Government of Central Kalimantan

Government of Indonesia

Government of the Netherlands

Master Plan for the Rehabilitation and Revitalisation of the Ex-Mega Rice Project Area in Central Kalimantan






PARTNERSHIP AND TECHNICAL FACILITY FOR REHABILITATION AND REVITALISATION OF THE EMRP AREA

Technical Guideline No. 1

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Euroconsult Mott MacDonald and Deltares | Delft Hydraulics
in association with
DHV, Wageningen UR, Witteveen+Bos, PT MLD and PT INDEC

Master Plan for the Rehabilitation and Rehabilitation of the Ex-Mega Rice Project Area in Central Kalimantan

Technical Report Number 1

Forest and Land Fire Management in the EMRP Area

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Bakomas	*Badan Koordinasi Masyarakat* / Community Coordination Board /
Bakornas	*Badan Koordinasi Nasional* / National Coordinating Board
Bakornas PBP	Badan Koordinasi Penanggulangan Bencana National / Coordinating Board for Disaster Management
Bapedalkab	*Badan Pengendalian Dampak Lingkungan Kabupaten* / Regency Environmental Board
BAPLAN	*Badan Planologi* / Planalogy Board
Bappeda	*Badan Perencanaan Daerah* / Regional Development Planning Agency
Bappedalda	*Badan Pengendalian Dampak Lingkungan Daerah*/ Regional Environmental Board
BKSDA	*Balai Konservasi Sumber Daya Alam* / Prevention and Suppression of Fires
BMG	*Badan Meteorologi dan Geofisika* / Monitoring and Evaluation
BNPB	*Badan Nasional Penanggulangan Bencana* / *National Board of Disaster Management*
BOS Mawas	Borneo Orangutan Survival Mawas
BPN	*Badan Pertanahan Nasional* / National Board of Land Affair
BPPLHD	*Badan Pusat Pengendalian Lingkungan Hidup Daerah* / Environmental Agency
BPPT	*Badan Perencanaan Pengendalian Teknologi* / *Planning and Controlling Technology Agency*
Brigdalkarhut	*Brigade Pengendalian Kebakaran Hutan* / Forest Fire Controlling Brigade
CO	Carbonmonoxide
DAOPS	*Daerah Operasi Kebakaran* / Fire Brigade Base
ENSO	El Niño Southern Oscillation
FDR	Fire Danger Rating
GIS	Geographic Information System
HPH	*Hak Pengusahaan Hutan* / Forest Exertion Right
HTI	*Hutan Tanaman Industri* / Industry Forest Crops
IRI	International Research Institute
ISPU	Indeks Standard Pencemar Udara / Standard Index of Air Pollution
KMPK	*Kelompok Masyarakat Pengendali Api* / Community Fire Controller Team
KPH	Forest Management Unit
LAPAN	*Lembaga Penerbangan dan Antariksa Nasional* / National Flight and Space Organization
MoA	Ministry of Agriculture

MoE	Ministry of Environment
MoF	Ministry of Forestry
MPA	*Masyarakat Peduli Api*
NGO	National Government Organization
NO2	Nitrogendioxide
O3	Ozon
PHKA	*Perlindungan Hutan dan Konservasi Alam* / Forest Protection and Nature Conservation
PM	Particulate Matter
POSKO	Pos Komando / Command Post
PPLHD	*Pejabat Pengawas Lingkungan Hidup Daerah* / *Regional Environment Supervisor Official*
PPNS	Government Investigator / *Penyidik Pegawai Negeri Sipil*
PRA	*Participatory Rural Appraisal*
Pusdalkarhutla	Forest and Land Fire Control Center / *Pusat Pengendalian Kebakaran Hutan dan Lahan*
RPK	Regu Pengendali Kebakaran / Fire Controlling Brigade
SATGAS	Task Force / *Satuan Tugas*
Satkorlak	Implementation Coordination Unit / *Satuan Koordinasi Pelaksana Penanganan Bencana*
Satlak	Implementation Unit / *Satuan Pelaksana Penanganan Bencana*
SO2	Sulfurdioxide
SOP	Standard Operational Procedure
TKNPKHL	*Tim Koordinasi Nasional Pengendalian* / Team for Forest and Land Fire Control / *Kebakaran*	National Co-ordination
TSA	*Tim Serbu Api* / *Fire Brigade Team*
UPTD	*Unit Pelaksana Teknis Dinas* / Technical Implementation Unit

Summary

This report on forest and land fire management in the Central Kalimantan province and the Ex-Mega Rice Project (EMRP) area provides an overview of the history, impact and underlying causes of fires in the EMRP area. It furthermore presents an introduction to the concept of a fire management system, including on community participation within such a system. The report further discusses developments and experiences concerning fire management institutions, tasks and results in the EMRP area in Central Kalimantan. Finally, it offers recommendations for strengthening for fire management in the province, with a focus on the EMRP area.

The EMRP area measures 1.4 million hectares, 900.000 hectare of which are peat lands, half of that being deep peat (> 3m deep). Much of these peat lands have been deforested and drained by a network of canals since the mid nineties. The degraded condition of these peat lands, combined with a tradition and trend of using fires for land clearance and land preparation, has lead to many disastrous fires during long dry seasons (El Nino years) over the last ten years. The national and regional governments, in response to the problem of forest and land fires, issued a number of laws and regulations to cover fire management issues and developed various multi-sectoral organizational structures at national and regional levels to supervise and control the implementation of those laws and regulations.

Even so, fire management is still not sufficiently effective until today, and much still needs to be done, foremost the establishment of a coordinated system of fire management at province, district and sub district and village level, in which all involved stakeholders, including the private sector, work together to reduce the negative impact of fire on the natural and socio-economic environment. For each of these partners in fire management, the roles, responsibilities and tasks should be clearly defined, based on the partners' mandates and terms of reference. An effective system of coordination, communication and operation needs to be developed, based on comprehensive and unambiguous standard operational procedures. These operating procedures are to cover all components of fire management, i.e. fire prevention, fire information, fire preparedness, fire suppression and fire follow-up. More comprehensive capacity building and budget support for the fire management partners is required to qualify them for their tasks.

An important partner in fire management is the village, both in terms of fire prevention as fire suppression. The EMRP has a number of village fire groups, most established and supported by NGOs, and some by regional government. Apart from the village fire suppression capacity, these villages have been supported to develop village development plans and associated village spatial pans that address and aim to reduce the fire risk. The concepts and experiences of these village fire management activities now need to be combined, integrated and standardized, and taken up into government

policy, programming and budgeting, to ensure sufficient up-scaling of community based fire management.

So far relatively little attention has been given by the Government to fire prevention and law enforcement, impact assessment and rehabilitation. Most attention and inputs have gone to, mainly ad hoc, fire suppression activities, hotspot analyses and dissemination. The provincial government 2007-2010 Action Plan for fire management does list a number of activities related to fire prevention, including introduction and support of new farming systems, zero-burning techniques and agricultural extension. The approach to fire prevention needs to be much more broad and comprehensive, and be embedded in a wider policy and program of integrated rural development.

1 Forest and Land Fires in the EMRP Area

1.1 Introduction

Large-scale forest and land fires and associated smoke have become an increasing problem in Indonesia and surrounding countries over the last two decades owing to continuous damaging over-exploitation of the forests and peat, inappropriate and unmonitored land management and a steadily expanding stakeholder pressure on remaining land and natural resources.

Major fires during the El Niño years 1982/1983, 1987, 1991, 1994, 1997-1998, 2002-2003 and 2006 devastated large areas of mostly logged-over forests, bush and shrub vegetation and drained, degraded and dry peat land. In the infamous 1997-1998 fires alone more than six million hectares of various agricultural and forested lands burned in Kalimantan, 3.5 million of which were forested areas.[1] Although only 20 % of the area burned is assumed to consist of peat swamp forests, they contribute about 90 % of the gaseous and particulate fire emissions.[2]

The dense smoke from these fires spread across Southeast Asia, causing respiratory health problems as well as transportation delays and accidents on land, air and sea, and led to serious diplomatic complaints from Indonesia's neighboring countries (i.e. Malaysia, Brunei, and Singapore). The economic costs of the 1997/98 fires in Indonesia have been estimated to exceed 9 billion US$ in terms of economic, social and environmental losses. Carbon emissions were estimated to be in the order of 1-2 billion tons, enough to elevate Indonesia to one of the largest greenhouse gas polluters in the world.[3]

The fire and haze problem could for the most part be avoided by appropriate land use policies and enforcement.

1.2 Fire History

Fires in the forest have been part of Indonesia's history for as long as there have been farmers cutting and clearing forest patches to open up lands for cultivating their crops. For a long time, these slash and burn activities were hardly a threat to the forests, since population densities were minute compared to the immense stretches of tropical rain forests in or near which these people lived. Moreover, these were subsistence farmers, cultivating only small patches of land every one or two years. These farmers had a good understanding of the ecological dynamics of forests and soils and over generations they developed forest and land use systems that showed a broad awareness of and focus on the ecosystem goods and services of their natural environment. These goods and services include clean water

[1] ADB/BAPPENAS.1999. Causes, extent, impact and costs of 1997/98 fires and drought. Final report, annex 1 and 2. Planning for Fire Prevention and Drought Management Project, Asian Development Bank, TA 2999-INO Fortech, Pusat Pengembangan Agribisnis, Margules Pöyry, Jakarta, Indonesia.
[2] Levine, J. S., The 1997 fires in Kalimantan and Sumatra, Indonesia: Gaseous and particulate emissions, Geophys. Res. Lettr. 26, 815-818,1999.
[3] See footnote 1

throughout the year, arable land, and forest animals, plants and other products for food, building and medicine.

Fires could hardly get out of control, since the forests surrounding the cleared patches were intact, and intact rain forests have a micro-climate sufficiently damp to prevent flaring fires. Even so, also in those past times, extreme dry weather conditions occurred occasionally, creating water stress and drought on those rain forests. Combined with a concentration of cleared patches, alternating with patches of regret, in locations with specific climatic, hydrological, soil and topographic conditions, all of which together would create a high fire risk due to a combustible fuel load and conditions that would accelerate the spread of fire, the use of fires at such times could spin out of control and lead to large wild fires. The bigger and hotter a fire becomes, the wider it will spread and the more damage it will do to forests and soils. Still, at those historic times, such events were rare, the more so since the farmers that used fires had become experienced in controlling and containing the spread and power of the fires.

Over the years, growing population densities started to exercise more pressure on the forests. This trend was much accelerated by the government's transmigration programs, converting many forests to agricultural use. These forests were thus taken out of the management cycle of the local traditional farmers leaving a smaller forest area to practice their rotating cultivation system. This effect was greatly amplified by the introduction of large scale commercial timber harvesting, which pushed the traditional farmers to more confined areas, leading them to re-open previously cleared and regrowing forests in much shorter rotation cycles. This accelerated cycle led to expansion of areas with pioneer and secondary vegetation, which are much more susceptible to fire in extreme dry seasons than mature rain forest. Not only did the traditional farmers end up with an unsustainable land use situation, but newly arrived transmigrants had no experience of forests, soils and ecological conditions in their new environment and, consequently, their use of land and forests did not have the built-in precautions of the traditional local system to prevent the spread of wild fires. The commercial forest concessionaires were the forest and land user group that introduced by far the largest fire risks to the forest lands. Indonesia's forests have mostly been gravely mismanaged by these concessionaires, leaving vast forest areas in a degraded state as a result of over-logging. In the footsteps of the loggers, spontaneous migrants moved into these areas to harvest remaining trees, settle down and open up land. This major increase in land use put pressure on remaining forests, leading to excessive exploitation of forests and lands that, combined with very little effective planning, monitoring and control of such developments, has left large areas of forests and forest lands in a severely degraded state. With the consistent use of fire for land clearing, these conditions have given rise to more and more large and severe wild fires. The fires further degrade the environment, forests and soils, finally leaving nothing but vast areas of hardy pioneer grasses dominated by Imperata cylindrica (alang-alang). In peat areas, the fires degrade the surface peat, making it more susceptible to burn in the next drought period.

The Ex Mega Rice Project Area in Central Kalimantan

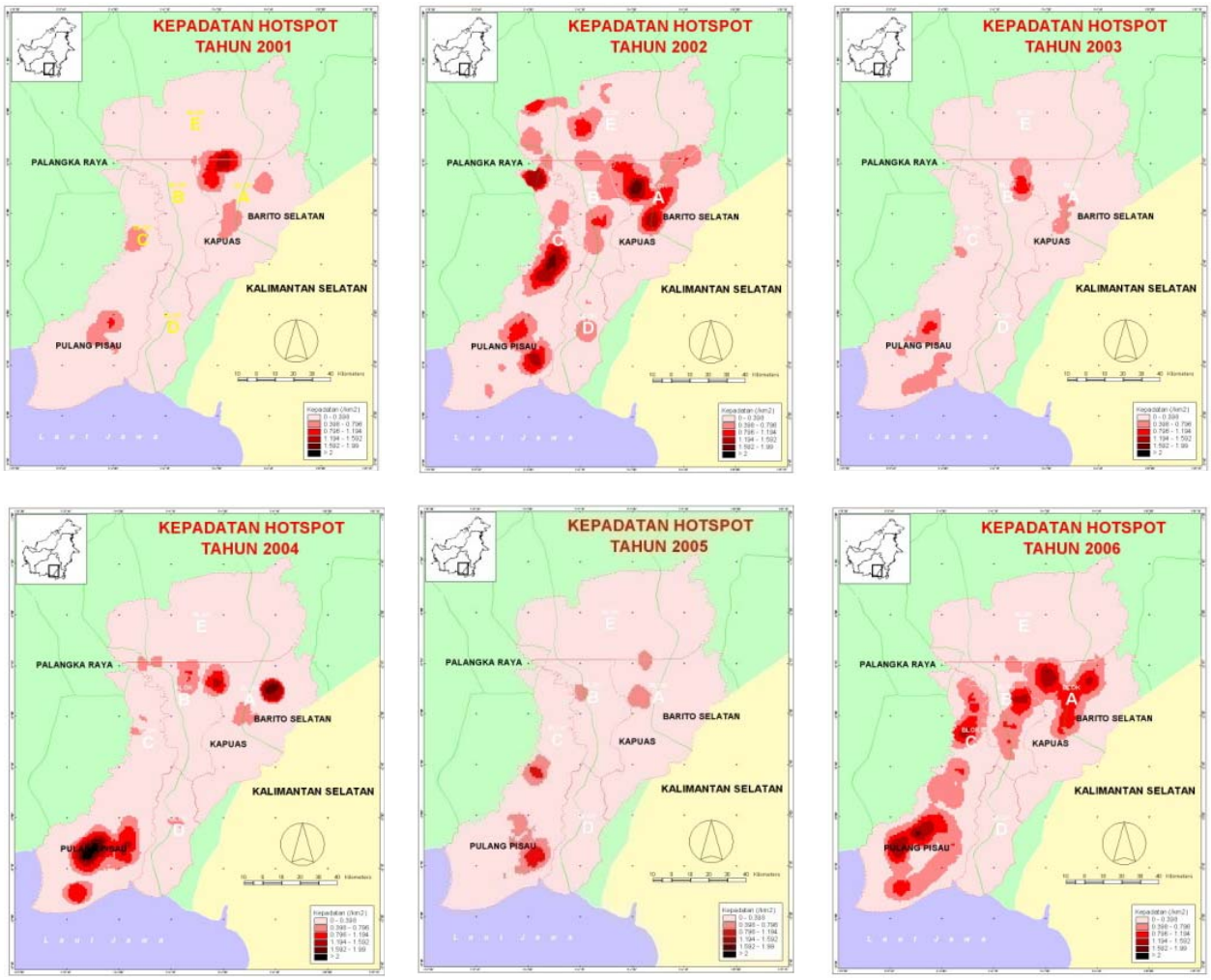
The degradation and conversion of forests and peat soils in the EMRP was primarily the direct result of the plan to turn it into a large scale transmigration and rice producing area. Forests were cleared, a network of drainage canals with a combined length of 2000 km was established that disrupted the hydrology of the peat, roads were built and people were settled into the area. Improved accessibility attracted even more people , further increasing illegal logging activities and fire-based agriculture. The wet humid peat swamp forests of old, in

which the population density and resource use methods of the traditional society didn't pose too much of a disturbance to this ecosystem, would never burn, but with these new conditions the remaining degraded vegetation and drying peat soils now pose a major fire risk in each dry season.

Fires occur mainly in the dry season, especially from August to October, but in higher number during El Niño episodes, e.g.1997/98, 2002 and 2006. Fires were relatively most numerous in Blocks A and C. In 2006, fires in the southern part of Block C were associated mainly with plantation establishment. Furthermore, because this is an almost uninhabited, vast, mostly inaccessible area, with a high fuel load (degraded vegetation and exposed peat soils), fires boosted by winds can rage on undisturbed for days and even weeks, out of reach of any fire suppression capacity.

Fires detected based on hotspot data[4] from 2001 to 2006 have been mapped and summarized by CARE International-Indonesia (Figure 1), related to their work on developing a fire early warning system together with the Environmental Agency of Central Kalimantan Province and the International Research Institute from Columbia University, USA.

Figure 1: Hotspots in EMRP 2001-2006 (Source: Care International)



[4] A High-Temperature Event (HTE) or heat signature as depicted by airborne or spaceborne remote sensing, here the NOAA weather satellite. Hotspots are almost always fires, after data processing and interpretation .

The images in Figure 1 show that fires were most abundant and persistent in the peat areas. Fires that are detected over a number of consecutive days are large persistent fires, either community fires that escaped to neighboring lands, or company fires for the purpose of land clearance. See Appendix 1 for more information on fire detection and hotspots.

1.3 Causes of Fires

Fuel (biomass susceptible to burning), heat, drought and human intervention are the four main ingredients that start a fire. Weather, fuel type and topography are the most significant factors determining the severity and behavior of the fires. The intensity of fires and the rate at which they spread is directly related to wind speed, temperature and relative humidity. Climatic conditions, such as long term drought, contribute further to the number and intensity of fires whilst, in peatland, drainage is also important since it lowers the peat water table, creating a surface peat layer that remains dry for long periods and increases its flammability.

Fires are virtually always initiated by human activity, either accidentally or intentionally. The fact that practically all fires are man-made, can be verified from the location of the hotspots, all of which are within a range of up to 5 km from access points for human activities, such as roads, rivers, canals, villages and, furthermore, within areas and vicinity of plantation, mining and forestry camps and illegal loggers or hunters' camp-sites. Fires may be unintentional, accidentally lit by cigarettes, cooking fires or camp fires. Often though, fires are intentionally lit.

Intensive logging, affecting most of Kalimantan including the EMRP area, has left mostly fragmented forest patches, individual trees, bare forest soil and tree debris. Exposed to sun and wind, the intrinsic moist micro-climate of the forest is gone and the degraded forests dry out and become highly susceptible to fire in the dry season. The fast growing pioneer grasses, shrubs and bush vegetation that emerge in degraded forest areas add even more to the fire risk after a long dry spell.

The threat and impact of fires are particularly high in the exposed, drained and degraded areas of peat land, especially where, in addition to destruction of the peat forest, peat domes have been dissected and drained by the canals. The abandoned drainage canals facilitate illegal logging, making access and log transport far easier.

Agricultural practices that use fire in land preparation carry a high risk of the fire getting out of control and developing into large fires in adjacent opened up and dried out degraded forest and/or peatland that have high fuel loads (biomass susceptible to burning). Once established, these fires can spread rapidly in the wind they help to create.

Many of the fires that are lit by local farmers for the purpose of land preparation are often short-lived when managed effectively. Local traditional farmers have such skills and expertise, whereas newcomers (migrants or transmigrants) often lack such experience. The local farmers will only burn small plots, e.g. 1 hectare, at a time and take precautions against the fire escaping into neighboring land by paying attention to wind-direction, making fire-breaks, leaving green-belts, and sometimes burning at night. Burning when it is dark has the advantage that the spread of fire can be better tracked, and suppressed in those directions or places it is not supposed to go. Nevertheless, under conditions of a high fuel load, intense drought and strong winds, fires easily run out of control.

The same is true in the establishment and maintenance of commercial and small-holder plantations, which often use fire as a cheap method for land clearing. The risk here of large

enduring fires is even higher because the areas being cleared are large, hence the fires are able to spread further, last longer and become progressively more intense and hot, and therefore will be harder to contain and extinguish. It is very difficult to prevent these fires from spreading outside of the plantation area.

In Kalimantan, including the EMRP area, much of the deforested land lies fallow. The owners or custodians, either the Forestry Department, other government institutions, villagers or urban dwellers, are not actively managing these lands. Their lands lie unproductive, because they simply own them as an investment in property, or they lack the resources, capacity, support and/or experience to manage and utilize the lands. Without an active management, these lands tend to get overgrown with shrubs and bushes, increasing the risk of fire.

Other causes of fires include situations where stakeholders resort to arson in conflicts over land and/or natural resources. Land tenure issues and licensing procedures are often unclear or not transparent, and traditional land and resource rights that many of the rural villagers hold are still incompatible with and unrecognized by formal regulatory authorities.

An additional cause of uncontrolled fires is that the local traditional farmers, who historically have been careful managers of land and forest, have lost their interest to care or respond when fires develop in neighboring areas which were once their own under traditional law until these were handed over to forest concessionaires in 1976 onwards. Now, with a feeling of lost ownership and responsibility, local farmers are indifferent to fires escaping in these areas.

Furthermore, a lack of sound and robust land use policies are prolonging the persistence of these unfavorable conditions and practices, even encouraging inappropriate land use, e.g. the clearing and developing of peat land. The trend of Indonesia being a major contributor to the fire and haze problem in the region needs to be halted through government-led comprehensive, long-term, well-coordinated and effective spatial planning and management and rural development programs.

Further study into the specific details of the causes and cases of fire in the Central Kalimantan – EMRP area would be needed to better address these causes, including applying sanctions to perpetrators of intentional fires. The Environmental Agency has a key role in this, as it is this Agency that has the task and authority to investigate cases of unlawful burning and to bring these cases to justice.

1.4 Fire Damage

Damage to natural environment

Most of the EMRP (particularly Blocks A to D, less so Block E) area has been affected repeatedly by fire over the last decade, leaving mostly a grass, fern and shrub dominated vegetation, which is highly susceptible to burn again in subsequent long dry seasons. The peat has also burned repeatedly and an estimate of how much of the surface peat layer was lost in the 1997/1998 fires varies from 25 to 85 cm, with an average of 51 ± 5 cm (95% confidence limit)[5].

A study by Page et al. (2002) using satellite images covering a 2.5 million hectare study area in Central Kalimantan from before and after the 1997 fires, calculated that 32% (0.79Mha) of the area had burned, of which peatland accounted for 91.5% (0.73 Mha). “Of this fire-damaged peatland area, 47.4% (377,814 ha) was PSF (peat swamp forest - pristine, logged

[5] Page SE, Siegert F, Rieley JO, Boehm H-DV, Jaya A, Limin S (2002) The amount of carbon released from peat and forest fires in Indonesia during 1997. Nature 420, 61–65. doi:10.1038/NATURE 01131

and fragmented) and the rest was degraded and deforested peatland. Only 4.5% of the pristine PSF was lost, while 29.2% of logged over and 70.0% of fragmented PSF were destroyed by fire. Severe damage also occurred to forest mosaics (54.1%), bushland (45.2%) and agricultural land (36.9%). The fire-damaged peatland represents 29.3% of the study area and 33.9% of the peatland within it." This same study also estimated the loss of carbon during the 1997 fires, amounted to 0.19–0.23 Gt C (3.5–8.2%) of the total carbon stored in the 2.5-Mha study, while in the EMRP, 0.12–0.15 Gt C (5.6–13.4%) of the peat carbon was transferred to the atmosphere.

In another study, by Hoscilo et al. (in press) from the University of Leicester, Department of Geography, the extent of fire scars over the period 1973-2005 within Block C was assessed (see Table 1). These data clearly illustrate that the western part of the PLG has been regularly and extensively affected by fire.

Table 1: Fire History of Block C – former Mega Rice Project area

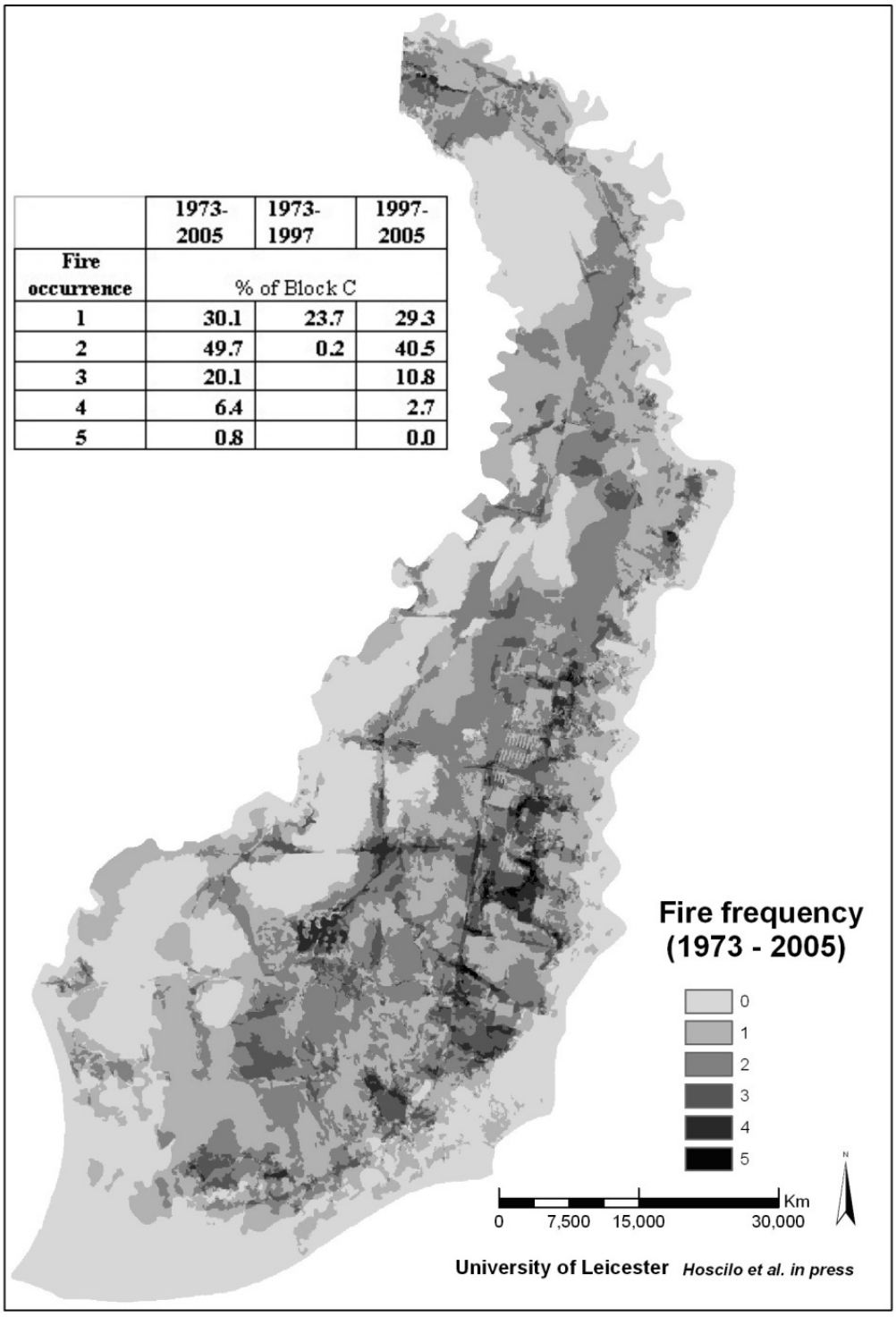
Time period	Extent of fire scars		Timing of ENSO-driven or other drought event
	(% of Block C*)	Hectares	
1973	6.9	31,109	1972/73 ENSO
1973−1991	8.6	38,420	1982/83 ENSO
1991	7.7	34,413	1991/92 ENSO
1993−1996	1.2	5,421	drought
1997	33.5	150,486	1997/98 ENSO
2002	22.2	99,573	2002/03 ENSO
2004	14.3	64,562	
2005	12.4	55,349	

The immediate consequence of this has been a large reduction in primary forest cover. In 1973, peat swamp forest occupied 60% of Block C, whilst other forest types (heath, mangrove and freshwater swamp forests) occupied an additional 12%. Over the last ten years, however, the rate of forest loss has increased greatly, particularly following implementation of the PLG in 1995 and the extensive ENSO-related fires of 1997 and 2002. The 1997 fires affected 150,000 ha of the land area within Block C (33.5%). By 2005, as a result of both the 1997 and the 2002 fires, the peat swamp forest area of Block C had been reduced by about 80% compared to 1973, with fire the principle vehicle of forest loss and degradation. After the 2005 dry season, the remaining peat swamp forest occupied only 11.7% of Block C (52, 000 ha). Yet even though the area of forest has been greatly reduced, fires return every dry season. Now they are increasingly focused on the heavily degraded, non-forested land. For example 24% of the study area was affected by the intensive fires of the 2002 dry season, whilst 14% and 12% burnt during the less pronounced dry seasons of 2004 and 2005 when there were no El Niño events.

Most fires within the EMRP now occur within non-forest, secondary vegetation, i.e. low growing, fern- or grass/sedge-dominated communities, which have replaced the forest in areas subject to repeated fires. This type of vegetation, although having a much lower biomass (and hence fuel load) than peat swamp forest, is highly flammable. There are now locations within Block C that have burned up to three or four times over the period 1997-2005; these are highlighted in Figure 2. Repeated fires on peat lead not only to a total and irreversible loss of forest cover, but also to an increased likelihood of flooding during the wet

season since successive lowering of the land surface through peat combustion brings the peat surface closer to the water table. A combination of flooding and fire produces conditions that are unfavorable to the growth of woody species, thus without some form of active intervention (fire control, hydrological control, tree planting), there will be no return to forest vegetation.

Figure 2: Fire Frequency in Block C - EMRP 1973-2005. *Source:* Hoscilo et al.



Fire occurrence	1973-2005	1973-1997	1997-2005
	% of Block C		
1	30.1	23.7	29.3
2	49.7	0.2	40.5
3	20.1		10.8
4	6.4		2.7
5	0.8		0.0

1.5 Peat Fires

Peat, which is composed of partly decomposed plant material, can burn easily as soon as the water content is reduced through drainage and the peat dries out. During the 1997/98 El Niño event over 2 million hectares of peat land were burned with drained peat land a major annual fire flashpoint. Indonesia has about 80% of the peatland area in Southeast Asia.[6] The peat swamp landscapes are difficult to access, making it hard to control and suppress fires. They also present major problems for sustainable alternative land use and restoration following degradation. Tropical peat land, once it has been opened up and degraded, tends to be subject to further human disturbance and becomes a long-term, persistent fire risk problem.

Peat land fires have larger environmental impacts than dry land fires, generating thick smoke and haze and large carbon emissions. Peat fires produce 16 times more smoke than above ground biomass fires, and can smolder and spread underground until extinguished by rain or fire fighters. Peat fires are difficult to extinguish as they occur under the ground. Once the peat layer has been affected by drought and fire, it loses its capacity to absorb and hold water (irreversible drying) and thus will dry quickly and become an even higher fire risk in the next dry season. Large, intense and prolonged fires consume dry above ground vegetation as the initial fuel source but, once established, they are also able to ignite and burn the underlying dry peat with its matrix of tree trunks and branches. Peat fires can penetrate deep into the peat layer (up to 50 cm), slowly tracking along wood buried in the peat where they can smolder for several weeks during which they can re-ignite fires on the surface. These peat fires are very hard to detect and put out. Even if the surface fires are extinguished, the peat underground will continue to burn unless a large amount of water is used to completely drench the peat layers. Thus it is common to see fires recurring in areas where the fires were doused earlier. Consequently, in peat land, the most effective way of containing the fires will be to flood the area. This requires large amounts of water, however, which is scarce during a prolonged drought. It generally takes 2-3 days of heavy rain to extinguish deep seated peat fires. The lack of water is a major constraint to fighting the fires effectively. Even in cases where pits and canals are dug, they dry up quickly. Water pipe wells (hydrants) drilled into the peat soil to reach the groundwater are the only potential source of water under such dry conditions (see box). The best way though to tackle forest fires is to prevent them or at least contain them as early as possible by preventing their spread especially to sensitive areas and communities.

Given the challenges of suppressing peat fires, more emphasis needs to be put into the sustainable management of tropical peat land and the prevention of forest and peat fires, especially through better water management and restoration of degraded peat land areas.

Box: TSA Kalteng and the Development of Local Techniques for Peatland Fires

TSA Kalteng is the Tim Serbu Api, a Village Fire Fighting Team established by CIMTROP-UNPAR (see Chapter 3 and Appendix). The TSA has developed practical experience with establishing pipe wells in peat areas. The teams are equipped with a drilling machine, steel and PVC pipes and other auxiliary equipment. A fire break line near the hotspot is set out and cleared, and deep wells are drilled every 300-500 meters on this line to find ground water, at depths between 12-24 m. It takes 2-3 hours to establish a pipe well. The groundwater wells supply water around the clock, enabling them to suppress peatland fires before they become too large.

[6] Estimate by the Carbopeat project

2 Fire Management Approaches

2.1 Fire Management Components

Fire management for land and forest fires is a continuous cycle of efforts, involving the following components:

- fire prevention
- fire information system
- fire preparedness
- fire suppression
- fire evaluation and follow up

Fire prevention in a broad sense typically needs an integrated multi-sector, multi-stakeholder and multi-disciplinary approach, embedded in the planning and management of a region's sustainable and environmentally sound development. It involves strategy, policy and program development, spatial planning and zoning, and land use planning, aimed at reducing fire threats and risks. It furthermore includes development and support of viable land use systems based on zero-burning and/or controlled burning techniques, in combination with new or adapted livelihood opportunities. Fire prevention is also contributed to by information, education and awareness campaigns, among others concerning the regulations, decrees and sanctions on the use of fire. Fire prevention in a more field level operational context concerns the protection of areas or assets at risk with fire breaks such as green belts or canals, the rewetting of peat lands through blocking of canals, early detection of fire outbreaks through watch tower observations and patrols and managing the debris from land clearance.

Forest or land fires are mostly very hard to contain and extinguish, increasingly so with growing intensity, size and heat of the fire. Fire prevention is therefore the most strategic, effective, and thus important component of a fire management system.

Fire Information System is essentially a decision support system in support of the other fire management components. A fire information system provides: 1) early warning of fire danger, 2) monitoring of fires in progress, and 3) assessment of impacts of fires.

Fire early warning has two outputs, namely, fire threat mapping and fire danger rating. The fire threat map highlights the locations of fire prone areas, based on an assessment of fire susceptibility of vegetation and soil (e.g. peat), elevation, human activity, accessibility, climate zone, and fire history. Furthermore, it incorporates an assessment of water availability in these high threat areas during the dry season in rivers, canals and wells. The fire threat map needs to be updated only when significant changes in the major parameters occur. The fire threat map provides the information needed to determine where prevention measures are likely to be most needed and where fire suppression capacity has to be positioned and concentrated, based on the level of fire threat and the importance of assets under threat (social, economic, strategic).

The second and much more dynamic output of fire early warning is the Fire Danger Rating (FDR), which involves the calculation of a daily index value based on weather data (rainfall, temperature, wind). The index value classes go from low, medium, high to extreme. The calculated index applies to the area where the weather station is located. To cover a wider area, weather stations distributed over the area of interest are needed. The fire danger rating provides the information important for public information campaigns, including daily forecasts of fire hazard, and it is important for the preparedness and mobilization of the fire suppression teams. Presently, the fire danger rating systems are weather-scale warning systems, triggering immediate fire-fighting measures. Seasonal-scale warning systems are being developed, based on the close correlation of rainfall data to fire hotspot activity, followed with the making of rainfall forecasts into the next dry season. The International Research Institute of Columbia University is working on such a system, together with CARE International-Indonesia and with the Provincial Environment Protection Agency as a cooperating partner in Central Kalimantan province. A seasonal early warning system would enable decision-makers to take earlier action to help reduce impacts of potential fires.

The monitoring of fires is based mostly on satellite information on detected hotspots, as well as on field monitoring through patrolling and fire tower observations. The information on the detected location, number and path of the fires is essential for the fire suppression response.

Fire preparedness is about both the capacity of the fire suppression response as well as the timely mobilization of that capacity. The fire suppression capacity encompasses a clear and tested organization structure, operational system and procedures, as well as trained and equipped fire fighting personnel on standby. Furthermore, working vehicles, equipment and tools, including for communication, safety and first-aid are part of this capacity. The availability of operational budget is another component of fire preparedness. The levels of fire threat indicated by the Fire Danger Rating component determine the level of short-term preparedness, such as calling up reserves, having teams on stand-by, or intensifying information campaigns.

Fire suppression is the actual fire fighting coordinated between province, district, sub-district and village level. The coordination involves the communication, cooperation, directing and supporting of the fire fighting volunteer teams from villages, government sector fire brigades, plantation company fire fighters and any allocated army and police personnel.

Fire evaluation and follow up concerns the assessment of the fire damage (burn scars), based on detection of burned areas using satellite information, combined with field observations. Such information is needed for the follow-up action after the fires, including knowing what was lost and needs to be restored, as well as for law enforcement action on illegally started fires. A restoration/rehabilitation program may be designed to revive important ecological and economical functions of the affected area. The restoration should prioritize the reducing of the risk of recurrent fires in the same area. The restoration and rehabilitation needs an integrated approach, bringing technical, organizational, planning, socio-economic, inter-sector and law enforcement aspects together.

2.2 Fire Management Organization

In developing or improving a fire management organization, the following considerations apply:

- fire management cannot be handled by a single agency, and it therefore must be a joint effort by several government agencies, institutions and groups (including private sector companies and village community groups)
- fire management responsibilities, roles and tasks should be clearly defined, distributed according to existing terms of reference, mandates and scopes of work, and duly respected
- the set-up of the fire management organization within and across the various levels of government (national, province, district, up to sub-district / village) should be consistent and effective
- it is essential for any fire management organization to establish a clear, accepted and effective system of coordination, cooperation and communication, based on complete and unambiguous operational procedures and associated budgets
- capacity development of the various agencies involved, institutions and groups to handle their respective tasks in fire management is needed and should be reflected in government sector programming and budgeting.
- laws, regulations, decrees concerning fire management issues should be consistent, synchronous and harmonious across all levels of government

2.3 Community Based Fire Management

People are the main cause of forest fires, therefore prevention and control has to involve people at the local level. The traditional approach of focusing on legislation and expensive equipment alone is not sufficient. Local communities actively participate in forest fire prevention and control when they have a stake in forest or land management and benefit from these forests and lands.

Despite legal obligations requiring local communities to participate in fire management, governments will not be very successful in mobilizing communities, if rural people have no secure access to lands and resources for them to manage as a livelihood resource. For any community-based fire management system to be sustainable, incentives for fire management must be largely related to the community's needs. Community-based forest fire management is probably most effective as part of an overall community resource management strategy and cannot be implemented in isolation. Communities show interest in controlling fires that threaten their lives, livelihoods and properties.

Communities have developed various forest fire management approaches, especially in swidden farming, such as:

- establishing firebreaks, buffer strips and fire lines;
- preventing fire from spreading by piling slash in the middle of the field, burning only in early morning or evening of the dry season and against the wind, and back burning;
- protecting valuable trees by removing underbrush and sheathing useful vines;

- relying on experienced villagers to manage the fires;
- forewarning all households in the community about the fire to be set so they can take precautions, and announcing fire outbreaks;
- implementing a monitoring system for patrolling fire-prone areas during the dry season
- encouraging community involvement in fighting fires.

Local communities must establish fire management systems at village level that are linked to sub-district and district levels. Such management systems aim to reduce the frequency of uncontrolled fires, encompassing both prevention and control methods. Communities need to be strongly supported by private companies and government agencies. With co-operative agreements, it is essential that neighboring partners co-operate and co-ordinate to protect their areas from fire.

The success of community involvement schemes depends on mutual trust, a commodity that has been singularly absent in the past and which will thus take time and patience to develop in the future. The prime need is to bring together villagers, companies and government agencies at the local level to prepare the ground for joint development of fire protection initiatives.

Community participation in fire management is of the greatest importance, and the best systems of community based fire management are those that are the responsibility of the communities themselves, embedded within the village government, planning, development, implementation and monitoring system, integrated within the socio-economic and cultural village structure.

3 Fire Management in Central Kalimantan and the EMRP Area

A significant number of relevant laws and regulations have been issued to cover fire management issues, such as dealing with authority, directions, responsibilities, obligations and technical aspects. Also, the government has developed various multi-sectoral organizational structures at various levels to supervise and control the implementation of those laws and regulations. Appendix 3 gives an overview.
Even so, fire management in Indonesia is still not sufficiently effective until today, and recently the efforts and determination by the government to improve it have been intensifying in order to deal with the problems that still prevail, including:

- An array of regulations, decrees, and guidelines that are often sector specific and sometimes inconsistent with other valid regulations and decrees; moreover, many are unclear or incomplete, not socialized, not followed up by technical guidelines and manuals, and introducing rapid and confusing changes in fire management organization and responsibilities.
- The same situation is now occurring at province and district levels, with inconsistencies arising between districts and districts and province
- The focus has been and in present implementation still very much is on fire suppression and/or the crisis management aspects, much less on a long-term integrated approach to fire prevention for example; the approach to fire suppression even has been very reactive and fire-event driven
- The strategy and approach to forest and land fire management has been partial, ad-hoc, confusing and mired with sectoral interests and bureaucratic hurdles
- It is still not sufficiently clear and/or sufficiently supported by the various relevant agencies how roles, responsibilities and tasks for fire management are distributed and implemented. Different perceptions and interests about fire management abound, persistent sectoral approach in the activities of the various agencies, lack of communication and co-ordination
- Different institutional set ups at provincial as well as district levels might hinder a smooth exchange of information, communication and collaboration as well as direct budget support from the national towards the provincial and district level.
- Capacity development needs are not sufficiently investigated, understood and/or addressed
- Fire prevention, i.e. fire risk management is not yet an inherent part of a wider environmental management approach, which in turn is an inherent part of overall sustainable development planning and management.

- The community stakeholders at village level are hardly actively supported and involved in the larger fire management approach, even though it is at this level, the level of the land user, that fires are started and subdued. The village, as the government level closest to the people, should be much more empowered, assisted and involved in development planning and associated spatial planning and environmental management. Part of the latter is fire management at village level, and as such coordinated with fire management at the higher levels of government.

3.1 Fire Management Institutions[7]

There is no single lead institution responsible for fire management in Indonesia. The fire management structures, procedures, guidelines and activities that have evolved over the years involved mostly the Forestry sector, the Environmental Protection sector and the Disaster Management sector (Bakornas). The Agricultural and Estate Crop Sector have more recently started to take up roles and tasks in fire management. Community based fire fighting concepts and groups have been developing as well. Private companies such as oil palm and wood pulp plantations have been developing fire management capacity to protect their assets, and are required to do so by law and regulations. Most attention still goes to fire monitoring and fire suppression, less so to fire prevention.

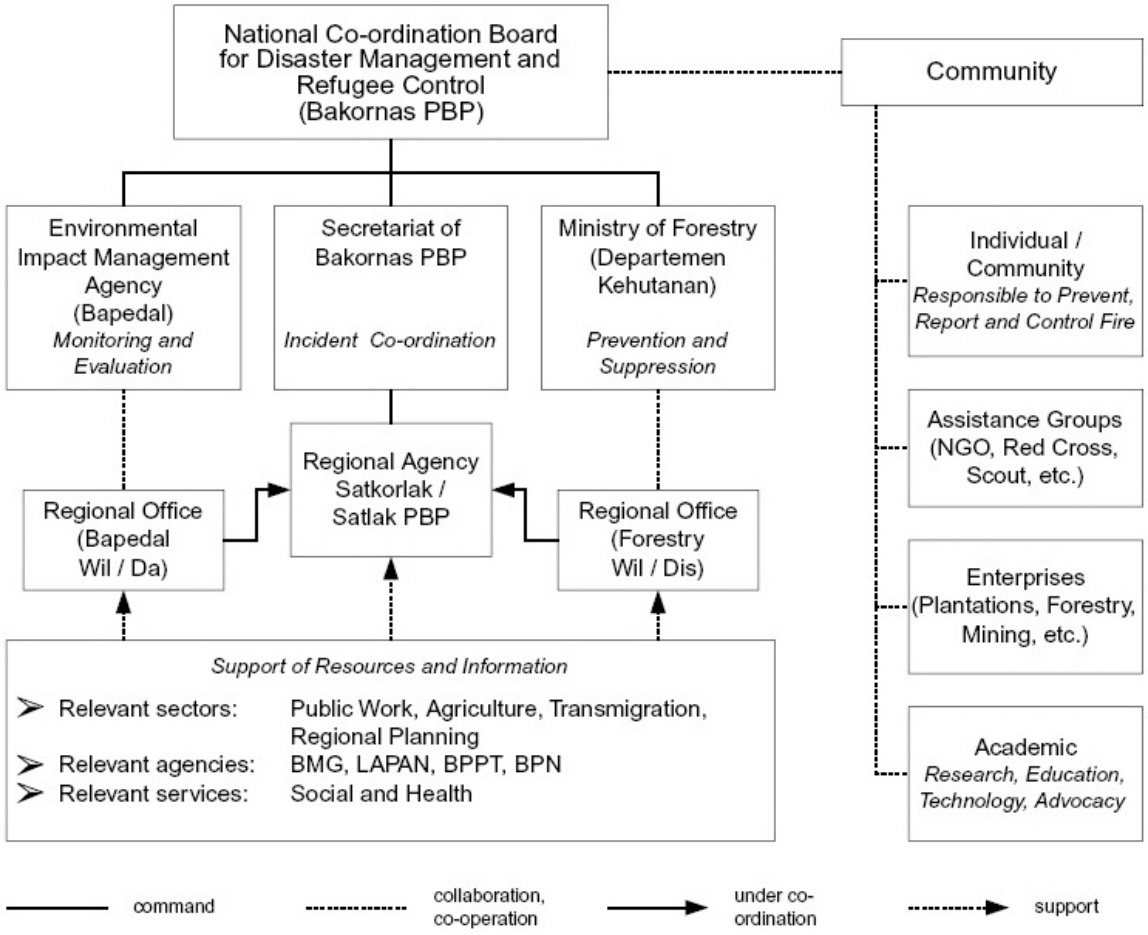
Bakornas PBP (National Coordinating Board for Disaster Management)

The coordination with regard to fire suppression in Indonesia is managed through the Bakornas PBP (National Coordinating Board for Disaster Management), with the Ministry of Forestry handling prevention and suppression and the Ministry of Environment focusing on monitoring, evaluation and policy. Support of resources and information is provided by several agencies, e.g. early warning and fire danger rating by the Meteorological Service (see figure 3).

Bakornas PBP is a non-structural co-ordination board and functions only when multisectoral action is needed during a disaster. The Bakornas PBP is involved with forest and land fires because the large-scale forest and land fires can result in a disaster for human and environment. The Bakornas setup at provincial level is called SATKORLAK (Implementation Coordination Unit), while at District level it is SATLAK (Implementation Unit). The Central Kalimantan SATKORLAK was established in 2002 by Governor Decree 343/2002. The Decree calls for the establishment of SATLAK at District levels. Each Kabupaten has established a SATLAK, but they have been treated as a formality only and have not been operational.

[7] See Appendix 3 for further information

Figure 3: Bakornas Organization Structure[8]



Pusdalkarhutla (Centre for Forest and Land Fire Control)

Before the implementation of Regional Autonomy in 2000, the MoF and MoE both developed and distributed their role and tasks in fire management to their line agencies at province and district level. In this period, the Forestry Department developed its forestry-sector Centers for Forest Fire Control at national and provincial level (Pusdalkarhutnas and Pusdalkarhutda). These were mostly command, delegation and reporting structures implemented within the forest agencies, with very little actual operational fire control capacity. In the same period, the Environment Ministry developed a National Co-ordination Team for Forest and Land Fire Control (TKNPKHL), with delegation of fire prevention and monitoring tasks to the environmental agencies at regional levels. Also this forum lacked actual operational strength.

After the enactment of regional autonomy in 2000, the regions had the authority to establish their own fire management structures, enacted per decree of Governor or Bupati respectively. The regions generally reviewed, renewed, and/or reformulated the existing Forest and Land Fire Control Centers, taking into account new guidelines, proposals and concepts coming from the national government. This lead to the establishment of Forest and Land Fire Control Centers (now called Pusdalkarhutla[9]), which in general aim to provide for a multi-sectoral,

[8] Simorangkir, D. and Sumantri. 2002. A Review of Legal, Regulatory and Institutional Aspects of Forest and Land Fires in Indonesia. Project FireFight South East Asia.
[9] Pusat Pengendalian Kebakaran Hutan dan Lahan

comprehensive and coordinated approach to fire control. However, not all Provinces have established a Pusdalkarhutla, or are still in the process of doing so, and in between Provinces there are variations in the Pusdalkarhutla's organization structure, involved institutions, and distributed tasks.

The Pusdalkarhutla are still coordination and communication structures and mechanisms, with actual operational strength depending on the involved member institutions. Pusdalkarhutla have so far only be established at Province level, rarely at District level.

Central Kalimantan Province installed a Pusdalkarhutla with the issuing of Governor's Decree No.77/2005 on Implementation Guideline for Forest and Land Fire Control. The latter decree is based on the Provincial Government Regulation (Perda) No.5/2003 on Forest and Land Fire Control. The Perda 5/2003 briefly lists the tasks to be implemented by a fire management institution, i.e. to list activities and enterprises that pose a danger to environmental pollution and/or degradation, to list and evaluate environmental impacts and to draw-up a strategy, plan and budget for environmental rehabilitation. No other tasks are defined, and strangely enough fire preparedness and fire suppression are not at all mentioned. The Decree 77/2005 on Implementation Guideline for Forest and Land Fire Control does list such tasks.

This Implementation Guideline however did not create a specific organizational structure for Pusdalkarhutla, but simply followed the SATKORLAK setup, equating SATKORLAK with Pusdalkarhutla for the matter of forest and land fire management, assigning the role and responsibility of Pusdalkarhutla to SATKORLAK. Tasks and responsibilities with regard to fire management tasks were assigned to the various relevant agencies based on their already established roles with regard to fire management issues, such as the Forest Service, Plantation Service, Agricultural Service, BKSDA (Prevention and Suppression of Fires) and the Environmental Agency and BMG (Monitoring and Evaluation). However, no further standard operating procedures for coordination, communication and cooperation were developed. No Pusdalkarhutla have been established at District level in Central Kalimantan Province.

Command Center (POSKO) for Forest and Land Fire Control

The SATKORLAK procedures called for a Command Post (POSKO) to be setup at both Provincial and District levels, operational for the length of the emergency response period, and coordinating the operations of the emergency response of the various involved agencies.

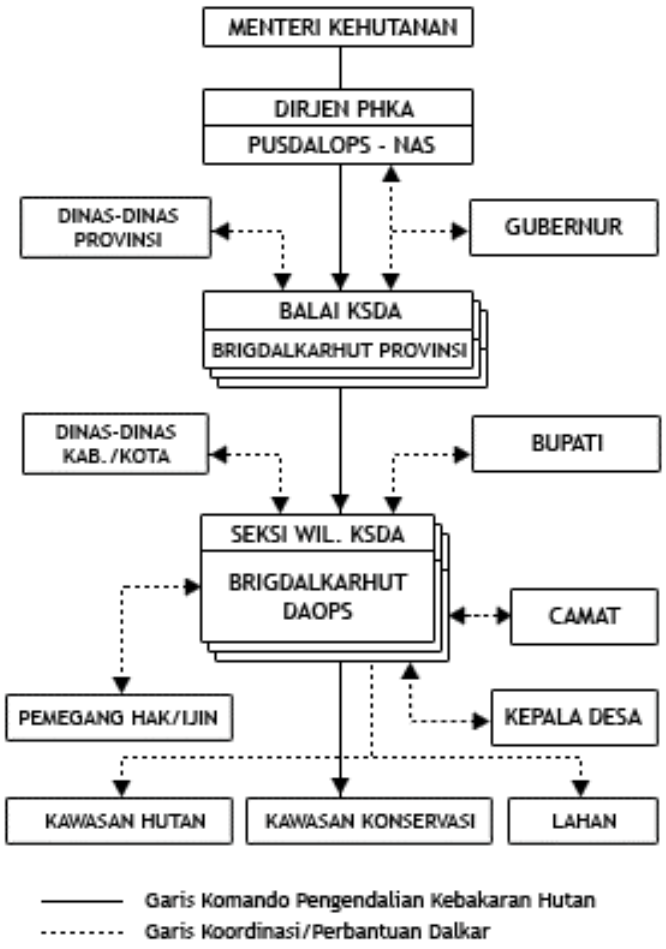
In 2007 an Integrated Command Post (POSKO) for Forest and Land Fire Control was established by Governor's Decree No. 660/2007. The POSKO operates under the authority of the Governor, and is managed by the Provincial Secretary. It has a Core Team, and 4 units below that: 1) Fire Early Warning, 2) Fire Control, 3) Law Enforcement and 4) Publication. Members of the Core team include the Heads of the Forestry, Plantation, Agricultural, Mining, Environment and People's Protection and Health agencies. The Command Post is an ad-hoc coordinating body, coordinating operations just before, during and after the dry season.

The Fire Early Warning unit is coordinated by the BPPLHD (Environmental Agency), the Fire Control unit by the Forestry Agency, the Law Enforcement unit by POLDA (police), and the Publication unit by the Province's Public Relations Office. The units have 4 – 8 members from relevant agencies or institutions. The tasks assigned to the POSKO units are mostly similar to those listed in the Governor's Decree No.77/2005 on Implementation Guideline for Forest and Land Fire Control. The extent and scope of the tasks all concern an operational approach and

action plan towards fire detection, monitoring and suppression just before, during and after the dry season.

District POSKO's have not been setup or are not operational, with communication from the Provincial POSKO directed to either a District's forestry agency, or a Manggala Agni Fire Brigade Base.

Figure 4: Organization of Brigdalkarhut (Manggala Agni)



Ministry of Forestry & Brigdalkar 'Manggala Agni'

The Ministry of Forestry has established "Manggala Agni" fire fighting brigades, stationed in the regions, under its control through the Department's Regional Nature Conservation Offices, BKSDA (see also Appendix 3).

The BKSDA is member of the Fire Control Unit of the POSKO. The BKSDA brings in its Forest Fire Control Brigades (Brigdalkar 'Manggala Agni')[10]. The Brigdalkar Manggala Agni from the BKSDA Kalteng has 4 DAOPS (Fire Brigade Base), with a total of 14 fire brigade teams, each team having 15 members. The 4 DAOPS are in Palangkaraya, Muara Tewe, Kapuas and Pangkalan Bun.

[10] See further Appendix 3

The BKSDA Forest Fire Control Brigades ('Manggala Agni') at provincial (Brigdalkarhut) and regional level (Brigdalkarhut-DAOPS) were established based on Decree of the Director-General of Forest Protection and Nature Conservation (PHKA) No.22/Kpts/DJ-IV/2002 on Guideline for Development of Forest Fire Control Brigades in Provinces North Sumatra, Riau, Jambi, Kalimantan Barat and Kalimantan Tengah. The Decree allocates 2 brigades to DAOPS Palangkaraya, and 4 brigades to each of the other three DAOPS. In practice however, DAOPS Palangkaraya stations 6 brigades, Kapuas 3 brigades, Pangkalan Bun 3 brigades and Muara Teweh 2 brigades.

The jurisdiction and work area for the Manggala Agni Fire Brigades is the state forest conservation area. However, the Brigades will assist fire fighting operations in other areas, if so required, financed out of their operational budget. An organizational overview of such cooperation is displayed in Figure 5.

The brigades according to their job description also have tasks in fire prevention such as awareness campaigns and establishing fire breaks and in fire information such as mapping of fire risks and burnt areas. They are also to work with and train community fire teams, called Masyarakat Peduli Api (MPA) in the terminology of the MoF.

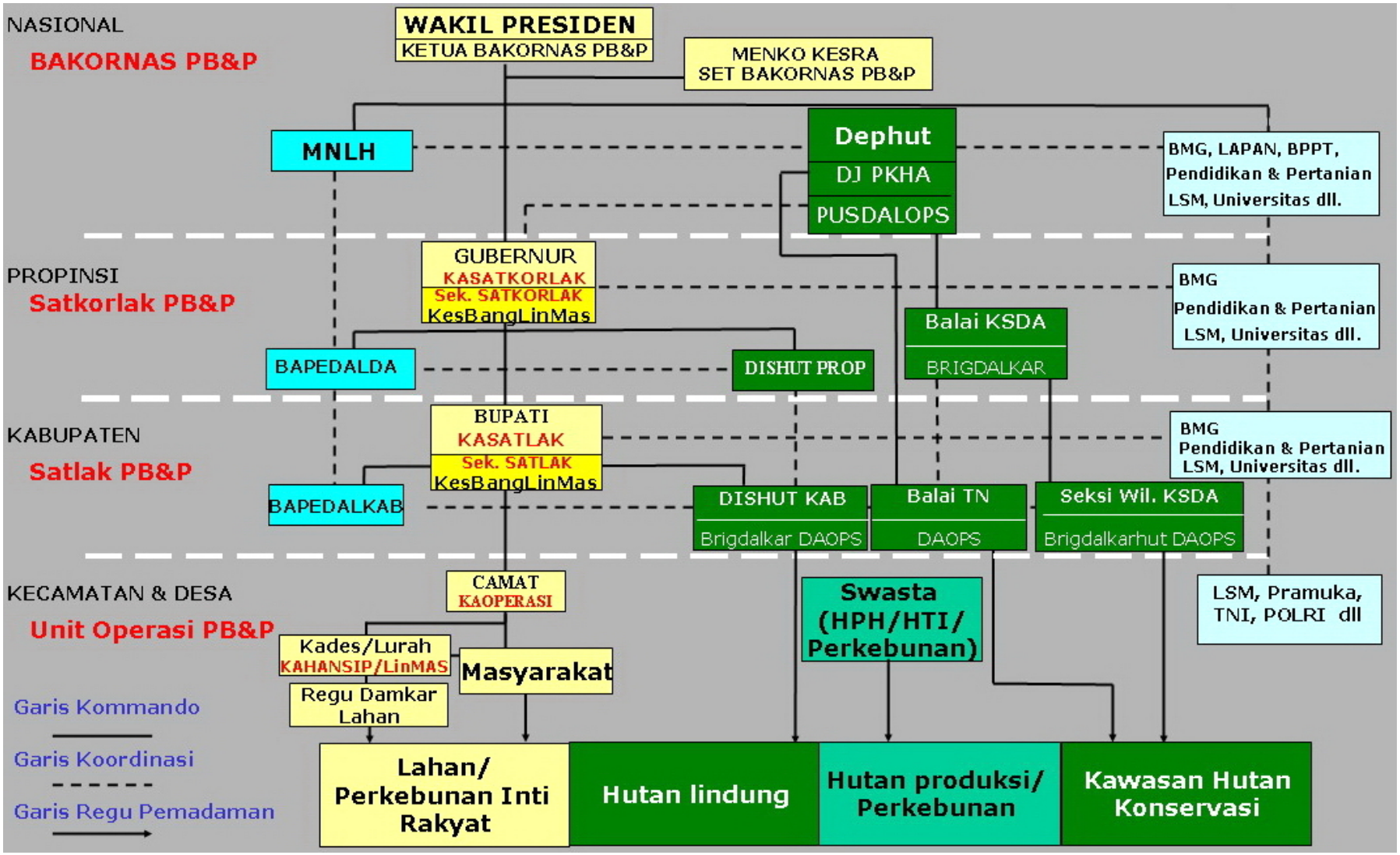
Provincial / District Government Agencies

The various government agencies have tasks in fire prevention, fire information, fire suppression and fire impact follow-up as per their agency roles, responsibilities and job descriptions. A number of regulations and decrees further specify or underline these roles and tasks.

Regarding fire prevention, Governor's Decree No.77/2005 on Implementation Guideline for Forest and Land Fire Control lists the roles and tasks of government agencies involved in the use, management, monitoring and evaluation of land and natural resources. The Guideline for Forest and Land Fire Control explains that prevention measures such as extension, training, equipment maintenance and awareness campaigns should be implemented throughout the year. Fire prevention is furthermore said to include infrastructure development such as fire-breaks, fire towers, water reservoirs and green belts. Also included in fire prevention is capacity development, of human resources, of equipment as well as available budget. Research and development is mentioned, with regard to fire management systems and techniques, such as controlled burning, fuel management, early warning system and real-time hotspot monitoring. Finally, the preparation and issuance of regulations and procedures by and for the districts is listed. In the Guideline, no specific mention is made for the need to improve spatial / land use planning, integrated rural development based on medium and long term government strategy and associated programming and budgeting. The coordinating role of the Bappeda with regard to integrated sustainable development planning, and the need to incorporate environmental management, is not mentioned. Furthermore, when reference is made to extension, it is unclear if there are extension workers available for this work.

The BPPLHD Environmental Agency is tasked with, apart from notifying the public / stakeholders about fire danger, giving extension to public / stakeholders on environmental management related with forest and land fire control. The Forest Service is tasked with fire prevention in the state forest area. The Estate Crop Service is to concentrate on the plantation areas. The Agricultural Service is to cover the agricultural lands while BKSDA operates in Conservation Areas.

Figure 5: Fire Management Organization in Indonesia (until 2008)[11]



[11] Hoffmann, A.A., Institutional Development For Integrated Fire Management in South Sumatra, 2004. South Sumatra Forest Fire Management Project Report Series.

Governor's Decree No.77/2005 furthermore determines tasks in fire information for the following agencies. BMG is tasked with monitoring and analyzing the weather and predicting the start and duration of the dry season. It will report this information to Satkorlak/Pusdalkarhutla (now POSKO) and provide this and further information to related agencies as needed. The BPPLHD (Environmental Agency) is tasked with hotspot monitoring and fire early warning, which includes the fire danger rating, also to be reported to Satkorlak/Pusdalkarhutla and related agencies as needed. The BPPLHD also has the task to produce a fire threat map. It furthermore will inform the public about fire alert levels and pollution index levels. The BPPLHD is implementing this task through its Pusat Informasi Lingkungan Hidup (PIL, Environmental Information Center), established per Governor's Decree No.334/2006. The latter decree among others incorporated the recommendations of a Seminar/Workshop on Early Warning System for Forest and Land Fires held in 2005 in Palangkaraya, as well as the recommendations from a Workshop on Lessons Learnt and Presentation of Pusat Informasi Lingkungan, in 2006 Palangkaraya.

Related to fire suppression capacity, in 2004 a Governor's Instruction No. 23 was issued ordering the establishment of SATGAS (Satuan Tugas, or Task Force) at each level of intervention (province, district, village). The related Provincial and District agencies were to setup a Task Force or Fire Control Brigade, while at village / field level Task Force & Village Fire Crews were to be established. The Provincial Forest Service established three of such Task Forces. The Forestry Agency also established a POSKO of its own, to coordinate these Task Forces.

The most recent legislation is the Central Kalimantan Governor Regulation No.52/2008 on Guideline for Land Clearance by Farmers (see 3.5). The guideline sets the targets and standards for coordination, communication and efficiency quite high, which is an important stimulus to accelerate the development of fire management in the region.

Concerning post-fire interventions, the Environmental Agency has the key task of investigating the causes of fire and its impact.

The Environment Agency has other important roles related to fire management, including:

- Monitoring of permit issuance and their matching with spatial plan, land allocation and zoning. This is particularly urgent with regard to the issuance of permits for establishment of commercial enterprises in oil palm and other plantations.
- Monitoring of forest fire risk preparedness by commercial enterprises and local Government
- Monitoring of Line Agencies e.g., Forestry in the implementation of their responsibility/ mandate of protecting biodiversity assets and production forest and plantation against fire and fire risk
- Checking the accuracy of environmental data used by Government agencies. The data on forest areas (Kawasan Hutan), forest covered areas (Areal Hutan) of different categories, burned areas (Daerah yang terbakar) are often not accurate and not up to date
- Promoting good environmental governance and awareness on environmental regulations
- Enforcing environmental laws and regulations
- Facilitating conflict resolution of stakeholders involved in disputes over environmental pollution cases.

Comments

Fire management so far hasn't been very effective because of ambiguous institutional setups and division of tasks and responsibilities, lack of overall capacity and an over-emphasis on fire detection and fire suppression

The Pusdalkarhutla, Satkorlak and Posko setups discussed so far are functional, ad-hoc coordination forums. At District level they exist on paper only, if at all. They have been rather ineffective to handle the fire problem. There is little awareness and guidance on who does what exactly and how and there are no standard operating procedures, insufficient working budget and overall a very limited capacity to successfully handle the various fire management tasks. Other causes are the ad-hoc nature of an emergency response, competition between sectoral agencies, logistical complexities, and the magnitude of fire problem. There is variation between provinces and districts, depending on the implementation of autonomy law and regulations, policy priorities, leadership, experience, human resource management and financial strength.

The effectiveness of the Manggala Agni is still limited, caused by a capacity development still in progress, with more improved procedures needed, skills and experience of the fire fighting personnel, more and better equipment, budget, and coordination with other government agencies and especially rural communities.

The role and tasks of the regional government line agencies are clearly described in national and provincial government regulations and decrees, even though overlaps and hiatuses in the combined tasks are evident. The bigger problem however is that the agencies lack sufficient capacity to implement these tasks, and to coordinate an integrated approach with other agencies. Key agencies are the Environmental Agency, the Forestry, Estate Crops and Agricultural Agencies, and furthermore BMG.

BNPB and BPBD (National and Regional Disaster Management Agencies)

In 2007 a new Law (No.24/2007) on Disaster Management was issued. Presidential Regulation No. 8/2008 based on that law replaces the Badan Koordinasi Nasional Penanggulangan Bencana dan Penanganan Pengungsi (Bakornas PBP) with Badan Nasional Penanggulangan Bencana (BNPB).

This new National Disaster Management Board is non-departmental but has ministerial stature and powers. It will work with new Provincial and District counterpart agencies, the Badan Penanggulangan Bencana Daerah. These will replace the Satkorlak and Satlak structures.

Several significant differences are noted. Unlike the Bakornas/Satkorlak/Satlak coordination structure, the BNPB/BPBD is a permanent government organization, with a clear mission, mandate and ministerial level powers. Unlike Bakornas, the new BNPB will be permanently active, and not just at times of an emergency. Furthermore, this new body will not only play a coordinating role across the various connected agencies/institutions, including the army, but will also have command over their resources, during as well as before and after disasters. As a Badan it has coordinating, planning, monitoring, reporting and supervisory tasks. The various tasks, roles and responsibilities of the government agencies already involved in fire management will not change much, but it is expected that with such new Disaster Management agencies the fire management in the province will be more effectively implemented, due to improvements in regulations, authorities and responsibilities, procedures,

budget and support for capacity building. So far, the province and districts have not yet initiated the establishment of aforementioned agencies.

Community Groups

Community fire fighting concepts and groups have been developed with the assistance of a number of government and non-government organizations, University of Palangkaraya and donor projects. An overview is presented in Table 2, with more information in Appendix 4.

Table 2: Community-based Fire Brigades in the EMRP Area.

Organisation	Team Name	Description
UNPAR-CIMTROP	Team Serbu Api (TSA)	TSA members are selected from the village community, and sign a work contract specifying their tasks, responsibilities, rights and duties. They are then trained in fire suppression topics and techniques. A TSA team has 20 to 30 members. The TSA are equipped with clothing, safety gear and tools, including a borer to drill ground water access wells. Activities of TSA include awareness raising among the communities, related to fire, the environment and alternative farming methods. One TSA group has been established in Kelampangan, its work area covering the research site of CIMTROP (TSA-UNPAR). TSA-Kalteng teams (6) and 21 TSA-K (k for kampung) have been established by the Palangkaraya Government. The TSA Kalteng concept includes support for business development or other income generation types for members of the community fire fighting team, to help these members to secure their families' financial needs, also during the periods that they spend their time on fire prevention and fire fighting work, as well as to generate budget to help finance the fire suppression activities of the TSA.
CKPP – Central Kalimantan Peat Project	Regu Pengendali Kebakaran (RPK)	The RPK (Fire Control Teams) have been established by Care International in 25 villages in the Kapuas, Barito Selatan and Pulang Pisau districts since 2003, and are presently managed/assisted by Care, WWF and BOS-Mawas in the context of the CKPP project. WWF has established an additional 8 teams with the Sebanggau National Park, and BOS-Mawas has planned another 10 teams for 2009. The RPK teams have 20 members or more, and received training and equipment similar to that of the TSA teams. The RPK teams are furthermore provided with radio communication equipment. The incentive for the RPK team members comes from their involvement as members in farming & income generation groups which are also supported by the project. Furthermore, the approach aims to integrate the RPK and fire management activity with village development planning, village budgeting and village regulations.
PPLHD (Environmental Agency)	Kelompok Masyarakat Pengendali Api (KMPK)	The role of the Environmental Agency is in fire early warning systems, environmental impact analysis of fires, smoke/haze monitoring and tracking of polluters, however, it has also programmed and budgeted for the establishment of fire control groups. The groups supported by the Environment Agency were in the first place to focus on fire prevention, via the making of charcoal, or composting of slash-waste, so as to provide alternatives for using fire for land clearing. However, the 26 KPMK groups have also been supplied with some fire fighting equipment. The BPPLHD though does not have the field presence, sufficient capacity, including funds, to properly guide and help develop these KMPK groups.
MoF / BKSDA	Masyarakat Peduli Api (MPA)	The MPA concept is introduced in the Forestry Minister Regulation No.(draft)/Menhut-II/2009. It involves establishing and training fire fighting volunteer groups among the communities near forest conservation areas or forest production areas. The MPA would become part of the fire management planning and operations of plantation companies, manggala agni fire brigades, and other parties which can support the development, coordination and funding of these groups. The MPA, even though referred to as volunteer groups, receive payment for their involvement. Village fire groups already established by other initiatives could be supported via the forestry department when absorbed as MPA group.

Private sector

Private sector companies with valuable assists to protect, have a high incentive to develop and maintain a fire management approach, establishing permanent teams of well-trained, well-equipped and well-paid fire fighters. The concession / permit holders are required by Indonesian law and regulations to develop and implement fire management plans for the land under their management, participate in fire prevention and suppression programs in neighboring areas, and establish a task force of forest firefighters that must be trained and equipped. Fires often start outside the concessions and enter as wildfires, therefore companies also have a great interest cooperating and coordinating with neighboring villages and/or other concessions.

The new Law on Estate Crops No 18/2004 is clear on demanding zero burning and the establishment of fire prevention and fire suppression capacity in the plantation sector. Intentional fires are prohibited by Indonesian law (zero-burning policy), and for companies there are heavy penalties, including the cancelling of land use and business permits. There are no pulpwood estates in the EMRP area. Oil palm estates are mostly in the start-up phase and have not yet developed the necessary fire fighting systems, trained personnel, equipment and infrastructure (fire belts, water ponds, watch towers).

3.2 Fire Management Results

The outcomes of fire management are reviewed in this section, based on documents, reports, news releases and interviews from the various stakeholders actively involved in fire management, including BKSDA-Manggala Agni, Forestry Agency, Environmental Agency, CIMTROP, CKPP-Care, CKPP-BOS Mawas, CKPP-WWF.

Overall, it can be concluded that fires and fire management have been a high priority matter to provincial and district governments and other stakeholders such as NGOs and research institutions. This is evident from the new and/or updated regulations, decrees, statements, guidelines and action plans concerning fire management, released by the government authorities over the last five years. It is furthermore reflected in the planning, programming and implementation of many fire management activities by the various parties. These activities include awareness campaigns, interpretation and distribution of fire information, training and equipping of village fire crews, fire prevention through improving land use approaches and village development planning, and mobilization of fire suppression capacity during fires.

However, although a lot has been done, the actual scale, scope, impact and effectiveness of these activities was limited. This is partly the result from a lack of coordination among the various parties regarding the planning, programming, budgetting and implementation of fire management tasks and activities. It is also due to an insufficiently comprehensive and thorough approach to fire management implementation, which is insufficiently financed as well. Furthermore, commitments, perceptions and/or level of contribution to the development and implementation of fire management tasks and activities have been uneven between the various parties.

There is still a lot to be developed and improved in the approach and implementation of each of the fire management components before effective fire management can be achieved. There's a need to develop and implement activities at a larger scale, more comprehensive,

intensive, integrated and mutually complementary, based on a common approach and plan which outlines the roles and tasks of each of the contributing parties. The initiatives, achievements and experiences of the various parties so far have to be combined, integrated and upscaled.

Foremost, an organization of coordinated fire management needs to be further specified and established, complete with a system of standard operating procedures for efficient, effective and coordinated action on fire management activities. This needs to be pursued by province, district as well as village governments, together with other stakeholders. Similarly important, a comprehensive, long-term approach to fire prevention needs to be further developed, intensified and implemented.

3.2.1 Fire Prevention

The following tables review the status of actions to prevent fires in the EMRP area:

1. Policy, Regulation, Strategy and Plans

Status	Description
Achieved	1. Joined signed commitment Governor / Bupati's Central Kalimantan (March 2008) [a] 2. Gov. Regulation 52/2008 on Land Clearance by rural communities 3. Governor's Decree No.370/2006 on the Formation of Integrated Team for Prevention, Controlling and Action against Perpetrators of Forest and Land Fires
Not yet achieved	1. Regulation on Spatial plan, spatial zoning, detail spatial plans and land use licensing. 2. Policy & Regulation on Integrated multi-sector, long-term rural development strategy and program. 3. Policy & Regulation Village development planning & village spatial planning. 4. Policy & Regulation on Integrated Extension & Development Services.
Key Issues	1. Provincial spatial plan still not validated, pending deliberations between provincial government and MoF. 2. Spatial planning focus, guidelines and practice not incorporating environmental trends, threats/risks and opportunities. 3. No comprehensive integration yet of socio & economic development needs and targets; potentials and constraints of the land, water and natural resource base; and environmental characteristics and risks (including fire risk). 4. Lack of appropriate directives, guidelines and manuals to direct comprehensive and integrated multi-sectoral planning/programming. 5. Government regulations and decrees insufficiently followed up by complete and unambiguous implementation guidelines, division of tasks and responsibilities, coordination mechanisms, output quality control, budgets and standardized approaches and operating procedures

[a] The Governor and Bupati's of Central Kalimantan in March 2008 have committed themselves per joint signed statement to the consistent implementation of the Action Plan (2007-2010) for Fire Prevention, Fire Suppression and Penalizing Fire Perpetrators[12]. The statement furthermore mentions the introduction and support of farming systems that do not depend on the use of fire and are fixed in location (as opposed to shifting cultivation) using a mixed cultivation of annual and perennial crops (rubber) or horticultural crops, the monitoring and control of any activity that imposes a fire risk, to

[12] See paragraph 3.4

develop a policy on the phasing out of fire-based farming, and to increase detection and suppression of fires using all available capacity.

2. Village development planning & village spatial planning, incorporating fire risk management integrated with livelihood options

Status	Description
Achieved	1. CKKP partners have developed and are implementing approaches to such village development / spatial planning in 25 target villages in EMRP area and Sebangau.
Not yet achieved	1. Effective collaboration with government agencies to hand-over, integrate, and expand the responsibility, support and extension with regard to such village development & spatial planning. 2. A standardized, uniform, and multi-stakeholder accepted approach to such village development planning & spatial planning.
Key Issues	1. Government has no policy and program yet to support such village development & spatial planning, which could be implemented through agencies such as PMD (Pemberdayaan Masyarakat Desa). 2. District Governments are not committing themselves yet to such comprehensive long term approaches, because of political, management, capacity, sector integration and coordination and budget issues. 3. NGOs, including CKPP partners have internal coordination and communication problems which impacts on their effectiveness to produce a collective focused output and on their influence towards the provincial and district government & agencies.

3. Farming system development based on zero/controlled burning

Status	Description
Achieved	1. Based on the Province's Action Plan, province government / agencies have implemented a very limited number activities with regard to zero-burning land clearance, with some demonstration plots (20 ha by the Plantation Service, location in Pulang Pisau and Katingan) and the distribution of booklets and some extension on zero burning techniques 2. CKPP partners have implemented trainings, extension and trials in their target villages.
Not yet achieved	1. The agricultural service has no program / activities so far with regard to this, with some planned for 2009 2. The district government has had very limited activities with regard to this so far, and few planned for 2009 3. An approach which integrates new/improved farming systems with effective extension, micro-credit services and marketing assistance been mentioned in the Action Plan, but has not been worked out and programmed in detail
Key Issues	1. A lack of direction, coordination, and sector-specific interests is preventing the various technical agencies and their supervising institutions to plan and implement an effective program 2. For the local rice farmers, zero burning is still a costly, ineffective, problem-ridden way of land-clearance. Without a thorough extension and support program to really lift the local farmers to a different level of farming, it is not going to work.

4. Establishment of fire breaks

Status	Description
Achieved	1. Provincial Forest Service reported to have established fire breaks (1000 m in 2007 and 4 water holes). Further data on the exact location of these fire breaks and how they have been established have not been identified yet. 2. CKPP partners have implemented trainings and activities in their target villages, and developed a technical manual on fire control and suppression.
Not yet achieved	1. A standardized approach and techniques, applied uniformly by the various involved technical agencies (forestry, plantations, agriculture), as well as by the various NGOs, has not been developed and/or accepted yet. 2. Many areas still lack fire breaks, as well as fire break maintenance.
Key Issues	1. As above, problems are a mix of management/guidance, capacity, coordination/communication, group-interests, budgets and priority

5. Canal-blocking in peat areas

Status	Description
Achieved	1. CKPP partners and CIMTROP have blocked a number of canals in degraded peat areas. Details are available, on number, location, techniques and organization.
Not yet achieved	1. No standardization of canal-blocking uniformly accepted by the various stakeholders
Key Issues	1. Lack of data and modeling concerning peat dome dimensions and hydrology which would be the basis for a canal-blocking plan. The EMRP masterplan project has contributed such data and modeling.

6. Information & Awareness campaigns

Status	Description
Achieved	1. Various agencies at province and district level (forestry, environment, plantation, BKSDA, people empowerment agencies) have implemented campaigns and distributed information to the public & farmers. 2. CKPP partners have implemented awareness campaigns as well.
Not yet achieved	1. Coordination, a uniform approach, effective sharing of activities, use of professional campaign designers who design just one all-encompassing campaign package 2. Impact assessment, a measurement of the impact and effectiveness of the messages conveyed.
Key Issues	1. Each sector / agency is welcome to contribute budget to awareness and information campaigns, however a lack of coordination and cooperation leads to inefficient use of government funds, overlap and confusion in messages conveyed, less effective impacts of the campaigns 2. Technical agencies such as forestry, environment and others should not be handling the art and technicalities of awareness campaigning, but put their funds together and hire a professional agency 3. While all other prevention activities are hardly implemented and/or budgeted for, it is the awareness campaigns which are readily programmed and budgeted by each agency.

Summary of Progress with Fire Prevention

Awareness campaigns and enforcement of the zero-burning policy seem to have had some effect on reducing the occurrence of wild fires, although their actual impact can not be determined yet. Fires during the 2007 dry season were less numerous and frequent then in 2006, but that was mostly caused by the wet weather rather then anything else. Experiences

have been gained with village development planning, village spatial planning, integrated with innovative farming system and livelihood development, mainly by the CKPP partner NGOs. Government agencies have planned and implemented various activities in this direction as well, mainly farming system development, but actual results are not verified yet. The province and district governments and the NGOs need to combine their strengths and experiences, and develop a comprehensive rural development program, that needs to drastically upscale from the present limited number of targeted villages. This would be the basis for more detailed, embedded activities, such as canal blocking, establishment of fire breaks, and monitoring and control of land use. The NGOs strength is their experience and results with such an approach, while the strength (and task) of the government is to develop, program, budget and implement a major upscale of the village and rural development approach. The rural development program needs also to give particular focus to the issue of land tenure. Land ownership, control over land and resources, access to land and resources play, play a crucial role in determining attitudes, responsibilities and active responses towards fires.

3.2.2 Fire Information System

The following tables review the status of actions to provide information regarding fires in the EMRP area:

1. Fire detection / monitoring (hotspots)

Status	Description
Achieved	1. Hotspot coordinates are obtained via email & internet and mapped, by the forestry agency, the environmental agency and BKSDA. In the POSKO Terpadu this would be the responsibility of the Environment Agency. The forestry agency however operates its own POSKO, as well as being member of the POSKO Terpadu. It distributes hotspot information to forest agencies at district level. BKSDA distributes hotspot information to its DAOPS.
Not yet achieved	1. Standard operation procedures to organize and steer operations of the POSKO Terpadu, in this case with regard to the hotspot / fire detection task.
Key Issues	1. Because hotspots are easy to receive via email-lists, or downloaded from websites, all agencies with some GIS functionality are enticed to be busy with hotspots. However, this comes at the cost of efficiency and duplication of activities and products should be avoided. Standard operation procedures are needed.

2. Early Warning – Fire Threat Mapping & Fire Danger Rating

Status	Description
Achieved	1. The Environment Agency, as per its task in the POSKO Terpadu, has produced a Fire Threat Map (see Appendix 2) and is producing Fire Danger Ratings during the dry season. The Agency has achieved this in collaboration with CARE and IRI from the Columbian University. The forestry service has also produced fire risk maps, and distributed them to forest services in the districts.
Not yet achieved	1. Application of weather station data from stations established by BOS-Mawas and CARE.
Key Issues	1. A Fire Danger Rating for a specific area can only accurately be made with data from a weather station from that specific area. Therefore, for fire danger ratings for the various districts or sub-districts, weather stations in these areas need to be established, utilized and maintained, in cooperation with partner institutions from those areas.

3. Haze & Air Pollution Measurement and Publication

Status	Description
Achieved	1. ISPU levels (Indeks Standard Pencemar Udara, or Air Pollution Index) are calculated by the Environment Agency based on standardized measurements of particulate matter (PM10), sulfurdioxide (SO2), carbonmonoxide (CO), ozon (O3) and nitrogendioxide (NO2).
Not yet achieved	1. The ISPU levels are only measured and calculated for Palangkaraya City. 2. ISPU levels are not sufficiently publicized to the public, or used in public health oriented action.
Key Issues	1. A mix of a lack of capacity, priority, directives, operating procedures, funds, public demand all lead to the non-existence of ISPU levels at district and sub-district levels. Hand held gas detectors and particulate matter readers could be used by the district environment agencies to calculate ISPU levels for their areas and inform the public in their areas accordingly.

4. Fire information distribution

Status	Description
Achieved	1. Fire detection/monitoring information (hotspots) and fire danger ratings are prepared by the POSKO, but cannot or only partially be delivered / communicated to the district and sub-districts 2. CKPP members CARE and BOS-Mawas have set-up radio communication links with their target villages. CIMTROP also has a radio communication infrastructure with the TSA groups.
Not yet achieved	1. A standard operating procedure on fire information distribution that covers the information exchange between province, district, sub-district and village. 2. Distribution from fire information from districts to sub-districts and villages. 3. Capacity development and radio communication facilities at District, sub-district and village (villages with fire crews) level to receive, process and utilize fire information from the province and other sources. 4. Integration & uniform implementation of radio-communication network linking all groups.
Key Issues	1. Districts do not have operational POSKO, have limited radio-communication access, have no operating procedures, have limited radio access to sub-districts and/or villages. The information from the province can hardly reach the districts, either not at all or with delay. Any delay in case of fires in progress will impact negatively on fire suppression results. See further c 2. Province / Districts have a tendency to consider their fire management tasks/responsibilities in a certain area to be covered if an organization such as an NGO or donor-funded project working in that area has already been developing and maintaining capacity.

Summary of Progress with the Development of a Fire Information System

Information on hotspots is still the primary focus of the various stakeholders in the province that are dealing with fire management. This shows that fire management here is still very much concentrated on detection and suppression of fires, and less so on fire prevention. Fire information such as fire threat maps are less familiar, although such a map is now available from the Environmental Agency. The Action Plan (see 3.3) does mention the compiling of fire threat maps by the Districts. However, how these maps are really going to be used is so far not clearly stated and/or understood. There is no link made so far between the information on

fire threats with land use planning, spatial planning, rural development programs and/or land use licensing. The Action Plan does not mention village land use mapping and the potential for such mapping to integrate fire threats at that level. Altogether, there is a need for directives, guidelines and standard procedures on the type and application of fire information.

The crucial role of fire information for each of the other fire management components is not yet optimized. Information on fire threats and early warning, haze content and intensity, and burn scars, are all just as important as information on hotspots for a comprehensive approach towards fire management. Furthermore, not only the topic, detail and potential use of the information is important, but equally so its distribution to the various users of such information. This information distribution still has many bottlenecks, and again, it needs coordination, sharing of experience, commitment and guidance by standard operating procedures among the various agents of fire management to improve this. Most urgent is to set up an effective network of radio communication encompassing province, district, sub-district and village, and the associated system of operation.

The system of fire information distribution by the POSKO to the districts, sub-districts and villages still experiences major problems. These include the absence of an effective organization of roles, tasks and procedures at District level, affecting the reception and processing of the fire information. A radio communication network with the districts is not available for the POSKO, the only network available is that of the Forestry Agencies. Their network however has protected frequencies which are only allowed to be used by the forestry agencies. Furthermore, not all forestry agencies at districts have working radio equipment. Another matter is that radio operators in the district are not always on standby. Information is now being send by telephone, fax and mobile phone. Telephone connections in some districts / sub-districts however are not working or disconnected. Cell phone networks don't have coverage throughout the EMRP.

Another problem with the fire information distribution is in the internal organization of the POSKO Terpadu, where BPPLHD is coordinating the Fire Early Warning Unit and producing the daily operational fire information that needs to be delivered as soon as possible to fire response units in the region. However, the Publication Unit of the POSKO Terpadu, under the coordination of the Public Relations Office of the Provincial Government, has been given the task and responsibility for information distribution to the general public. There is a difference between instant daily operational information needed immediately by the fire response units, and summary information for the general public. There would not be a problem if the Publication Unit were implementing these two types of information distributions with the required quality and speed. In the practice of the POSKO however, the operational fire information is held up too long in the Publication Unit before it is transferred to the districts.

BKSDA is sending fire information to the Manggala Agni field stations (DAOPS) via their radio communication network. Being part of the POSKO as well, the BKSDA assists the BPPLHD to cover for the fire information distribution to the area / districts with DAOPS Manggala Agni presence. For EMRP, this is only the Kapuas District and Palangkaraya City.

3.2.3 Fire Preparedness

The following tables review the status of actions to develop fire preparedness in the EMRP area:

1. Selection / training of village fire crews

Status	Description
Achieved	1. The provincial forestry , the environment agency and the community empowerment agency have all trained a number of village groups in fire prevention and fire suppression. The environment agency and community empowerment agency focused more on prevention such as land preparation & clearance, fire breaks, using debris for making charcoal or compost. However, also fire suppression was covered. The village groups trained by the forestry agency have a fire suppression focus. Village groups are KPMK (by Environment and Community Empowerment Agencies), TSA (Forestry Agency) and MPA (BKSDA). 2. CKPP members have trained and supplied village crews, called RPK, in 25 villages, with 10 more planned. 3. UNPAR-CIMTROP has established and trained groups called TSA.
Not yet achieved	1. Many more village groups need to be identified and trained. Government program/budget for 2008 presented a large increase in groups to be prepared/trained. The realization of this is yet unknown. For 2007, only a small number of village groups have been trained (30 people by community empowerment agency, 1 kabupaten(1 group?) by the environment agency, 80 people by the forestry agency). Data are incomplete and scattered. 2. Districts have shown minimal interest , with only a few groups established in Palangkaraya City and Pulang Pisau. 3. There is no uniform strategy, plan and standardized approach towards the development and role of village fire crews, with every sector agency having its own approach. This incompatibility starts at Department level at national government. 4. There is an urgent need to develop and standardize the community based fire management approach, and to make efficient use of government funds by clearly distributing non-overlapping responsibilities and tasks among the government agencies. 5. Results and experiences from CKPP members with village fire crews have not been fully utilized by government in the design of their own approaches.
Key Issues	1. Data on how many groups were trained, training materials, training results, training costs are not readily available and/or transparent and need cross-referencing. 2. Groups are identified, developed and supported in an uncoordinated manner, with varying approaches and depth/detail. 3. There should be a clear guidance through regulations and/or decrees from province and district governments on a community based fire management strategy 4. Many different names for village groups with essentially the same functionality and purpose is not helping a common unified approach to community based fire management.

2. Training of government fire crews

Status	Description
Achieved	1. BKSDA, forestry and plantation agencies have (re)trained their personnel, in fire fighting and/or monitoring & extension of fire management activities by companies and/or communities.
Not yet achieved	1. More personnel needs to be trained, and quality standards set. 2. District agencies are lagging behind capacity building of their personnel.
Key Issues	1. Trainings not standardized, not sufficiently budgeted, not sufficiently documented, absence of a pool of trainers in the region, no training of trainers.

3. Purchase / maintenance of fire equipment

Status	Description
Achieved	1. Provincial forestry agency has maintained and/or replaced fire fighting equipment and safety clothing of its Task Forces and supplied pumps to TSA village crews. 2. BKSDA restocks, maintains and updates the equipment and supplies of its Manggala Agni fire brigades.
Not yet achieved	1. None of the fire fighting groups, except for the Cimtrop-TSA, are sufficiently equipped with tools for fighting peat fires. 2. SOP concerning equipment, supplies, tools.
Key Issues	1. Equipment requirements not standardized, not shared among the groups, no advantage sought of joined purchasement of equipment, not suitable for use in peat fires, too much focused on the availability of open water. 2. Detailed data on the condition and available of equipment is sketchy.

4. Patrols

Status	Description
Achieved	1. Patrols in dry season by forest agencies, Manggala Agni, TSA and RPK village teams
Not yet achieved	1. Coordination of patrols among nearby groups. 2. SOP on patrolling and reporting.
Key Issues	1. Coordination of patrols among nearby groups. 2. A standardized map with a grid dividing the entire area (for instance EMRP) into square coded parcels (a military grid) needs to be developed to support coordinated fire monitoring and fire fighting operations. Each of the parties coordinated under the POSKO's of districts and province is assigned its area of responsibility / operation based on that map.

5. Establishing water wells

Status	Description
Achieved	1. CKPP partners CIMTROP-TSA, BOS-Mawas, and furthermore BKSDA have all established water pipe wells (hydrants) in fire risk areas, to varying success. Fifity (50) wells were established in Block E, 75 wells were established along the Trans Kalimantan Highway and some in the Sebangau National Park buffer zone. 2. CIMTROP-TSA teams work with plastic bags filled with water ("bom tik") brought to the fire location, which can then be hurled at the fire. This has proven effective to contain small starting fires. Since surface waters often dry up in the dry season, these 'bom tik' are the only solution for a fire attack, unless working water wells can be established.
Not yet achieved	1. A clear and accepted guideline/manual on the establishment of such wells in different types of area (peat and non-peat areas).
Key Issues	1. Lack of direction, guidelines, instructions, exchange of experiences.

Summary of Progress with the Development of Fire Preparedness

Oncoming dry seasons are now anticipated with the drafting and implementation of Action Plans that include awareness campaigns, activating Command Centers, fire danger monitoring, distribution of information on hotspots and daily fire danger, patrolling and holding fire fighting resources and personnel on standby. The RPK teams assisted by CARE and BOS-Mawas make a yearly work plan.

Achievements with regard to fire preparedness are likewise identified as many, relatively independently developed, small scale actions. The various parties including NGOs, Cimtrop, forest agency and BKSDA have all provided fire suppression trainings, equipment and instruction booklets, to their own target-groups in their own area of work. There has been some but still little integration or shared implementation of such activities. There are however many advantages from cooperation, including standardization of fire suppression techniques (especially concerning peat fires), field operations, fire equipment, safety procedures and training. This will be more cost-effective for all, lead to better integrated and safer field operations and more effective fire suppression. It is very advantageous when the various parties (stakeholders) are willingly involved in setting up fire fighting capacity in their area of work, and the next step needed now is to link all these together in a system/network of integrated fire fighting capacity.

The problem of water scarcity during the dry season urgently needs to be addressed in a coordinated and sufficiently authorized manner. The approach to overcome this problem should be part of a fire management plan for the province / EMRP, which all parties in fire management implement together. Water availability needs to be solved as much as possible with water pipe wells, where surface water during the dry season is not available. The numbers and locations of these wells are based among others on a fire threat map.

3.2.4 Fire Supression

Command structures

The POSKO Terpadu was operational in 2006, but could not accomplish much yet in terms of coordinating the fire suppression capacity of the various government agencies and institutions and community groups. The POSKO's effectiveness was mostly limited to the publication of hotspot data only, limited coordination and reporting. Mostly, the actors in fire suppression were operating independently through their own coordination structures, with limited coordination between them. The actors are the Manggala Agni fire brigades coordinated by BKSDA-Brigdalkarhut, the TSA team coordinated by CIMTROP, the RPK village teams coordinated by CARE and BOS Mawas, and the forest service task forces by the provincial forest service. The POSKO does not have a Standard Operational Procedure to integrate and guide the various available fire suppression capacities.

Operations

Fire fighting capacity seen active on the ground during the last few years are the BKSDA-Manggala Agni teams, the Task Forces from the Forest Service, the TSA Community teams and the RPK community teams. Furthermore, there has been aerial support, coordinated by the POSKO. In 2006 a Russian water-bomber BE-200 plane was leased and deployed

together with a Hercules plane from the Army and a police helicopter. In 2007 2 helicopters from Kamov Korea were operated, along with a Polda Kalteng police helicopter.

According to a Forest Service report, the Task Forces of the provincial and three district teams managed to extinguish 557.25 hectares in those three districts in 2007 (Kotawaringin Barat, Kotawaringin Timur, Kapuas).

The 15 BOS village fire brigades were engaged in fire suppression in some 650 hectares in Block E and north of block A during a 47 day operation, with a total of 310 brigade members. The fire brigades contributed to fire fighting on 20 other fire events in Block A and B.

The Cimtrop-TSA team has been successful to keep fires out of the area of Cimtrop's research forest in Kalampangan.

Techniques

A system of peat fire extinguishing is also briefly described in the Technical Guidelines for forest and land fire control, issued by Decree of the Central Kalimantan Governor, No.78/2005. One method mentioned is the digging of trenches around sections of the burning peat body, which are subsequently drenched with water. Another technique described for peat burning on depths of 50cm or more, is the injection system. Here, a steel pipe with nozzles (perforations) along its length, is inserted in the peat layer, and water is pumped into the pipe. The water reaches the burning peat through the nozzles. The nozzles are protected from clogging by protection sleeves. Water bombing has not been very successful, fires in peat areas cannot be extinguished with a single bombing. Multiple bombings are required. In comparison, peat fires need 2-3 days of heavy rain to drench the layers smoldering up to 40 cm or more below field level.

The helicopters are even less effective for water bombing, for they can bring only relatively small amounts of water, carried in a specially designed water bucket with a 3000 liter capacity. One bombing covers a 60 by 20 meter stretch of land. With hundreds of hectares on fire, spread over different locations, many sorties would have to be flown. The helicopters should be made much more effective by dropping fire fighter teams near the fire locations, while also giving water bombing support, and bringing other supplies as needed. If no water source is available at the fire location, then the water bombing support combined with cutting fire breaks, digging trenches and mopping-up efforts of the ground teams is the only option. Instead or in addition to water bombing, deep wells need to be drilled to access ground water sources, depending on site conditions. The teams have to be properly equipped for this and such equipment should be made standard, as most of the time lack of open water will be a major problem. To reach the ground water in peatland, wells need to be drilled up to 25 meters deep, or more, depending on the site.

There is also a need for a continuous operation until the fire is completely under control. Fire brigades should work in shifts, however, it has been observed that teams go back to camp at the end of a work day, while the fire is still burning.

The following table reviews the status of operations to suppress fires in the EMRP area:

Status	Description
Achieved	1. Provincial Forest service, Manggala Agni, TSA, RPK have all reported fires extinguished by them. The reports are not always clear though on the exact location and size of the areas involved. Furthermore, they all report great difficulty in finding surface water. The TSA teams seem to be the most flexible and adaptable, with their 'bom tik', strict discipline, and successful drilling of water wells. The pick-up, pump and hose based teams from the forestry agencies and Manggala Agni were in many cases ineffective due to their limited reach, depending as they are on access by roads, as well as being bound by surface waters (if available) such as rivers, canals, 'beje' water ponds.
Not yet achieved	1. Some fires have been fought, most haven't. 2. Effective command structure, coordination and communication is still unavailable to direct, guide and monitor operations between province, district, sub-district and village.
Key Issues	1. Inefficiencies and capacity problems at provincial POSKO, where even 2 POSKO's are operating, one POSKO Terpadu (Integrated) and one Forestry POSKO. Lack of standard operating procedures for all fire management components. 2. Posko's at district level are unavailable or have serious capacity problems. 3. No Posko's at sub-district. 4. No effective radio communication network between province, district, sub-district and village. 5. Existing village teams, equipped with radio communication, are hardly utilized within the POSKO approach. 6. Lack of communication and coordination leads to delayed response times, allowing the fires to grow out of control and greatly reducing success of extinguishing. 7. No effective fire preparedness, with the wrong equipment, lack of working water wells, lack of skills, lack of discipline and/or logistics/funds. 8. No uniform operational map with military grid to direct and unite all inputs and operations, based on a pre-determined allocation of areas of responsibility involving all fire fighting groups. 9. Districts still lack commitment, in action and funds, to their responsibility towards fire management.

Summary of Progress with the Development of Fire Suppression Capacity

The various village fire crews and Manggala Agni fire fighter brigades have had some success in suppressing fires, though to varying degree. The Manggala Agni brigades, as well as the fire teams from the provincial forest service, were less successful due to their reliance on surface waters, which are mostly dried up during long dry seasons. Furthermore, their approach and equipment, using pick-up trucks, heavy pumps and slip-on tanks, pins them to the roads, limiting their access to the fire spots further away from these roads. Also, these brigades have a large area of operation, with many fire locations. They have to make a quick assessment and carefull judgement which fire spots to prioritize for engagement, based on an estimation of potential successful suppression, given accessibility, distance and time to the location, population and properties at risk. Their present capacity is not sufficient to tackle all or even many fires, and the time and effort spent on a fire that is most likely out of their reach and control is better spent on fires that they can manage. Fire Information again is crucial in this regard, to be able to call such decisions. Much improvement is still needed. Equally

crucial is joining forces with other fire fighting groups, such as the village fire crews, forest service crews and fire crews from timber and oilpalm companies. The latter are absent in the EMRP (there are only oilpalm plantations, mostly in preparation stage and early stage of planting, and none of them has established fire capacity yet, although required by law), and the forest service crews are from the provincial agency and have limited capacity. The most important partner for the Manggala Agni brigades are the village fire crews (TSA, RPK).

These village crews have been fighting proximate fires, TSA under command/coordination of Cimtrop, RPK groups under command/coordination of WWF-Sebanggau National park, other RPK groups under command/coordination of BOS-Mawas. TSA Kalteng groups from Palangkaraya have been coordinated by the forest service. Some mutual assistance has occurred (TSA with RPK, RPK with forest agency teams), but mostly the fire fighting were individual group/network actions. The fire problem requires more capacity and better synergy from all available fire teams. More village groups need to be established, based on a standardized concept and approach, including with regard to institutional setup and incentive system. These groups, together with all other brigades/groups need to be tied into a system of coordinated preparation and fire suppression action.

3.2.5 Fire Follow Up

The following tables review the status of actions to to follow up on fires that have occurred in the EMRP area:

1. Reporting / Evaluation

Status	Description
Achieved	1. The various agencies and institutions report on fire prevention, preparedness and suppression activities, including evaluations.
Not yet achieved	1. The reports are in various cases not sufficiently comprehensive, or clear, or detailed. Data are not always verifiable, operations are not always well-documented and/or geographically recorded. Reports/evaluations do rarely cover the whole fire management cycle, experiences/lessons learned are therefore not systematically available. 2. There is no standard required format for reporting on fire management outcomes which should be used by all fire management institutions involved to allow the creation/compilation/expanding of a joined, cooperative knowledge base.
Key Issues	1. The various stakeholders do not yet prioritize the importance of building experience and knowledge together, instead reports/evaluations are treated as a mere formality.

2. Burnt area mapping

Status	Description
Achieved	1. Burnt area estimates / mapping is done by research institutions such as LAPAN, Unpar-Cimtrop, assisted by specialized consultant agencies..
Not yet achieved	1. Burnt area mapping by a provincial government agency is not yet routinely undertaken. The appropriate agency would be the environment agency, assisted if so arranged by the forestry agency. Technical support and research partner is LAPAN.
Key Issues	1. Capacity, budget.

3. Law Enforcement

Status	Description
Achieved	1. Available laws, regulations and decrees prohibit the use of fire to clear land, for land use enterprises and local farmers alike 2. A recent provincial government regulation allows land clearance by fire for local farmers under certain requirements (see 3.4)
Not yet achieved	1. Despite the legal toolbox and the many hotspots in areas designated for oil palm establishment, none have been confronted with the law. 2. PPNS (government investigators) at the Environment Agency who have expertise in investigating fire cases are yet unavailable 3. Expert witnesses & resource persons at University or other research institutions at province or regional level are non-existent. Presently, only a few persons are available for this in the whole of Indonesia, based in Bogor.
Key Issues	1. There is insufficient capacity and determination to truly enforce the law.

4. Rehabilitation / replanting

Status	Description
Achieved	1. There are sectoral initiatives, such as planning and anticipated implementation of rehabilitation by BP DAS (forestry), or the Gerhan (reforestation program). There are research activities such as by LAPAN. Wetlands International is active in canal-blocking and replanting. Other agencies and NGOs have also similar programs, activities and/or intentions.
Not yet achieved	1. All these activities together are not yet sufficient, and are also not yet integrated into a common approach, linked to spatial management, integrated rural development and environmental impacts. 2. There is no coordinated government lead approach yet to evaluation and rehabilitation / restoration of areas and communities damaged by fires
Key Issues	1. The purpose of the Inpres 2/2007 is to achieve a comprehensive and integrated approach to rehabilitation and restoration, and the EMRP Master Plan is an instrument that supports and elaborates that purpose.

Summary of Progress with Actions to Review and Follow Up Past Fires

Interventions following damage incurred by fires are aimed at preventing future fires in the affected area, restoring environmental, ecological and economical functions of the area, and enforcing the law to penalize those who started and/or ignored fires unlawfully. This fire management component has to be strengthened considerably, in all these aspects. Without a in-depth documentation and evaluation of how the fires started, progressed (fire behaviour) and the damage they did, it will be hard to systematically learn from experiences and build up a knowledge base on fires. The latter is needed to improve and fine-tune fire management planning and operations. It is noted that one of the most important ecological effects of burning is the increased probability of further burning in subsequent years due to changed condition with more exposure to sun and drying up, increased fuel-loads of dead trees, and extended areas of fire prone grasses (alang-alang). Further study including stakeholder analyses, resource entitlements and insecurity over resource entitlements, tenure will give insight in the structural problems in regional development and environmental governance.

Furthermore, the evaluation, investigations and build-up of knowledge are needed as a body of evidence to bring culprits to face the law. Law enforcement is an essential fabric of society, also with regard to the forest and land fires.

3.3 Fire Management Action Plan

Action Plan for Fire Prevention, Fire Suppression and Penalizing Fire Perpetrators

The provincial government in cooperation with district governments stepped up the attention and government action on fire prevention with a rural development component, combined with a stricter enforcement of law and regulations. An integrated team was formed based on Governor's Decree No.370/2006 on the Formation of Integrated Team for Prevention, Controlling and Action against Perpetrators of Forest and Land Fires. In 2007, the team drafted and started to implement an Action Plan (2007-2010) for Fire Prevention, Fire Suppression and Penalizing Fire Perpetrators, concerning forest, land and agricultural field fires.

This Action Plan has its basis in a number of major trends and/or events that took place during the last 5 years:

- the chronic fire problem, reaching a point where the ever increasing environmental problems it causes, the social and economic damages it does, the good governance issues it raises, and the relentless international and national criticism it unleashes, have simply become unacceptable
- the Inpres No.2/2007 on the Rehabilitation and Revitalization of the Ex Mega Rice Area
- the Workshop on Strategies and Integrated Action Plan on Land and Forest Fires Prevention in 2003, held in Palangkaraya and bringing together Province and District Governments and other stakeholders (Appendix 5)
- the Palangkaraya Declaration of 2006, which was an outcome of the National Seminar on Prevention, Control and Action against Perpetrators of Forest and Land Fires. The Declaration represents the joint commitment of the National, Central Kalimantan Province and the District Governments, University, Community Representatives and NGOs towards resolving the forest and land fire issues (Appendix 6)
- the initiatives, support, concepts and programs offered and implemented by the UNPAR CIMTROP research centre, CKPP, international cooperation agencies, national and international NGOs

The actions and planned budgets in the Action Plan are in response to the request from the Governor in January 2008 to all Heads of District and Municipalities, to deliver an Evaluation Report and Plan of Anticipation of Forest and Land Fires in 2008. The total budget subsequently proposed by the Districts and Municipality combined is 3.9 billion rupiah from the regional budgets, and 4.6 billion rupiah from the national budget, together 8.5 billion rupiah.

The Provincial budget allocated for Fire Prevention, Fire Suppression and Penalizing Fire Perpetrators in 2008 is 21.6 billion rupiah from the provincial budget and 15.2 billion rupiah from the national budget, altogether 36.8 billion rupiah.

The Action Plan lists a number of activities, per province and district, grouped under:

- Fire Prevention
- Fire Suppression
- Fire Information
- Coordination & Command Center

- Zero-burning Land Clearing
- Farming systems, permanent agriculture
- Extension services
- Training & Capacity Building
- Community Based Fire Fighting groups (KMPK, RPK, MPA)
- Law Enforcement

The Action Plan has a number of distinct shortcomings:

- There is no activity with regard to strengthening the POSKO at province level, or setting up POSKO's at District and sub-district level. The activities that are listed under POSKO merely list the costs of coordination meetings and the 'activation' of Posko's
- There is no mention made of producing any standard operating procedures on any of the fire management components, and on an effective system of command, coordination and communication of the POSKO Terpadu
- No initiative is taken to a multi-stakeholder approach to developing the fire management system and components; the Action Plan itself is not a multi-stakeholder action plan since it only involves government agencies
- There is no mention made of developing, expanding, maintaining a radio communication network that encompasses province, district, sub-district and village, and again, no protocols or standard operating procedures
- There are a lot of activities on extension, on supply of seeds, fertilizer, plant materials etc. in the course of support to farming system development. Various agencies are involved in this, including the agricultural, plantation, forestry, environment and people empowerment agencies. It seems that a number of agencies keep involving themselves in what really isn't or shouldn't be their task. It all leads to all these village/farming focused activities being uncoordinated, using different approaches (no standardization), not based on a grand design or masterplan, with unclear priorities, quality standards and hardly based on a PRA and participatory planning with the villagers.
- Trials with zero burning are minimal
- Purchasement and distribution of fire equipment for village groups is mentioned, but is again uncoordinated.
- Different names/concepts of village groups are being used (RPK, KPMK, MPA), an overall strategy and approach where all agencies involved contribute to is not available. Training for the village teams is hardly included, a comprehensive and shared program of support, coaching and development of these groups is not available or sketchy.
- The competition and lack of coordination between the forestry agencies and the environmental agencies, at province as well as district levels, continues: both are busy with hotspot detection and distribution, both are making and distributing fire risk maps, both are setting-up and equipping village crews, both involve themselves with burned area evaluation.
- The same goes for information and awareness campaigns: all agencies are doing it, and all uncoordinated.

- A standardized and shared fire management base map, used by province, district, sub-district and village alike, in order to allocate areas of responsibility and operations, is unavailable
- The many activities are listed without much clarity on how and why they were planned, to what grand strategy or master plan they refer, what the overall targets and objectives are of integrated fire management involving province, district, sub-district, village and non-government partners

Implementation of this plan as is will not achieve effective fire management in Central Kalimantan. Instead, a lot of overlapping, disconnected and ineffective activities will be implemented, making very inefficient use of government funds. Fires will hardly be prevented or contained, and a quantitative and qualitative build-up of fire management capacity will again be stalled. It will not be easy to monitor actual performance and effectiveness of the activities and associated budgets.

3.4 Central Kalimantan Governor Regulation No.52/2008

This new regulation on Guideline for Land Clearance by Farmers determines the following:

- All land clearance on new and existing lands has to be in accordance to the Spatial Plan, with access to new lands to be verified based on existing laws and access to existing lands to be verified based on land titles and/or *adat* rights.
- Zero burning techniques for land clearing should be prioritized.
- Land clearance with burning has to be on limited scale, controlled and based on a permit issues by the relevant authorities, i.e. the Bupati or Mayor, with a limit of 2.5 hectares (until 0.1 ha delegated to Neighborhood Head, 0.1-0.5 ha Village Head, 0.5-2.5 ha Sub-District Head).
- On any one day, no more than an accumulated 100 hectares can be licensed for sub-district level, and 10 hectares for Village level.
- The permitting authority is required to first check information on hotspots, fire danger rating, fire weather index and /or information on visibility released by the Environment Agency.
- No license is to be issued when the publicized Air Pollution Index is at the level of dangerous, or Fire Danger is high.
- On shallow coastal peat, controlled burning is only allowed outside the dry season.
- Burning is not allowed on undisturbed inland peat with a depth of more than 50cm
- The regulation gives detailed information on a 10-step procedure of controlled burning.
- It furthermore gives everyone the right to: 1) receive information, technical and advisory assistance from government and private sector, on zero burning, controlled burning and mechanization of agriculture; 2) have access to / receive all fire related information; 3) ask for fire fighting assistance from government in case of wild fires.
- The obligations require everyone to: 1) report any wild fires to the authorities; 2) suppress fires that run out of control and 3) remove debris and other potential fuel during the rainy season to reduce fire risk during the dry season.
- The authorities have responsibility to provide all the information referred to earlier.
- Everyone cultivating a site holds responsibility for any fire escaping from it.

- Coordination is required with each local POSKO, between the various levels of authority, and with adat representing institutions.

3.5 Action under INPRES 2/2007 with regard to fire management

The Inpres 2/2007 lists the following actions with regard to forest and land fire management:

1. Review and improve the fire management organization (with priority)
2. Review and improve standard operating procedures for fire management (with priority)
3. Develop an incentive system for land clearance without burning and fire control
4. Assessment of KPH (forest management units) development in the EMRP
5. Assessment of KPH organization development in the EMRP

These are to be implemented by the Ministry of Forestry (PHKA for activity 1 and 2; Litbang for activity 3; and BAPLAN for activity 4 and 5), the Ministry of Environment, the regional government, and the public (communities).

In addition, or combination, with these actions, there are the ongoing development programs from MoF-PHKA and the MoE with regard to forest and land fire management.

The MoE is coordinating an a Framework Action Plan on Trans Boundary Haze Pollution in Southeast Asia Region 2007-2009, outlining tasks for the MoE, MoF, MoA, regional government. This action plan includes programs on support to farmers on training, extension and equipment on opening up land without burning, using the waste from land clearing for composting or making charcoal (by MoE and MoA). Furthermore providing incentives such as free seeds and planting materials to stimulate zero burning farming methods (MoA). These programs assist 250 villages each year, with 3 farmer groups in each village. The MoF program for these 250 villages involves the development of community fire brigades (in Central Kalimantan, it is actually the Provincial Environmental Agency who is presently developing the KPMK groups), including the provision with fire fighting equipment. The MoF is also given the task to setup at least one fire brigade in 35 districts, with a command post (Posko), equipment, vehicles and a trained crew, as well as mobilizing fire crews from communities, government and companies. The regional governments in those 35 Districts are asked to setup and operate fire watch towers. Furthermore, the program includes awareness and education campaign activities in 35 districts and 10 villages yearly (MoE). Another number of activities are listed, dealing with surveillance, law enforcement, early warning system, and peatland management. The realization of the Plan is not yet verified. Funding is from each of the contributing Departments.

The MoF-PHKA program encompasses capacity building of their Manggala Agni fire brigades, through training, equipment upgrades and maintenance, and improvements in operating procedures. Furthermore, the PHKA plans to expand the number of village fire groups called MPA (Masyarakat Peduli Api), to be established in villages near conservation areas and other forest areas, including those near forest management enterprises such as HPH, HTI and later KPH. These MPA would be institutionally setup, trained, equipped, and making a work plan together with the forest authorities or forest management institutions. The MPA would receive assistance for farming or other livelihood methods, and receive honorary payment.

4 Recommendations

The following recommendations are made:

1. The consistent and effective implementation of the Central Kalimantan Governor Regulation No.52/2008 on Guideline for Land Clearance by Farmers will be essential to drive and stimulate much of the recommendations listed here. It establishes the necessity for province, district, sub-district government, and their agencies, to serve the public (communities) on fire information and fire prevention, in effective cooperation. It furthermore urges the establishment of Posko's at all these levels.
2. The POSKO command, coordination and communication system needs to be strengthened and expanded, with a network of POSKO's established and/or operationalized at Province, District, Sub-District and Village level. Roles, responsibilities and tasks of the various agencies, institutions and groups involved in fire management aspects and the POSKO's need to be further clarified, developed and endorsed.
3. The POSKO is however only operational active on an ad-hoc basis, during the dry season. Coordination, development and activities with regard to fire management are needed throughout the year. This is either established by:
    a. strengthening the Pusdalkarhutlah, as a forum for guiding, coordinating and bringing together the combined input and actions of all agencies and institutions involved with fire management roles and tasks.
    b. establishing a UPTD for fire management (Technical Implementation Unit). A UPTD is part of a government agency (dinas), and eligible for its own funding through that agency. An UPTD cannot be formed under a Badan, like the Environmental Agency, and it would most likely be formed under the forestry service, alternatively the plantation service. This will create some sectoral strife. Moreover, it would still need to cooperate and coordinate activities with other government agencies and stakeholders, which will prove to be a real challenge in this setup. The danger is that other agencies will simply shift their responsibilities on the shoulders of this 'specialized' UPTD.
    c. establishment of the new Disaster Management Boards at province and district levels. These new agencies can coordinate an effective fire management system since they would have sufficient authority, are non-sectoral, permanent (as opposed to an ad-hoc operation) and have access to sufficient budget and national government network support.
4. Unambiguous and effective standard operating procedures for all tasks in the integrated fire management system need to be developed.
5. A standardized map for field operations, using a grid dividing the entire EMRP or larger area into cells (compartments), identified by row and column number ("military grid"),

needs to developed and to be used to synchronize all actions by all fire management elements

6. A fire management master plan needs to be developed, not just an Action Plan. This Masterplan provides blueprints and standardized concepts, guidelines and approaches, based on multi-stakeholder input and agreement (an effective multi-stakeholder forum is needed). A focused, standardized and cooperatively implemented approach is needed for all fire management components, including community fire crews, fire equipment, training and training providers, communication networks and protocols, farming systems development, information and awareness campaigns, reporting, monitoring and evaluation.
7. An Action Plan is to be based on this Masterplan, and the combined list of activities of all agencies and institutions involved needs to reflect this, and effectively and efficiently contribute to the fulfillment of the Masterplans goal and targets.
8. Fire suppression capacity needs to be greatly expanded, especially the number of village fire groups. For all contributors to the development of village groups, they need to follow standardized concepts and approaches, provide standardized equipment and supplies, trainings, radio communications, socio-economic support programs, and logistics support.
9. A number of agencies can have the same activities, and have their own funding for these activities. This is welcome, since it means that more volume, numbers and quality can be achieved. The number one rule is though that all abide to the masterplan, the action plan, the standardized concepts and approaches, and implement their contribution or portion of it consistently and in a coordinated way.
10. A Regulation / Decree from the Governor is needed regulating the following:
    a. Fire prevention to be approached in a much more comprehensive manner, appropriately reflected in integrated government sector policies, programs and associated budgets. The various government sector agencies already have their basic tasks and functions in areas such as spatial planning, land use planning, extension, rural development, farming systems support, environmental monitoring, licensing, infrastructure development, monitoring and evaluation of license holders etc. All of these relate to fire prevention, and need effective coordination of government sector planning, programming and implementation to actually make any impact with regard to fire prevention. The BAPPEDA (Regional Development Planning Board), as the agency responsible for integrating the various sector programs, approving budget allocations to these programs, need to make integrated fire prevention planning a priority.

    b. The various approaches and efforts regarding village development planning integrated with village spatial planning should be harmonized into one standard successful approach and system and become the focus of integrated government programming and funding.

    c. The various community based fire management approaches and efforts should be integrated and harmonized into one standard successful approach and system. Capacity development programs and budgets to develop the

community based fire management approach and community fire crews need to be intensified, guaranteed and long-term.

d. Pusdalkarhutlah as the forum & organization structure to steer and coordinate fire management. Responsibilities, roles, tasks, procedures, funding have to be comprehensive and unambiguous.

e. Standard operating procedures for the fire management system and fire management components

f. Masterplan for fire management in Central Kalimantan Province

g. A Multi-Stakeholder Forum for design and development of fire management system and components, with a Board of Decision-makers and Working Groups on selected topics (e.g. community based fire management system, village development & land use planning, peat fire management), supported by a Secretariat.

11. The recommendations from the Palangka Raya Declaration should be evaluated, renewed and implemented.
12. Land tenure issues need a solution. Presently, people feel their long-standing rights and needs to land and resources are not heeded, and resentment and apathy ensues among them, as they see their lands claimed as state forest land and/or licensed out to forest concessionaires or large estate crop companies. Under such conditions of legal and economic disparity, local communications will not feel inclined to play a role in fire suppression.

FIRE ACTION PLAN 2009 – 2010 KALIMANTAN TENGAH / EX-MEGA RICE PROJECT

Proposed by: MASTER PLAN EMRP

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
	POLICY / REGULATIONS								
1	Establish Multi-Stakeholder Forum with MSF Board, Working Groups and Secretariat. WG's will work out solutions & policy formulations for fire management organization, fire prevention, information, suppression and follow-up	- Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Pemda Kab and Prop - NGO - Community - University - Private Sector	Initial Workshops. MSF established per Bupati Decree. Members of MSF Board and WG's selected via consensus. Workplan and MSF rule/procedures established. Province can be member too, or resource persons	2-3 Working Groups per MSF	- District/City	- Workshops 1x4 locations - Follow-up meetings 1x4 locations - WorkGroup & Board meetings 1x4 locations - Int.Cons. 3 wk - Nat.Cons 3wk	3200 800 1600	2009
2	Policy & Regulation/Decree on Fire Management System reviewed and renewed, concerning institutional structure, role/tasks, procedures and financing, including a comprehensive and standardized approach to on Community Based Fire Management	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	All stake-holders	Input from MSF-WG's, province/pusat resource persons, other stakeholders/partners	- Draft Gov.Regulation - Academic paper	- MSF - District/City - Province	- MSF-WG meetings, 2x4 locations - Workshops 1x4 locations - Int.Cons 2wk - Nat.Cons 3wk	1600 3200	2009 2010
3	Policy & Regulation/Decree on Village Development Planning, including Village Spatial Planning, and rural development planning	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	All stake-holders	Input from MSF-WG's, province/pusat resource persons, other stakeholders/partners	- Draft Gov.Regulation - Academic paper	- MSF - District/City - Province	- MSF-WG meetings, 2x4 locations - Workshops 1x4 locations - Int.Cons 2wk - Nat.Cons 3wk	1600 3200	2009 2010
4	Development of Fire Management Master Plan, also including capacity development plan, data/information plan, integrated fire prevention & rural development & spatial	- Province - Pulang Pisau - Kapuas - Barsel	All stake-holders	Input from MSF-WG's, province/pusat resource persons, other stakeholders/partners.	FM Masterplan	- MSF - District/City - Province	- MSF-WG meetings, 2x4 locations - Workshops 1x4	1600 3200	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
	planning	- Palangkaraya		Fire Management MasterPlan to be formalized by Governor Decree.			locations - Data surveys 4x - Int.Cons 3wk - Nat.Cons 3wk	1600	
5	Develop & elaborate standard operating procedures for the functioning of the fire management organization and for the implementation of components fire prevention, information, preparedness, suppression and follow-up	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	All stake-holders	Input from MSF-WG's, province/pusat resource persons, other stakeholders/partners. Standar Operating procedures to be formalized by Governor Decree.	Standard Operating Procedures	- MSF - District/City - Province	- MSF-WG meetings, 2x4 locations - Workshops 1x4 locations - Int.Cons 3wk - Nat.Cons 3wk	1600 3200	2009
	PROGRAMS/ BUDGETS								
6	Insert fire management development and implementation activities in annual and multi-year government programming and budgets	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- LH/EA - Forest Srv. - EstateC Srv - Agric. Srv. - Bappeda - PU - BPMD - Bappeda - DPRD - Public	Providing input to proposed agency programs and the subsequent Musrenbang process through consultations, presentations, seminars, road shows	5 musren-bang	- District/City - Province	- Presentations / seminars 5x - Int.Cons 2wk - Nat.Cons 3wk	2000	2009 2010
	FIRE MANAGEMENT IMPLEMENTATION								
	Fire Management Organization								
7	Establishing / updating / operate fire management organization and Command Centers at province and district/city levels	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Province - District/City - LH/EA - Forest Srv. - EstateC Srv - Agric. Srv. - Other	Based on the fire management system and operating procedures as determined per regulations / decrees and fire management master plan, a communication, data and information network will be	- Province FMO & Posko - District/City FMO & Posko	- Province - District/City	- FMO data / information / communication network and hard & software - Posko fire equipment - Posko protect.	10000 3000 3000	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
				developed and/or upgraded connecting the FMO members.			equipment - Training - Int.Cons 1wk - Nat.Cons 2wk	 2000	
8	Development / expansion / upgrading of radio communication network connecting province and district/city Posko's, as well as sub-districts and/or villages (that have fire crews)	Conservation Zone; Adapted Management Zone	- FMO[1] - Province - District/City - Sub-District - Villages	Installing / upgrade radio communication network; procedures for operation / maintenance; communication protocols	Radio com-munication network with x number of nodes	- Province - District/City	- Posko radio comm. network, (4 nodes) - Sub-district nodes, 4 - Village nodes,8	6000 8000 6400	2009 2010
	Fire Prevention (general)								
9	Prepare / implement capacity building plan based on fire prevention roles, tasks and standard operating procedures, as per regulation/decrees (refer activity 5). Specific focus on extension workers (PPL)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	All stake-holders	Individual and organizational capacity building needs assessment for those partners involved in fire prevention	Short / medium / long term planning	- FMO - Province - District/City	- Workshops 1x5 locations - Int.Cons 2wk - Nat.Cons 2wk	3000	2009
10	Village border marking / mapping by/together with Villages in adapted management zone or in/near conservation zone. Zone boundaries included in mapping; part of a pilot on rural development alternatives.	- Conservation Zone - Adapted Management Zone	- Villages - District/City - BPN - Tata Peme-rintahan	Study & Method / Approach development; consensus building, participatory boundary mapping, training, GIS mapping, official village boundary registration, monitoring / evaluation	8 selected villages	- District/City	- Preparation/ Consensus - Part.mapping - Training - Equipment - Monev - Int.Cons 1wk - Nat.Cons 2wk - NGO 4wk	2000 5000 1500 3600 1000	2009
11	Village development planning integrated with Village Spatial Planning & Mapping by/together with Villages in adapted management zone or in/near conservation zone; part of a pilot on rural development alternatives.	- Conservation Zone - Adapted Management Zone	- Villages - District/City - BPMD - Bappeda - PU - LH/EA - BPN	Study & Method / Approach development; consensus building, participatory appraisals, training, extension, mapping, monitoring / evaluation	8 selected villages	- MSF - District/City	- Preparation/ Consensus - Part. appraisal - Mapping - Training - Extension - Equipment	2000 3000 2000 1500 1500 500	2009 2010

[1] FMO: Fire Management Organization (Pusdalkarhutla)

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
							- Monev - Int.Cons 2wk - Nat.Cons 4wk - NGO 8 wk	1000	
12	Farming system development within the context of feasible technology, skills, inputs, threats to environment (fires/zero-burning), livelihood opportunities & farm incomes, markets / transportation, land zone function (in accordance to the spatial plans); part of a pilot on rural development alternatives	- Adapted Management Zone	- Community - Villages - District/City - Agric.Srv. - EstateC Srv - Animal Husb. Srv. - Fishery Srv. - LH/EA	Study & Method / Approach development; consensus building, participatory assessments, training, extension, demonstrations, monitoring / evaluation	4 selected villages	- District/City	- Preparation / Consensus - Part. assessm. - Extension - Demonstrations - Monev - Int.Cons 2wk - Nat.Cons 4wk - NGO 8wk	1000 1000 1000 8000 500	2009 2010
13	Livelihood development within the settings of the conservation zone, including NTFP and community-based reforestation programs; part of a pilot on rural development alternatives	- Conservation Zone	- Community - Villages - District/City - Forest Srv. - BKSDA - BLH/EA	Study & Method / Approach development; consensus building, participatory assessments, training, extension, demonstrations, monitoring / evaluation	4 selected villages	- District/City	- Preparation / Consensus - Part. assessm. - Extension - Demonstrations - Monev - Int.Cons 2wk - Nat.Cons 4wk - NGO 8wk	1000 1000 1000 4000 500	2009 2010
14	Development of marketing, transportation, infrastructure, services and credit-support plan in support of the farming system / livelihood development activity; to complete the pilot on rural development alternatives	- Conservation Zone - Adapted Management Zone	- Villages - District/City - Coop. Srv. - Transp. Srv - Bappeda - PU - BRI/bank	Data collection, spatial analysis, sector analysis, feasibility studies, scenario building, proposals	8 selected villages	- District/City	- Data collection - Int.Cons 3wk - Nat.Cons 3wk	1000	2009 2010
15	Development of Village Regulations on Village Land Use & Fire Management	- Conservation Zone - Adapted Management	- Villages - District/City - Bagian Hukum	Study & Method / Approach development; consensus building, training, facilitation, monitoring / evaluation	8 selected villages	- District/City	- Preparation/ Consensus - Training - Facilitation	1000 2000 2000	2009 2010

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
		Zone					- Monev - Int.Cons 2wk - Nat.Cons 4wk - NGO 4wk	1000	
16	Draft a proposed revision of the Provincial and District Spatial Plans, representing economic development options conforming to environmental/ecological parameters (leading to reduced fire threat and better organized and managed land use)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	All stake-holders	Study & Method / Approach development; consensus building, land use evaluation, spatial analysis, EIA, sector analysis, capacity building, presentation/consultation	Proposed revisions in 5 spatial plans	- MSF - Province - District/City	- Preparation/ Consensus - Data collection - Training - Workshop - Int.Cons 8wk - Nat.Cons 8wk	1000 1000 2000 4000	2009 2010
17	Improve licensing, monitoring and law enforcement of land use	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Licensing authorities - Monitoring authorities (LH/EA, Bappeda, BPN) - UNPAR - Private Sctr	- Standardization, accessibility and transparency of data / information based on which land use / licensing decisions are made - Review and strengthening of the licensing process including EIA - Preparing operational procedure for data / information collection for evidence / legal case building purpose - Capacity building of government investigators (PPNS) and UNPAR experts	- Data/ info system standards - Licensing procedure - Data / info procedure to support investigation - 10 Gov. investigators trained - University experts trained	- MSF - Province - District/City	- Preparation/ Consensus - Data collection - Training - Int.Cons 4wk - Nat.Cons 4wk	2000 1000 5000	2009 2010
18	Design a blueprint Fire Information / Awareness Campaign, as the basis for implementation of information & awareness campaigns in/by province, district, city (message: fire threat and prevention, laws/regulations, solutions)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Community - Villages - District/City - Province	Campaign design by professional agency to ensure quality; design to be used by all to ensure uniformity of message and form	Campaign method, message, materials	- FMO - Province - District/City	- Campaign design - Implementation / materials	7000 6000	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
	Fire Prevention (specific)								
19	Restoring & improving water levels at drained peat domes / lands through blocking the canals that drain it	- Conservation Zone	- Community - Villages - District/City	Method follow the experiences with canal blocking from CKPP partners Unpar-Cimtrop and Wetlands Int., both technical and social approach (also incl. training of villagers)	8 dams (to be confirmed)	- Villages - District/City - PU - Cimtrop - Wetlands	- Preparation/ Consensus - Construction - Monev - Int.Cons 2wk - Nat.Cons 4wk - NGO 8wk	1000 8000 1000	2009 2010
20	Determine location and establish green belts & fire breaks	- Conservation Zone - Adapted Management Zone	- Community - Villages - District/City - Gov. Agencies - Private Sctr	Based on fire history, fire threat, values at risk, population at risk, village land use plan. In combination with other interventions, incl. installing of water pipe wells, regreening of areas	16 km of green belts & fire breaks (to be confirmed)	- Villages - District/City - Forest Srv - Agric. Srv - Cimtrop - Wetlands	- Preparation/ Consensus - Site survey - Extension - Materials / planting (incl. planting stock)	500 500 500 2500	2009
21	Regreening of degraded areas	- Conservation Zone - Adapted Management Zone	- Community - Villages - District/City - Gov. Agencies - Private Sctr	Based on fire damage, fuel loads, environmental / ecological function, potential land use & livelihood. Participatory regreening / reforestation with incentive program.	160 hectares replanted (to be confirmed)	- Villages - District/City - Forest Srv - Agric. Srv - Cimtrop - Wetlands	- Preparation/ Consensus - Site survey - Extension - Materials & Planting stock (seedlings, nursery)	500 500 500 22000	2009 2010
	Fire Information								
22	Prepare capacity building plan based on fire information roles, tasks and standard operating procedures, as per regulation/decrees. (refer activity 5)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agencies - x	Individual and organizational capacity building needs assessment for those partners involved in fire information management and distribution	Short / medium / long term planning	- FMO - Province - District/City	- Workshops 1x5 locations - Int.Cons 3wk - Nat.Cons 3wk	3000	2009
23	Developing / updating manual and training on the type, collection, interpretation and	- Province - Pulang Pisau	- Gov. Agencies	Manual and training for users of fire information, and	- Standard manual	- FMO - Province	- Presentations - Training	1000 1500	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
	use of fire information	- Kapuas - Barsel - Palangkaraya		contributors of fire information. Includes the distribution of information.	- 15 particip.	- District/City	- Int.Cons 2wk - Nat.Cons 2wk		
24	Upgrade/replace/provide equipment for collecting, receiving, processing, analyzing, storing and publishing fire data / information	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	- Env. Agencies - x	Review of available equipment, hard/software; determine specifications & standards; Procurement	1 + 4 sets of selected equipment	- FMO - Province - District/City	- Equipment set	10000	2009
25	Updating / developing of Fire Threat Maps FMO by/for province and districts	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agencies - x	Based on 1:50,000 topo-map, combining fire history, soil-type, land cover, land use, accessibility, settlement proximity, change-trends a.o. Resolution can be increased pending higher resolution imagery and accommodating field data	Province and Districts/City fire threat maps	- FMO - Province - District/City	- Satellite images - Field surveys	500 500	2009
26	Adding mapping detail to medium-high fire threat areas on surface and potential ground water resources, road / canal access, settlements / land & resource use.	- Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agencies - x	Using higher resolution images and associated ground surveys; Using hydrological studies and other information	Districts/City enhanced fire threat maps	- FMO - District/City	- Satellite images - Field surveys	6000 500	2009
27	Expanding network of weather stations and improving weather data collection and management (in support of drought index calculation)	- Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agencies - Agricul. Srv - BMG	Drought index calculations are at the core of fire danger rating system, and are to be local/sub-regional determined (as opposed to being extrapolated over a large region/area based on one station-location only)	x number of weather stations (to be confirmed)	- FMO - District/City 4 stations	- Weather station procurement / installation	4800	2009
28	Increase coverage of smoke / haze pollution index (ISPU) monitoring by establishing capacity in the districts	- Pulang Pisau - Kapuas - Barsel	- Env. Agencies - X	Training in use of hand-held equipment and subsequent data analysis Publication of ISPU level warnings to public in Districts	- 3 hand-held gas analyzers - 3 hand-held particle	- FMO - District	- Gas analyzers - Particle counters - Filter calibration - Training	7500 7500 1000 1000	2009 2010

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
					- counters - Manual		- Nat.Cons 2wk		
29	Develop base map for fire management operations, using block grid (military grid)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agency - Forest Srv.	Compile, produce and distribute the map. Familiarize map to users	- x nr of map sheets	- FMO - Province	Training Nat.Cons 2wk	1000	2009
30	Develop/expand/maintain distributed spatial database/GIS with regularly updated information on land cover/land use and land users	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- Env. Agency - Forest Srv. - others	Standardization of spatial data sets, spatial data management and spatial data networking, with individual and shared agencies' tasks. (refer also to 24, 29)	Spatial data descriptions, procedures, custodians	- Province - District/City	Workshop	1500	2009 2010
31	Develop/update/produce a weekly fire info sheet and monthly fire info bulletin, distributed to relevant stakeholders at all levels of administration (during dry season) and quarterly during wet season	- Province - NGO	- FMO - LH/EA - BMG - Forest Srv	Determine information content, lay-out / design, information source, distribution list, feedback plan (refer also to 18)	250 copies in EMRP	- FMO - Province	Printing		annual
32	Map impacts of fire on soil and land cover using remote sensing data and field survey data	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO - LH/EA - Forest Srv	Image interpretation & analysis, spatial analysis, evaluation / integration of field data. Cooperation with IRI, LAPAN, others	Burnt scar map	- FMO - Province - District/City	- Satellite optical images (refer 25, 26) - Satellite radar images - Field surveys	500	annual
33	Distribute fire information online within the FMO /Posko network during the dry season (refer to 7, 8)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO - LH/EA - X	Following the standard operating procedures (also refer to 5)	On-time delivery of fire information	- FMO - Province - District/City	- Operation cost		annual
	Fire Preparedness								
34	Prepare capacity building plan based on fire preparedness roles, tasks and standard operating procedures, as per	- Province - Pulang Pisau - Kapuas	- FMO / Posko - Village crew	Individual and organizational capacity building needs assessment for those	Short / medium / long term	- FMO - Province - District/City	- Workshops 1x5 locations - Int.Cons 3wk	3000	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
	regulation/decrees. (refer activity 5)	- Barsel - Palangkaraya	- Other crew - Private sctr	partners involved in fire preparedness	planning		- Nat.Cons 3wk		
35	Training of trainers, establishing a pool of trainers in fire suppression, first aid and equipment maintenance	- Province	- FMO / Posko - Manggala Agni - Village crew - Other crew - Private sctr	Theory / practice based on tested training program	X number of trained instructors	- FMO - Province			2009
36	Establishment of village fire crews based on agreed concept & approach (MSF; refer to 2, 5, 7, 8)	- Conservation Zone - Adapted Management Zone	- Villages - Districts	Introduction / consensus building, training, equipping, rules & procedures.Training using standardized approach, method, manual	8 selected villages	- FMO - Province - District/City - Village	- Preparation/ Consensus - Fire Training - Fire equipment - Pumps & acc. - Nat.Cons 2wk	1000 3000 16000 24000	2009
37	Activating Posko's, checking & maintenance of communication systems, procedures and equipment	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO / Posko - Manggala Agni - Village crew - Other crew - Private sctr	Using simulation, checklist, evaluation, follow-up	Posko's operational	- FMO - Province - District/City - Village	- Training / extension - Materials - Nat.Cons 1wk	1000 2000	annual
38	Refresher training of existing fire crews, both existing village fire crews, and government teams	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Training using standardized approach, method, manual.	30 Fire crews re-trained (TSA, RPK, Task Force)	- FMO - Province - District/City - Village	- Fire Training	10000	2009
39	Training in peat fire attack for all fire crews, including development / updating of manual and equipment updates (combined with 35 and 37)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Training using standardized approach, method, manual. Equipment updates for peat fires.	Added to the fire crew training	- FMO - Province - District/City Village	- Fire Training module - Equipment updates		2009
40	Establish water pipe wells / hydrants at selected locations, based on previous mapping/surveys (refer to 25)	- Pulang Pisau - Kapuas - Barsel	- FMO / Posko - Village crew	Number and locations determined in combination with fire threat map and other	200 water pipe wells established	- FMO - Province - District/City	- Training / extension - Materials	800 3600	2009

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
		- Palangkaraya	- Other crew - Private sctr	data e.g. on hydrology	(25 per team)		- Nat.Cons 1wk		
41	Fire Readiness Drills	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Readiness drills (Apel Siaga), Province, Districts, Villages combined	- 3 locations / events	- FMO - Province - District/City Village	- Readiness drills, incl. travel / transport	7500	annual
42	Patrolling of high fire risk areas, based on early warning information (fire threat map and fire danger rating)	- Province - Pulang Pisau - Kapuas - Barsel - Palangkaraya	- FMO / Posko - Village crew - Other crew - Private sctr	Patrolling by fire crews and through information / reports received from public	- Patrol GPS checks - Patrol reports	- FMO - Posko - Fire crews	- Operations, 60 days	4000	annual
	Fire Suppression								
43	Fire situation analysis and fire attack planning	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Following standard operating procedures (refer to 5)	- Attack plan: scale, units approach, attack type	- FMO - Posko - Fire crews	- Operations		annual
44	Mobilization, coordination and operation of fire crews	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Following standard operating procedures (refer to 5)	Fire suppression	- FMO - Posko - Fire crews	- Operations, 120 days	20000	annual
45	Mopping-up, patrolling / observation, evaluation / measurements, equipment check	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	- FMO / Posko - Village crew - Other crew Private sctr	Following standard operating procedures (refer to 5)	Fires confirmed extinguished, and all data recorded	- FMO - Posko - Fire crews	- Operations		annual
	Fire Follow-up								
46	Comprehensive reporting on fire development, suppression results, inputs and other data/information	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	All stake-holders	Standardized forms, reporting formats, databases, publication of results	Reports, for verification / review / knowledge building	- FMO/Posko - Province - District/City - Village - Env.Agency	- Desk study - Field study - Interviews - Data Entry - Documenting	4000	annual

		Location / Zone	Target Group	Method	Output / Volume	Implement by	Cost-Item	Cost (euro)	Time
						Other	- Nat.Cons 1wk		
47	Equipment inventory check and report	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	- FMO /Posko - Province - District/City - Villages	Standardized approach and reports, publication of results	Reports, for verification / review / knowledge building	- FMO/Posko - Province - District/City - Village	-	1000	annual
48	Investigations in fire start, progress and damage done, link with activity 17.	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	All stake-holders	Location of start of fires determined, identity of those responsible determined, ownerships/licenses/responsibilities clarified, damages calculated	Investigation reports	- Province - District/City - Village - Env.Agency - Other	- Desk study - Field study - Interviews - Data Entry - Documenting - Nat.Cons 1wk	4000	annual
49	Prepare reports for prosecution of fire felons	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	All stake-holders	Detailed definition, identification and collection of evidence and supporting data / information	Prosecution files	- Province - District/City - Police	- Desk study - Field study - Interviews - Data Entry - Documenting	4000	annual
50	Link activity 32 and 21 on burn scar mapping and regreening/rehabilitation	- Province - Pulang Pisau - Kapuas - Barsel Palangkaraya	All stake-holders	See further 21 and 32					annual

Total estimated cost (activity + procurement)[2] : 343,600 euro (around 5 M rupiah)

Total estimated short-term expert input, national : 75 weeks (portions potentially contracted to NGO)
Total estimated short-term expert input, international : 52 weeks
Total estimated NGO input : 40 weeks

[2] Further break-down of costs will be prepared after first consultation of plan. Source of funds is yet undetermined mix of government funds and donor funds.

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