991 – 2000 there were considerable changes in the extent and quality of the natural forest. The total deforestation over this 9-year period was 42 % or an average of 5 % per year (see Table 4-2). The forest type most affected was high-density forest, which was reduced by 10,039 ha, or 44 %. Low-density forest was also reduced by 37 % from 1991.

Class name	1991	2000	Change
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	(ha)	(%)	(ha)	(%)	(ha)	(%)
<i>Natural Forest</i>	31,552	14.90	18,130	8.56	-13,422	-42.54
high density forest	22,464	10.61	12,426	5.87	-10,039	-44.69
low density forest	9,087	4.29	5,704	2.69	-3,383	-37.23
<i>Plantation and agriculture</i>	155,618	73.47	187,901	88.71	32,283	20.74
Plantation		0.00	2,875	1.36	2,875	-
mixed agriculture/savanna and <i>Imperata</i> grassland	151,331	71.45	180,172	85.06	28,840	19.06
Mosaic of agriculture and settlement	4,287	2.02	4,854	2.29	568	13.24
<i>burn scar</i>	22,858	10.79	3,997	1.89	-18,861	-82.52
<i>River</i>	1,092	0.52	1,092	0.52	0	0.00
<i>Cloud</i>	688	0.32	688	0.32	0	0.00
Grand Total	211,808	100.00	211,808	100.00	0	0.00

Table 4-2 Cumulative land cover change estimates 1991–2000

Underestimation of the area of the burn scars in 2000 could be a result of regeneration of burnt *Imperata* within a short time after the recent extensive fires of 1999. Some 46 % of the burnt areas in 2000 were also classified as burn scars in 1991. The existence of mixed agriculture/savanna and *Imperata* grassland as the most dominant land cover in the study area has certainly increased the risk of extensive wildfires in the area. Most of the burn scars were located in or next to this mixed agriculture/savanna and *Imperata* grassland.

4.3 Social Survey Results

The causes and the effects of fire within the Sanggau site are generally associated with the area's "frontier" history of settlement, resource use, and resource access and control patterns, which continue to form the basis for the development of the landscape within this site. Local populations and land managers believe that fires that they consider undesirable, as well as wildfires, can be virtually eliminated from this area. This would require improved fire management by village smallholders and plantations (using appropriate precautions and limited improvements in fire fighting technology), with

more effective and just allocation and enforcement of land and resource rights. This understanding of fire as a largely manageable phenomenon contrasts sharply with some of the more seriously affected sites in this research project.

Social research concerning the Sanggau site has focused on fires during the 1990s, with background data on settlement and landscape histories from prior periods. Fires that village residents, plantation managers, and government officials in this area considered significant in the 1990s had various causes, according to local accounts and narratives documented in this field research. These included (1) accidental and generally “unwanted” fire (most often tied to agricultural burning under high risk conditions without appropriate safeguards, or to “unknown causes” such as local informants’ occasional suggestions of cigarette butt ignition); (2) fire generally recognized as “legitimate” by all parties; and (3) contested fire (fire considered legitimate or appropriate by some people but not by others, including [a] burning for plantation land clearing, and [b] burning in retaliation for land or resource expropriation, or to reassert customary claims over land previously ceded to plantations).

A portion of recent fires can be attributed to corporate plantation expansion (see Figure 4-5) and contested control over land and resources that may either precede land expropriation or follow in its wake. Fires in such cases include some that local residents believe were set by plantation staff to speed up negotiations with local communities to cede land to plantations, as well as fires set by village people to re-claim customary rights property they believe was illegally or erroneously cleared by plantation companies (see Figure 4-6).



Figure 4-5 Establishment of new oil palm plantation at *Kampung Pakit Engkuning*



Figure 4-6 Reoccupation of Timber Plantation Land by People of Sungei Omang and Sebuda Village (in *Desa Sape*)

However, others are rooted in “traditional” indigenous agroforestry practices associated with shifting cultivation. Village residents attributed the majority of the wildfires as originating from swidden fires, which spread out of control under exceptionally dry conditions and to ill-guided household decisions to burn under high-risk weather conditions. This was exacerbated by increasingly fire-prone vegetation, inadequate safety measures during and immediately after burning, and weakened customary controls that no longer effectively define strict liability or enforce strong sanctions for damage due to negligent burning. Village people note customary sanctions imposed for accidentally burning neighboring agroforestry property, but acknowledge that enforcement of these sanctions is uneven, weighed in light of perpetrators’ intentions, and their ability to offer compensation to parties seeking a redress of damages.

Some communities within the study site have recently attempted to document and reinforce customary rules and sanctions concerning burning, and sanctions for damages caused by inadequately controlled fires. However, neither customary nor formal government sanctions respond to burning that damages land that is already seriously degraded by local standards (grasslands dominated by *alang-alang* [*Imperata cylindrica*], or scrub forest not yet planted with rubber, illipe nuts, fruit trees, or other economically valuable perennial crops), or that consumes common property old growth forests, unless perpetrators are from a neighboring community.

Some of the most extensive fires in this site during the 1990s burned grasslands and scrub forest in areas that had become increasingly fire-prone since the 1930s, after repeated burning and wildfires. In effect, this defined the frontier between the Mualang and their neighbors the Jangkang and Ketungau peoples, along the western border of what is now *Kecamatan* Belitang Hilir (Figure 4-7). The historical origins of the swathe of grasslands and scrub forest that skirts south/north through the middle of this site, along the customary border between Mualang and Jangkang areas, remains a bone of contention, but most parties to the debate agree that fire played an important role in its formation. Much of this area was designated for plantation development since the early 1990s, and some had been a focus of failed government “regreening” efforts before that. Some local residents, especially in Mualang villages adjacent to Jangkang areas, believe that wildfire risks are actually lower now than they were a generation ago, when their

Jangkang and Ketungau neighbors set brush fires to facilitate hunting. The swathe of fire-tolerant grasslands and scrub at their western and southern frontier, assert the Mualang, was created by decades of Jangkang hunting fires³. In response, Jangkang villagers whose customary territories abut the border with the Mualang complain of a Mualang history of expansion, in which Mualang neighbors extend forest product collecting and, in the past, swidden field clearing too far to the west across the border with the Jangkang. This often happened without permission along the ambiguous and previously contested border, and without taking proper precautions to extinguish camp fires and swidden fires. Jangkang villagers attribute Mualang expansion to the west and south until the 1960s and 1970s to population pressure that led to over-cultivation of swidden areas, and to almost complete clearing of primary forests within Mualang areas. These pressures would have motivated communities to split and migrate in former times when frontier land was still available for establishing new villages.



Figure 4-7 Fire prone swathe of grasslands and scrub forest in the contested area in Kecamatan Belitang Hilir

The most extensive wildfire for which our social research provided data on causes was

³ Some traditional hunting practices in Borneo involve setting fires to drive wild boars, deer, and other game into the open during collective hunts. Later, tender post-fire vegetation continues to attract wildlife to forage in the open, making easy marks for hunters and trappers.

over 1,000 ha, and began with a swidden fire that spread out of control in 1991 across the border area between Menawai Tekam village (Belintang Hilir) and Jangkang. A few of the fire events accounted for in village people's narratives were considered to be a result of arson by one plantation company in an attempt to pressure villagers to cede customary rights land to the plantation. At least one fire in 1998 was a swidden fire that villagers in Sungkap customary village (*Desa Semadu*, in Belintang Hilir) openly set to protest labor practices by the neighboring timber plantation.

Information on fires that burned commercial timber plantings in *Kecamatan* Belintang Hilir, Jangkang, and Mukok was provided in detail by staff of PT Finnantara Intiga. This joint venture company is developing a pulpwood plantation in *Kabupaten* Sanggau and Sintang, with plans to plant 100,000 ha of mainly fast-growing trees in and near its 300,000 ha concession area. PT Finnantara Intiga's parent corporations are Swedish-Finnish timber conglomerate Stora-Enso, and Indonesian state forestry corporation PT Inhutani III. This plantation is remarkable in Indonesia since, from its inception in 1994, managers promised that its land would be cleared and prepared for planting without burning (pioneering no-burn techniques now universally required by law), and that no mature forest or forest gardens would be converted for the plantation (which they would have been permitted to do in the 1990s for pulp plantation development). Several fires burned significant parts of the Finnantara plantation in 1997, when drought in Sanggau was serious, and when Finnantara's operations there had been in hiatus due to uncertainty about whether the company would continue operations in Sanggau. In 1999, Finnantara reported 53 fire events at their Sanggau sites. The estimated costs to the company from these fires were Rp. 1,200,000 per hectare burned (US\$ 150 at mid-1999 exchange rates). Most of the fires were traced to escape shifting cultivation burning by adjacent smallholders. However, the most serious fire, by assessment of company staff, was actually caused by a new oil palm plantation that had contracted for land clearing with members of a local community who had previously ceded parts of their customary land to the timber plantation, but who were re-clearing the timber plantings to make way for the new oil palm plantation. Local village populations believed that the new plantation concession had legitimately taken over the land previously allocated to the timber plantation. Plantation managers note that this reallocation had not yet been

officially approved at all levels, in their reckoning, at the time when the plantation actually began land clearing operations.

5. UNDERLYING CAUSES

Causes of fires in the 1990s are consistent with a broader landscape history of this “frontier” region in Sanggau. Uncontrolled fires were concentrated along boundaries that simultaneously represented divisions between Mualang and Jangkang ethnic/linguistic groups; between Belitang and Mengkiang watersheds; between Belitang Hilir and Jangkang administrative/political jurisdictions; and between long-standing Dayak communities and new timber and oil palm plantations. Landscapes in these boundary lands, where land and resource rights have been contested, have gradually become more fire-prone over the past century, and especially in the past 25 years.

The Mualang people of Belitang Hilir attribute the swathe of fire-prone grassland and scrub forest that bisects the Sanggau site to deliberate burning for hunting by the Jangkang people to the west. Some Jangkang people attribute it to aggressive expansion of shifting cultivation by the Mualang to the east. The national government originally targeted this swathe of fire-prone degraded land for “regreening” in the 1970s, Transmigration in the 1980s, and an Industrial Timber Plantation in the 1990s, with little understanding of the underlying causes of continuing land degradation and recurring fires.

Local customary law sanctions for damages to agroforestry property due to negligent use of fire are being reinforced in many communities. They seem to be effective on a small scale, but perpetrators never have the resources to restore or compensate for extensive damages. Village residents have not been eager to help suppress fires on former customary lands that they have already released to timber or oil palm plantations, unless those fires threaten their own remaining forest gardens or houses.

Primary forests have been seriously degraded during the 1990s, as competition for resources between local people and “outsiders” licensed by government authorities has increased. Yet, in most indigenous communities the total area covered by mixed-species forest gardens has increased in the last generation, as forest farmers have planted rubber and fruit trees in former shifting cultivation fields. The forest garden matrix has created

relatively fireproof community landscapes.

In a few cases, villagers accuse oil palm plantation staff, or people associated with them, of deliberately burning villagers' agroforestry property to coerce village people into ceding land to the plantation. In a few cases, village shifting cultivators have allowed their slash fires to spread to commercial plantation areas to protest plantation labor practices, or land expropriation.

Finally, members of long-standing local communities and managers of new commercial plantations all believe that fire in this area can be effectively controlled, with provision of appropriate materials and skills, and with improved and more just institutions controlling land use and resource access. None believe that the fires their region has experienced in recent years are an inevitable force of nature, or inevitable consequences of drought.

6. POLICY IMPLICATIONS

Communities where fire research was conducted at the Sanggau site have generally resisted demands to cede land to timber and oil palm companies, though they are located within these companies' concession areas. They have also been relatively free of fire. These two facts are related. Communities that have been cohesive and confident in the viability of their own land use systems, and who have maintained or developed their own customary or locally-based governance institutions, are most likely to be able to resist land encroachment and expropriation by politically powerful companies. These same characteristics are also likely to boost the effectiveness of local practices and institutions to prevent wildfire and to collectively suppress uncontrolled fires.

Villages that have been involved in community empowerment and customary land rights advocacy activities (including community mapping) have tended to be relatively capable of voluntarily initiating proactive steps to prevent the spread of future fires. Any local institutional developments that reinforce community cohesion to facilitate wildfire prevention and suppression should be encouraged by government recognition, and assistance if requested, directly or through representative NGOs.

Any effort to prohibit burning by indigenous smallholder shifting cultivators and forest gardeners will undermine broader fire control efforts. While material assistance to prevent swidden fires from getting out of control may be effective, in the form of equipment and training of village fire users, an outright prohibition or cumbersome government-administered burn permit system would be unlikely to gain acceptance, and thus would be impossible to enforce.

Government assistance to prevent and suppress fires must be prompt and respectful of local communities' existing resources, values, knowledge, and capabilities.

Large enterprises with well-developed infrastructure, such as timber and oil palm plantations, can be foci for regional efforts to prevent, contain, and suppress wildfires.

The wide variety of fire causes in this site, even within areas that are nominally within the borders of government-granted land development concessions, indicates that commercial concession-holders should not be assumed to be responsible for all fires on any land within their concessions, regardless of whether or not they are actively managing particular areas. Identifying “hotspots” from remote sensing imagery within the borders of a particular company’s concession should also not be considered sufficient evidence alone of a company’s illegal burning. If such a system were consistently imposed, as implied by recent policy reforms, concession-holders wishing to avoid accusations of illegal burning could legally attempt to prohibit all burning within their concession boundaries, including burning by customary land holders cultivating land in traditional manners. If such total responsibility and liability for fire within a concession is to be imposed, government agencies granting commercial concessions should delineate boundaries carefully, at appropriate scales, and in consultation with local communities, to ensure that only areas that the company will actively manage will be included within the concession. This could only come about through major reform in the concession-granting process.

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APPENDIX I: LAND COVER CHANGE MATRICES

area in hectare and percent	2000																	
	high density forest		low density forest		plantation		mixed agriculture/ savanna and grassland		mosaic of agriculture and settlement		burn scar		river		cloud		Grand Total	
high density forest	12,426	54.39	2,483	10.87	307	1.35	6,111	26.75	210	0.92	927	4.06	0	0.00	382	1.67	22,847	10.79
low density forest	0	0.00	3,221	35.15	32	0.35	5,287	57.70	175	1.91	372	4.06	0	0.00	76	0.83	9,163	4.33
Mixed agriculture/ savanna and grassland	0	0.00	0	0.00	309	0.20	149,592	98.84	833	0.55	597	0.39	0	0.00	22	0.01	151,354	71.46
Mosaic of agriculture and settlement	0	0.00	0	0.00	1,010	23.56	844	19.69	2,166	50.53	267	6.22	0	0.00	0	0.00	4,287	2.02
burn scar	0	0.00	0	0.00	1,217	5.28	18,337	79.50	1,470	6.37	1,834	7.95	0	0.00	208	0.90	23,066	10.89
River	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1,092	100.00	0	0.00	1,092	0.52
Grand Total	12,426	5.87	5,704	2.69	2,875	1.36	180,172	85.06	4,854	2.29	3,997	1.89	1,092	0.52	688	0.32	211,808	100.00