



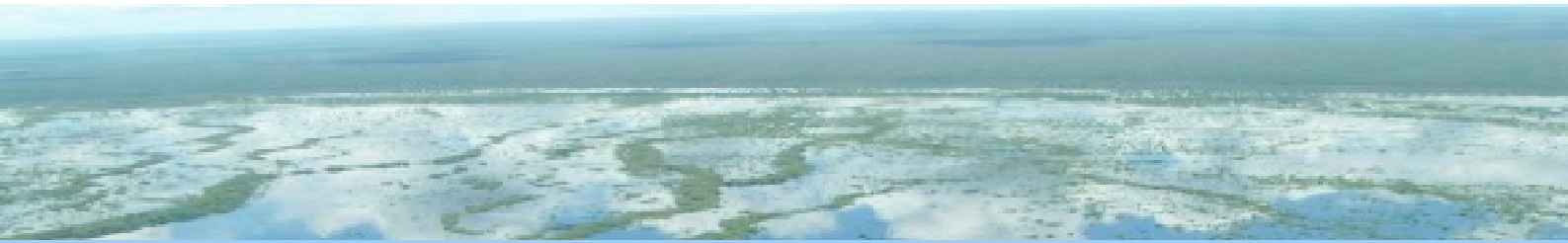
Government of Central Kalimantan



Government of Indonesia



Government of the Netherlands



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



## MAIN SYNTHESIS REPORT

OCTOBER 2008

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 Revitalisation of the Ex-Mega Rice Project Area in Central Kalimantan**

A Joint Initiative of the Governments of Indonesia and the Netherlands

## **MAIN SYNTHESIS REPORT**

***FINAL DRAFT***

***October 2008***

## Preface

The Master Plan for the Rehabilitation and Revitalisation of the Ex-Mega Rice Project area has been completed following the request of the Governor of Central Kalimantan for assistance from the Government of the Netherlands.

At the request of Bappenas, the Master Plan team has used Presidential Instruction (Inpres) No 2/2007 as a key reference but has been asked to consider ways in which Inpres 2/2007 could be improved based on new knowledge generated during the Master Plan project and, in particular, to "avoid the mistakes of the past". The Master Plan team has therefore considered the best means of achieving the overall goal of the Inpres 2/2007 as stated by the President of Indonesia at the time Inpres 2/2007 was announced (see Box).

*"We want to rehabilitate and conserve a large part of the peat and land area and restore its condition. By doing this, we can prevent further degradation of the environment and restore the ecosystem. The second objective is to develop and optimize local agriculture in the remaining part of the area. Central Kalimantan is one of the provinces prone to forest fires. From year to year, it has been a source of the haze in our country. We really hope that this will decrease significantly as well as the other major problem of flooding. It is hoped that employment and agriculture can reduce poverty in the area. And, importantly, carbon dioxide emissions from Central Kalimantan will be reduced so that our atmosphere is more protected from global warming and climate change."*

Dr. H. Susilo Bambang Yudhoyono, 16 February 2007 on announcing Inpres 2/2007.

The Master Plan team, drawing on international and national expertise including the University of Palangka Raya, has worked between October 2007 and October 2008 to collect existing and new data on the area, complete a range of analyses and work together with government and key stakeholders. A number of organizations made significant contributions to the formulation of the Master Plan including the Central Kalimantan Peatlands Project coordinated by Wetlands International and CIMTROP-UNPAR, who undertook surveys and provided important inputs to the Master Plan. CARE Indonesia provided a key role in leading community consultations held in nineteen sub-districts on the rehabilitation and revitalization of the EMRP area, which provided important information on community priorities. Bappenas, the three Working Groups of Inpres 2/2007, the Provincial Government of Central Kalimantan and District Governments of Pulang Pisau, Kapuas, Barito Selatan and Palangka Raya have assisted greatly through sharing information, knowledge and experience of the area.

Between July and October 2008, the draft Master Plan was presented to the three Working Groups of Inpres 2/2007 (Conservation, Cultivation and Community Empowerment), the Provincial Government of Central Kalimantan and other district stakeholders, the district governments of Pulang Pisau, Kapuas, Barito Selatan and Palangka Raya. Based on feedback from these meetings and expert reviews, the Master Plan was revised to produce a final draft version.

This Master Plan Main Synthesis Report integrates the work completed by the team into a single Master Plan document that provides the technical basis for the rehabilitation and revitalization of the EMRP area. In addition to this, a series of Master Plan Technical Reports have been completed that support this Main Synthesis Report and present in more detail the technical analyses and conclusions of the Master Plan.

The Master Plan team would like to thank all those who have given their time and knowledge during the planning process and hope that this Master Plan can provide a helpful guide to the rehabilitation and revitalization of this vast area and for the prosperity of the people living there. The Master Plan team takes full responsibility for any shortcomings of this Master Plan.

The Master Plan Team  
31 October 2008  
Palangka Raya

## Table of Contents

<b>Executive Summary</b> .....	<b>1</b>
<b>1 Introduction</b> .....	<b>4</b>
<b>2 Existing Conditions in the EMRP Area</b> .....	<b>7</b>
2.1 Brief History of the Area.....	7
2.2 Biophysical Conditions.....	8
2.3 Socio-economic Conditions, Agriculture and Livelihoods .....	13
2.4 Institutions, Plans and Permits .....	16
<b>3 Challenges, Opportunities and Future Scenarios</b> .....	<b>19</b>
3.1 Rehabilitation and Revitalisation: Challenges and Potential.....	19
3.2 Future Scenarios .....	29
<b>4 Strategy for the Rehabilitation and Revitalisation of the EMRP Area</b> .....	<b>33</b>
4.1 Goal and Strategies for Rehabilitation and Revitalisation.....	33
4.2 Key Principles for Implementation .....	34
4.3 Spatial Zoning of the EMRP Area.....	35
4.4 Main Programs .....	40
4.5 Financial and Economic Analysis .....	51
4.6 Revision of Inpres 2/2007 .....	55
<b>5 Summary of Interventions and Actions</b> .....	<b>59</b>

## List of Annexes

- Annex 1: Presidential Instruction No 2/2007
- Annex 2: Approach to the Master Plan Project
- Annex 3: Peat Map for the EMRP Area
- Annex 4: Hydrology of the EMRP Area
- Annex 5: Hydrological Database, Hydrological Model and Topography
- Annex 6: Land Cover Analysis in the EMRP Area
- Annex 7: Fire History of the EMRP Area
- Annex 8: The Regional Economy and Socio-Economic Conditions
- Annex 9: Rural Services and Infrastructure
- Annex 10: Land and Water Management
- Annex 11: Farm Systems and Livelihoods
- Annex 12: Plantations and Permits in the EMRP Area
- Annex 13: Challenges for Agricultural Revitalisation
- Annex 14: Challenges for Land and Water Management
- Annex 15: Challenges for Fisheries
- Annex 16: Challenges for Socio-economic Development and Livelihoods
- Annex 17: Scenario Development
- Annex 18: Village in the EMRP Area
- Annex 19: Management Zones
- Annex 20: Proposed Management Units of the EMRP Area
- Annex 21: Fire Prevention and Management in the EMRP Area
- Annex 22: Spatial Planning in the EMRP Area
- Annex 23: Partnership, Secretariat and Technical Facility
- Annex 24: Long-Term Monitoring System
- Annex 25: Capacity Building
- Annex 26: Estimation of Financing Needs
- Annex 27: Carbon Finance
- Annex 28: Consultation Meetings

## List of Tables

- Table 1: Area, Population and Administration within the EMRP Area
- Table 2: Comparison of the Summaries of the Three Scenarios
- Table 3: Lead Strategies and Types of Interventions
- Table 4: Management Units in the EMRP Area and the Main Interventions
- Table 5: Matrix of Reforestation Interventions
- Table 6: Agricultural Productivity in the EMRP Area, 2000 and 2006
- Table 7: Highly indicative financing plan for rehabilitation and revitalization of the EMRP Area
- Table 8: Estimated annual public investment expenditures in the EMRP area
- Table 9: Recommendations for Revision of Specific Activities Listed in Annex I of Inpres 2/2007
- Table 10: Summary of Issues and Strategic Interventions for the EMRP by Master Plan Management Zone
- Table 11: Summary of the Programs and Main Interventions

### **Tables in Annexes**

- Table A1.1: Land allocations for the EMRP Area in Inpres 2/2007
- Table A2.1: Planning Themes and Main Tasks of Master Plan Team
- Table A6.1: Area of Major LULC Classes
- Table A8.1: Economic Structure of EMRP Area, 2001 and 2006
- Table A8.2 Labour market structure of EMRP Area, 2001 and 2006
- Table A8.3: Population Change (1993-2005) and Poverty (2005)
- Table A9.1: Number of health facilities and service providers in the EMRP Area
- Table A9.2: Number of schools in the EMRP Area
- Table A11.1: Farming Systems of the EMRP Area
- Table A11.2: Distribution of Lowland and Upland Rice in the EMRP Area
- Table A11.3: Distribution of Rubber in the EMRP Area
- Table A11.4: Lead Sub-sectors and Local Livelihoods in the EMRP Area
- Table A11.5: Extension workers in the EMRP Area, 2005
- Table A12.1: Overlap between Permits and Provincial Spatial Plan
- Table A12.2: Overlap between Permits and Peat Depth
- Table A12.3: Overlap between Permits and Inpres 2/2007
- Table A12.4: Plantation Permits and Peat Depth in the EMRP Area
- Table A17.1: Estimation of the Ecosystem Goods & Services from the EMRP
- Table A18.1: Proposed Target Population for Inpres 2/2007
- Table A18.2: Proposed Target Villages for Inpres 2/2007
- Table A19.1: Rationale for the Management Zones
- Table A25.1: Strategies for Organizational Development
- Tables A26: Estimated finance need for rehabilitation and revitalization of the EMRP area

## List of Figures

- Figure 1: Situation Map of the EMRP Area
- Figure 2: Map of Peat Distribution and Depth in the EMRP Area
- Figure 3: DEM and topography across the landscape and between canals
- Figure 4: Land cover change in the EMRP Area
- Figure 5: Land Use and Land Cover in the EMRP Area
- Figure 6: Distribution of Hotspots between 1997 and 2007 in the EMRP Area
- Figure 7: Farm Systems and Major Land Use Types in the EMRP Area
- Figure 8: Overlay of plantation licenses and planned transmigration on peat distribution and depth in the EMRP Area
- Figure 9: Scenario Results for Peat Subsidence and Flood Risk
- Figure 10: Proposed Management Zones in the EMRP Area
- Figure 11: Proposed Management Units in the EMRP Area
- Figure 12: Map of Potential Peatland Canal Blocking Locations

### Figures in Annexes

- Figure A1.1: Proposed spatial zoning in Inpres 2/2007
- Figure A4.1: Flooding patterns in the EMRP Area
- Figure A4.2: Twenty-five year series of modeled groundwater depths
- Figure A4.3: Rainfall in the EMRP Area
- Figure A7.1: Fires in the EMRP Area – area burnt in block C and relationship with distance to canals
- Figure A8.1: Distribution of population in the area's villages
- Figure A10.1: Land and Water Management Zones in the EMRP Area
- Figure A19.1: Decision Tree and Schematic Diagram of the Macro-zoning in the EMRP Area
- Figure A22.1: Provincial Spatial Plan of 2003 and revised draft Provincial Spatial Plan of 2007 for the EMRP area
- Figure A22.2: Map of the Management Zones in the EMRP Area showing potential community land marked by circles with a 5km radius around each village.

## List of abbreviations

ADB	Asian Development Bank
AMDAL/ANDAL	Environmental Impact Assessments (Indonesian)
Anjir	Canal linking two rivers
APBD	Anggaran Pendapatan dan Belanja Daerah (Regional state budget)
APBN	Anggaran Pendapatan dan Belanja Negara (National state budget)
BAPPEDA	Regional Development Planning Agency
BAPPENAS	National Development Planning Agency
BKSDA	Balai Konservasi Sumber Daya Alam
BNPB	Badan Nasional Penanggulangan Bencana (National Disaster Management Agency)
BOS	Yayasan Borneo Orangutan Survival
BPBD	Badan Penanggulangan Bencana Daerah (Regional Disaster Management Agency)
BP DAS	Balai Pengelolaan Daerah Aliran Sungai
BRI	Bank Rakyat Indonesia
BUMN	Badan Usaha Milik Negara (National state-owned enterprise)
Camat	Administrative head of a sub-district
CDM	Clean Development Mechanism
CER	Certified Emission Reduction (CDM projects)
CIMTROP	Centre for International Co-operation in Management of Tropical Peatland (University of Palangka Raya)
CKPP	Central Kalimantan Peatland Project
COP	Conference of the Parties
CPO	Crude palm oil
DEM	Digital Elevation Model
Dephut	Department of Forestry (Departemen Kehutanan)
Deptan	Department of Agriculture (Departemen Pertanian)
EIA	Environmental Impact Assessment
EMRP	Ex Mega Rice Project
FMU	Forest Management Unit
Gerhan	National Forest Rehabilitation Movement / Program
GOI	Government of Indonesia
Handil	Small traditional canals dug perpendicular to rivers
HTI	Hutan tanaman industri (industrial forestry plantation)
IDR	Indonesian rupiah
IFAD	International Fund for Agricultural Development
Inpres	Presidential Instruction
IPB	Institut Pertanian Bogor
KFCP	Australia-Indonesia Kalimantan Forest & Climate Partnership
KFF	Kawasan Flora & Fauna (Flora & Fauna Conservation Area)
KPH	Kesatuan Pengelolaan Hutan (Indonesian for FMU)
LH	State Ministry of Environment (Lingkungan Hidup)
LULC	Land Use Land Cover
MRP	Mega Rice Project
Musrenbang	Annual development planning process



*Master Plan for the Rehabilitation and Revitalisation of the EMRP Area*

NGO	Non-governmental organisation
NTFP	Non-timber forest product
PAS	Potential Acid Sulphate (a type of soil in [near-] coastal areas)
Pemda	Regional government (provincial / district)
PLG	Proyek Lahan Gambut (Indonesian acronym for MRP)
PM2L	Program Mamangun Mahaga Lewu (Central Kalimantan's community development program)
PNPM	Program Nasional Pemberdayaan Masyarakat (National Community Development Program)
PSF	Peat swamp forest
PU	Department of Public Work (Perkerjaan Umum)
Rakorbang	Quarterly development coordination meetings
REDD	Reduced Emissions from Deforestation and Degradation
RESTORPEAT	Restoration of tropical peatland to promote sustainable use of renewable natural resources
RTRWP	Rencana Tata Ruang Wilayah Propinsi (Provincial spatial plan)
SME	Small and medium sized enterprise
SPI	Saluran Primer Induk (Main Primary Canal)
SRTM	Shuttle Radar Topography Mission - high-resolution digital topographic database of the earth from NASA
STRAPEAT	Strategies for implementing sustainable management of peatlands in Borneo
Tambak	Brackish water aquaculture ponds
UNFCCC	United Nations Framework Convention on Climate Change
UNPAR	University of Palangka Raya
UPT	(1) Unit Pelaksanaan Teknis (deconcentrated technical unit of government); (2) Unit Pemukiman Transmigrasi (Transmigration Settlement Unit)
USD	US dollars
UU	Undang-undang (Law)
VER	Verified Emissions Reduction (for voluntary market)
WWF	World Wide Fund for Nature

## Executive Summary

1. The Master Plan for the Rehabilitation and Revitalisation of the Ex-Mega Rice Project Area presents a strategic framework and guidance for the implementation of Presidential Instruction 2/2007 on the Acceleration of Rehabilitation and Revitalisation of the Ex-Mega Rice Project Area.

### Existing Conditions

2. The area is a river delta of 1.4 million hectares dominated by more than 900,000 ha of peat with roughly 450,000ha being more than 3m deep. Hydrological assessments indicate that the hydrological function of the peatland has been permanently changed and flooding is a serious problem, especially in the eastern part of the area along the Barito River. Current land cover is estimated to consist of a mix of healthy and degraded forest (37%), severely degraded forest and woodland (14%), shrubland (22%), grassland, ferns and recently burnt land (15%) and agricultural land (12%). Peat swamp forest with high biodiversity value is found in the more remote areas, especially in the north, and healthy stands of mangrove exist in part of the coastal zone. Deep peat (>3m) is protected under Presidential Decree 32/1990 and more than 400,000ha of the peat area >1m deep is now degraded and without forest cover. This area remains a significant source of greenhouse gas emissions.
3. Poverty is relatively high and the biophysical conditions remain challenging for agriculture. The last ten years has seen the negative impacts of forest clearance and the construction of the canal system of the Mega-Rice Project that has left many of the existing communities with reduced livelihood opportunities and a land that is prone to uncontrolled fires. The region's economy is dominated by agriculture and poverty rates are relatively high compared to the provincial average, especially in the MRP transmigration areas. Rural infrastructure is poorly developed in the remote areas and although most villages have access to basic education and health facilities, improvements in service provision, transportation, clear water and sanitation are needed. The fiscal capacity of district governments has increased in recent years, but Inpres 2/2007 has real potential to make much needed improvements, especially for improving rural infrastructure, basic and agricultural services, land and water management, and strengthening village institutions. It is proposed that Inpres 2/2007 targets the 227 villages and 450,000 people living within and around the EMRP area.
4. An analysis of local livelihoods shows the importance of both on-farm and off-farm income and a diversity of farm systems are found (rice-based, tree crop based and livestock-based) that vary across the area according to location and social group. The biophysical conditions place a limit on agriculture, but improved infrastructure, land and water management, and support services can help farmers raise agricultural productivity and access markets. Across the area, fisheries, and to a lesser extent forestry, provide an important contribution to local livelihoods. New opportunities in the plantation sector are emerging, especially with oil palm; however, there is a conflict between land allocation to plantations, the proposed spatial plan of the Inpres and the distribution of deep peat that requires immediate resolution.

### Challenges and Future Scenarios

5. The Master Plan identifies seven key challenges for the rehabilitation and revitalization of the area: (1) wildfires, (2) peatland management and rehabilitation, (3) conservation and environmental management, (4) agriculture, (5) community and socio-economic development, (6) institutional and organisational capacity and (7) climate change. Peatland rehabilitation and reforestation can be achieved given that (a) the threats of illegal logging, fire and inappropriate drainage and allocation of land to plantations are addressed and (b) an adaptive, integrated approach is developed with community participation and linkages to people's livelihoods. Significant

improvement of land and water management infrastructure and practices is required (including redesigns of existing schemes) with the strategy for agricultural development focusing on improving yields in existing agricultural areas and supporting farmers to make informed decisions about their own agricultural strategies such as specialization towards specific cash crops, tree crops and the development of fisheries. Poverty reduction in the area requires a focus on social, economic and institutional isolation to empower communities and strengthen village institutions.

6. Three future scenarios are analysed based on (a) a business as usual scenario, (b) a plantation scenario and (c) a rehabilitation and revitalization scenario. The conclusion is that only through a concerted effort to rehabilitate and revitalize the area can balanced development occur that leads to regional economic growth, poverty alleviation as well as positive environmental outcomes. Effective rehabilitation and revitalization of the area can lead to significant reductions in greenhouse gas emissions.
7. There is a general consensus that the EMRP area can be rehabilitated and developed in ways that would improve the welfare of local communities, create revenue for Central Kalimantan and conserve the main peat areas. This requires not only detailed knowledge of the biophysical conditions of the area and prioritising the conservation of the most sensitive areas (such as peat domes), but also a strong commitment by the Government of Indonesia at all levels. Opportunities to generate revenues from terrestrial carbon stocks are emerging as the world becomes increasingly concerned with global climate change and is working towards new mechanisms to reduce carbon emissions. The Government can use this opportunity to bring about the dual goals of conservation and poverty alleviation.

#### **Approach and Strategy for Rehabilitation and Revitalisation of the EMRP Area**

8. The strategic approach of the Master Plan is based on three main pillars: (1) rehabilitate and conserve forests and peatlands, (2) provide an enabling environment for increased productivity of agriculture and (3) support the provision of basic infrastructure and services.
9. A spatial zoning of the area is proposed based on natural hydrological landscape units that defines four main management zones:
  - **Protection Zone (773,500 ha)** - Deep peat and biodiversity conservation.
  - **Limited Development Buffer Zone (353,500 ha)** - Cultivation with limited drainage and controls on existing drainage to minimize negative impacts on the hydrological function in the peat and maintain water levels as high as possible in the dry season.
  - **Development Zone (295,500 ha)** - Development in hydrological units without significant peat.
  - **Coastal Zone (40,000ha)** - Coastal protection and limited development.
10. Six main programs are proposed:
  - (1) **Fire prevention and management:** To eliminate wildfires from the area;
  - (2) **Spatial management and infrastructure:** To establish detailed spatial plans, effective systems to manage spatial development and develop macro-infrastructure;
  - (3) **Sustainable peatland management and conservation:** To rehabilitate and conserve existing peatland and forest resources;
  - (4) **Agricultural revitalization:** To increase agricultural productivity in the area through intensification and diversification of farming systems, upgrading of land and water management infrastructure and practices, and limited development of new areas;

**(5) Community empowerment and socio-economic development:** To reduce poverty through community empowerment and socio-economic development;

**(6) Institutional development and capacity building:** To establish an effective institutional basis and capacity for the rehabilitation, revitalization and long-term management of the EMRP area.

11. It is considered vital that the following principles in the implementation of programs are adhered to:

**(1) An Adaptive Management Approach:** It is neither possible nor desirable to provide a “blue-print” for implementation of Inpres 2/2007. During implementation lessons will be learned as to what works and what does not and these lessons should be included in future planning. Adaptive management promotes a process of “learning by doing” and integrates planning and design with ongoing monitoring, assessment and evaluation.

**(2) An Integrated Approach:** Implementation of the Master Plan will be complex and will involve a large number of sectors as well as district, provincial and national governments - each with its own interests and responsibilities. A major challenge will be to integrate and harmonise these needs so as to reduce any conflicts and to maximise synergies.

**(3) A Landscape Scale Ecosystem Approach:** The different parts of the landscape should not be considered in isolation but as integral components of a complex landscape mosaic, with each part having effects on its neighbours. The rehabilitation and revitalisation program needs to take a resource-based approach to lowland management.

**(4) A Community-based Approach:** Communities in the EMRP area should aware of and have a voice and role in planning for their environment and the development of their respective areas. Feedback from local communities is essential to measure the effectiveness (or not) of interventions and will serve to constantly improve planning and future actions. Community rights with regard to land need to be respected.

12. A summary matrix of the proposed interventions is presented. The key short-term actions and recommendations include:

- Review and revoke permits for oil palm and other large-scale plantations that are on deep (>3m), and preferably also those on medium deep (1-3m) peat.
- Revise the Annexes of Inpres 2/2007 with new knowledge of the existing conditions.
- Revise the EMRP part of the draft provincial spatial plan (RTRWP).
- Focus agricultural revitalization on intensification, optimization and diversification of existing farming systems.
- Plan for only a limited expansion of new agricultural areas with a substantial reduction in the target for new transmigrants.
- Take immediate action to build up fire prevention and management capacity prior to the 2009 dry season.
- Further development of the knowledge base is needed including hydro-topographical information, integrated land suitability assessments, basic and applied research and establishment of a long-term monitoring system.
- Establish a “Partnership for the Rehabilitation and Revitalisation of the EMRP Area” supported by a full-time secretariat and technical unit to facilitate collaboration and learning between government, donor, NGO, private sector and other initiatives in the area.
- Plan for an incremental program, starting with pilots in priority areas and learning by doing through an adaptive approach.

# 1 Introduction

In 1995, the Government of Indonesia initiated the Central Kalimantan Peatland Development Project – commonly known as the Mega Rice Project - to convert up to one million hectares of peat and lowland swamp to rice cultivation (Figure 1). The project involved extensive construction of thousands of kilometers of canals and has led to serious degradation and deforestation of the area as a result of drainage and wildfires. The land proved largely unsuitable for rice cultivation and roughly half of the 15,594 transmigrant families moved to the area have now left. Local residents have suffered through damage to the area's natural resources and the hydrological impacts of the project. As the negative impacts of the project became clear, the Government mobilized two teams of Indonesian experts to review the project in 1998 and 2002, the former focusing on block A and which led to the project's closure in 1999.<sup>1</sup> The key findings of these teams included:

- Even the best land in block A was only marginally suitable for agriculture and the only kind of rice that could be grown was upland rice.
- 80% of the block A land is higher than the river level, thus offering no opportunities for gravity fed irrigation.
- The intended use of the Barito and Kapuas rivers for neutralizing acids formed as a result of pyrite oxidation and peat decomposition cannot be accomplished.
- Major constraints to development include flooding by heavy rains, droughts during the dry season and pest outbreaks.
- All surface water is unsuitable for domestic use and was already causing diseases at the time of the survey.
- Restoration of the hydrological functions on peat areas needed urgent attention.
- There should be no more transmigration in the ex-MRP area while existing transmigrants were unable to obtain sustainable livelihoods.
- Fire must be controlled and prevented.
- Development of tropical peat should only be allowed if it is based on scientific and socio-economic data.

Recognising the need to address the situation, the Government has called for the rehabilitation and revitalization of the area through the issuance of the Presidential Instruction (Inpres) No 2/2007. Inpres 2/2007 contains three main interventions: (1) a Conservation and Rehabilitation Program, (2) an Agricultural Development Program and (3) a Community Empowerment Program, which proposes an additional 46,500 transmigrant families to be moved to the area (see Annex 1). The Governor of Central Kalimantan has been appointed as the person responsible for the implementation of the Presidential Instruction with the intention that a Master Plan be produced to provide an integrated framework to rehabilitate and revitalize the EMRP area. This Master Plan, produced with the assistance of the Government of the Netherlands, is the result (see Annex 2 for details of the approach to the Master Plan). Based on the most complete data available and current plans by relevant departments, it assesses the development and conservation potentials of the area, generates a number of development scenarios and

---

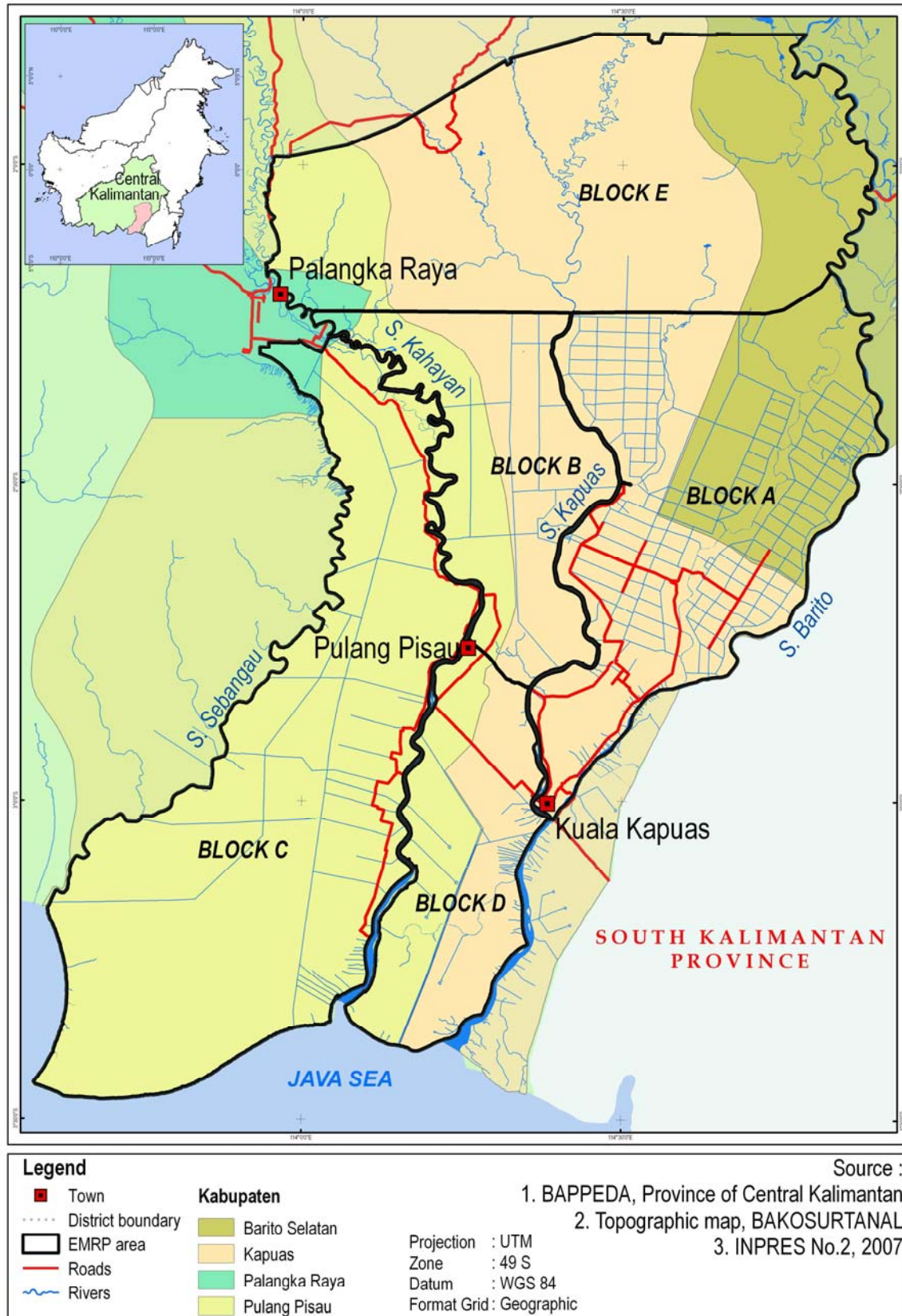
<sup>1</sup> An expert team of scientists mostly from the Bogor Agricultural Institute (IPB) and Gadjah Mada University (UGM) was established in 1998 by Bappenas to re-evaluate the Mega Rice Project. In 2002, the Minister for Accelerated Development of the Eastern Part of Indonesia formed an Ad Hoc Team and Core Team for the Mitigation of the EMRP. The team was made up of government officials, scientists and other professional organizations and was tasked with evaluating the ex-MRP and to seek mitigating measures including rehabilitation and alternatives for future development.

provides strategic guidance and a framework for the long term management of the area in line with the strategic aims of Inpres 2/2007.

The long-term future of the EMRP area requires a development strategy that optimizes and balances regional economic development, poverty alleviation and key environmental goods and services such as flood control and carbon storage. The Master Plan focuses on these three key policy issues - regional development, poverty alleviation and environmental goods and services - as a means of assisting the Government of Indonesia assess policy options for the area.

The area's extensive peatlands and tidal and non-tidal lowlands makes this a dynamic system where potential land uses are defined to a large extent by hydrology and the management of the area's land and water resources. The Master Plan uses hydrological and peat subsidence simulations to assess potential outcomes of different future development scenarios. These scenarios highlight the need for a balanced development strategy based on a spatial zoning that allows for the long-term sustainable management and wise use of the peatland resource, and improved land and water management across the area to stimulate agricultural revitalization and development.

The time horizon of the Master Plan focuses on the medium-term goals of Inpres 2/2007 for the rehabilitation and revitalization of the area. However, it is considered likely that this will take longer than five years and the Master Plan should be aligned with Indonesia's long-term planning horizon of 25 years (2008-2033). Decisions made now about the management of the EMRP area should consider the consequences of these decisions over the long-term for the sake of the long-term sustainable development of the area. The complexity and size of the area, combined with limitations in existing knowledge and data about the area, means that it is neither possible nor appropriate to provide a "blueprint" or prescriptive implementation plan. Further work is required by GOI and its development partners to develop further specific strategies, programs and other interventions in the area.



**Figure 1:** The Ex-Mega Rice Project (EMRP) area covers 1,462,000 hectares in the eastern part of Central Kalimantan. It is bounded by the Sebangau River (west), the Barito River (east), the Java Sea (south) while its northern border roughly follows the Palangka Raya - Buntok road. The area is divided into five blocks (A-E). The main primary SPI canal runs between the Kahayan, Kapuas and Barito rivers, between Block E (to the north) and Blocks A and B (to the south).

## 2 Existing Conditions in the EMRP Area

The EMRP area falls within the boundaries of four districts of Central Kalimantan province: Kapuas, Pulang Pisau, Barito Selatan and Palangka Raya (Figure 1, Table 1). The EMRP area is home to 350,000 people - a mix of Dayaks (which constitute the dominant ethnic group), and lesser numbers of Banjarese, Javanese, Madurese, Sundanese, Batak and Bugis. Recent developments in the area have been dominated by the Mega Rice Project (MRP) and the construction of two 87-km long main SPI canals linking the Kahayan, Kapuas and Barito rivers, 958km of primary canals in blocks A, B, C and D and thousands of kilometers of secondary, tertiary and quaternary canals. Construction of these canals was accompanied with extensive clearance of forest and other land cover, leaving a degraded peatland landscape with a high fire risk.

**Table 1:** Area, Population and Administration within the EMRP Area.

District/City	Area of EMRP (ha)	# Sub-districts	# Villages	Population	Households
Palangka Raya	16,324	2	8	11,303	2,879
Kapuas	629,827	8	108	206,908	51,647
Barito Selatan	197,601	3	18	34,691	8,852
Pulang Pisau	618,543	7	53	99,201	25,036
<b>Total</b>	<b>1,462,296</b>	<b>20</b>	<b>187</b>	<b>352,103</b>	<b>88,414</b>

Source: Master Plan calculation (area of EMRP) and PODES 2005.

### 2.1 Brief History of the Area

Local settlers and spontaneous migrants began to develop the downstream riverbanks and tidal swamps in the EMRP area during the 1920s and 1930s followed by government-sponsored transmigration in the swamp and peatland interiors in the 1970s and 1980s. A 1984 study concluded that only some parts of Block A and D were still suitable for new development while the remainder of the area consisted of unsuitable deep peat (> 2 m) or was already occupied.<sup>2</sup>

The technical teams involved in the design of the MRP planned for a cautious and phased development, starting in the Block A area earlier identified as being suitable. A macro-network of drainage and supply canals was designed to improve water management conditions. Unfortunately, works on the macro-infrastructure did not follow the same phasing, and started in the whole area on the basis of pre-designs, and ahead of the hydrological and topographical surveys and the environmental impact assessment (AMDAL).

Construction of the canal system resulted in the 87 km long main canals connecting the Barito River (at Mangkatip) and the Kahayan River (near Palangka Raya) and 958 km of primary canals in Block A, B, C and D. In Block A, an additional 973 km of secondary canals, 900 km of tertiary canals and 1515 km of quaternary canals were constructed. The macro-infrastructure caused severe damage to peat domes resulting in over-drainage, subsidence and was associated with forest clearance as a result of improved access that increased fire risks. After extensive fires during the long El Niño dry season of 1997 and Indonesia's momentous political transition of 1998, the project was abandoned.

<sup>2</sup> Nationwide Study of Coastal and Near Coastal Swamp Land in Sumatra, Kalimantan and Irian Jaya, Nedeco-Euroconsult-Biec, Directorate General of Water Resources Development, Ministry of Public Works, Indonesia, 1984



## 2.2 Biophysical Conditions

**The EMRP area is a river delta landscape dominated by peat.** Peat of more than 0.5m depth covers about 920,000 ha of the EMRP area of which about 450,000ha has a depth of more than 3 metres (Figure 2, Annex 3).<sup>3</sup> This deep peat is legally designated for protection under Presidential Decree 32/1990. The remaining 532,000 hectares consists of mineral soils, mostly of marine and riverine origin, including large areas of potential acid sulphate (PAS) soils. Within the EMRP area, four main land systems can be distinguished:

- **Riverbanks and Levees** – In areas with strong riverine influence, well-drained, coarse textured riverbanks or levees are formed. Downstream, near the coast, these levees are less pronounced or even absent. Traditional settlements are mostly found along the riverbanks and levees, which are suitable for agriculture based on local water management and agricultural practices.
- **Swamps** - The swamps are the low lying areas between the riverbanks, often flooded and water logged for longer periods. Soils are of riverine and marine origin and have a high horizontal and vertical spatial variability, containing (shallow) organic soils, clays, and potential acid sulphate soils. In the elevated marine terraces in the north, infertile white loamy and silty podzol soils are found.
- **Peat Soils** - With the accumulation of peat in the swamps, the surface level rises gradually reducing the river influence. After some time peat growth may fully depend on rainfall resulting in the typical dome-shaped peatlands. Three continuous deep peat areas are found in the area (Figure 2). Patches of shallow to medium deep peat are found in the south of Block A and Block D.
- **Coastal Soils** - The coastal zone is mostly defined by alternating sandy beach-ridges and swales with clayey and organic soils.

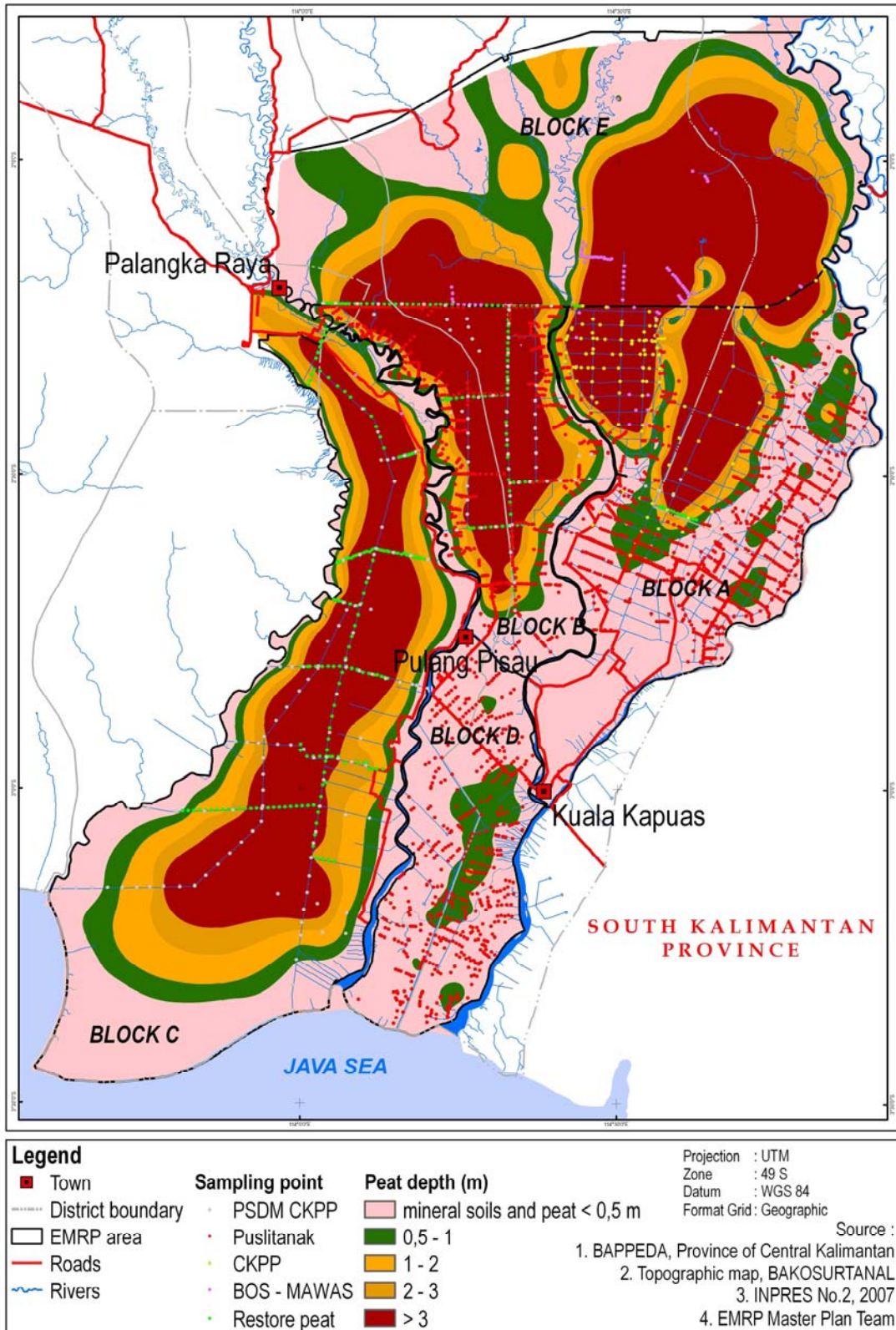
**The hydrology of the area is determined by (i) the sea tides entering the area, (ii) upstream river flows into the area and (iii) rainfall in the area (see Annex 4).** Sea tides are diurnal and tidal range fluctuates from 1.2 m in the neap tides to 2.4 m in the spring tides. The upstream areas of the rivers within the EMRP towards the main SPI canal are mostly non-tidal and their flows more seasonal, being determined by river flows. River flooding is particularly problematic in these areas, especially along the Barito River, and needs management interventions. In parts of the south of the area tidal flooding occurs which creates the potential for tidally irrigated agriculture. Drainage associated with the MRP has created problems with flooding in some areas during the wet season and water shortages during the dry seasons. Hydrological and other models developed show that if further peat subsidence occurs in the area through inappropriate development, drainage will be further limited and flooding may become a more widespread problem (see also Figure 9 and Annex 5 for details of the hydrological model).

**Peat domes exist between the main rivers but subsidence of peat near to the canals has caused the formation of ‘mini peat domes’.** A Digital Elevation Model (DEM) of the area (based on field surveys, laser altimetry surveys supplemented with Shuttle Radar Topography Mission [SRTM] radar data) shows the elevated nature of the peat domes that exist between the main rivers in the area. The higher points in peat domes are several metres above the riverbanks and at least 5m above mean river water levels. Water tables in canals that drain the peatlands are not controlled at present, resulting in canal water tables often being more than 2m below the surrounding peatland, causing excessive drainage. Transects across the peat domes where canals have been dug between the rivers illustrate the current topography that shows the formation of ‘mini peat domes’ between the canals (Figure 3). These changes in landscape are caused by

---

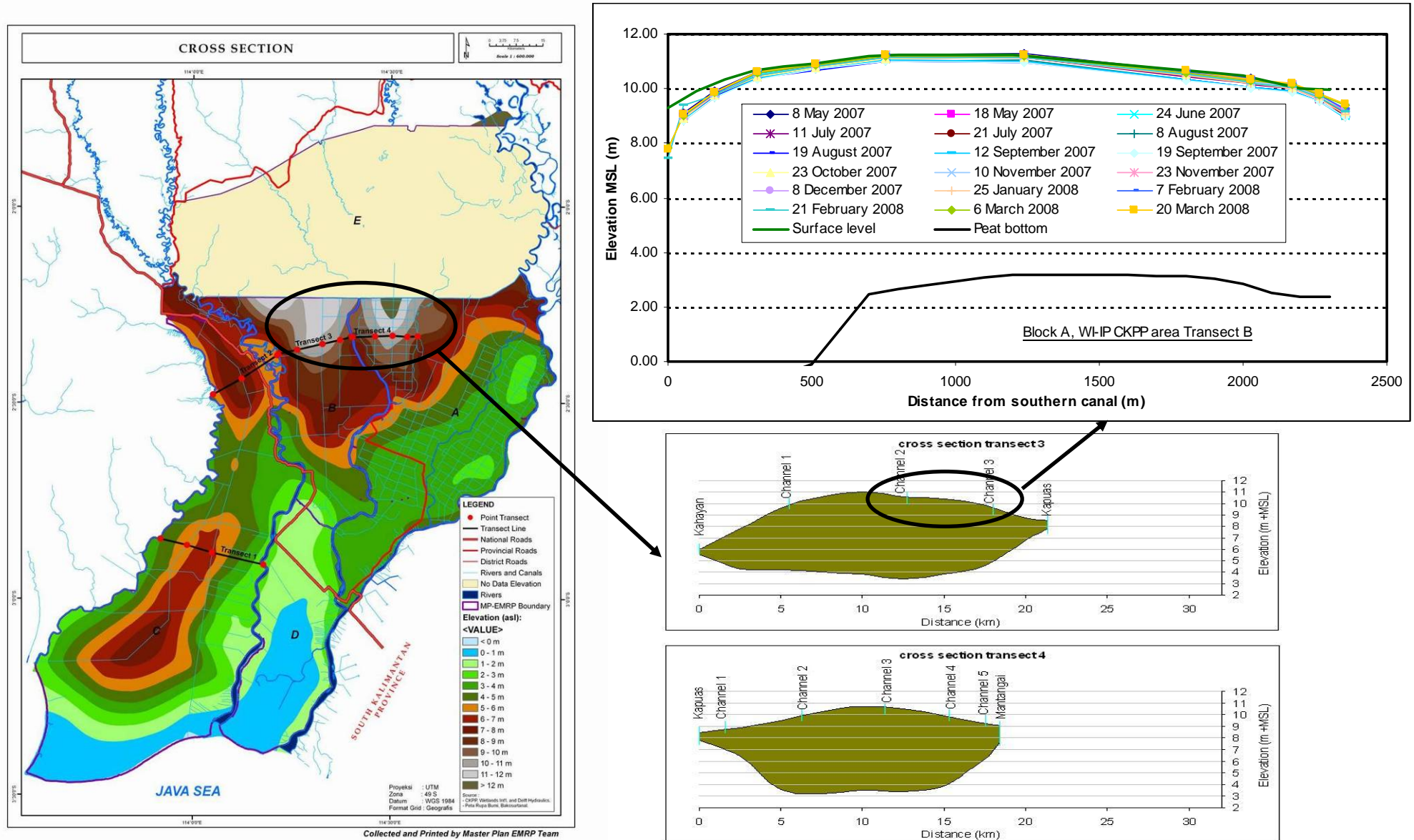
<sup>3</sup> Data on peat depth for the area were assembled using data from Puslitanak (1997), CKPP, BOS and Restorpeat.

drainage impact of the canals on the peat being highest near to the canals, which has led to high rates of peat decomposition and fire frequency near to the canals.



**Figure 2** – Peat depth map with sampling locations for the EMRP area. The map shows peat >3m deep (red area) with peat depth zones of 2-3m, 1-2m and 0.5-1m. The pink area represents mineral soils and shallow peat <0.5m. Data for block E are approximate and based on the Wetlands International peat depth atlas for Kalimantan (see [www.wetlands.or.id](http://www.wetlands.or.id)).

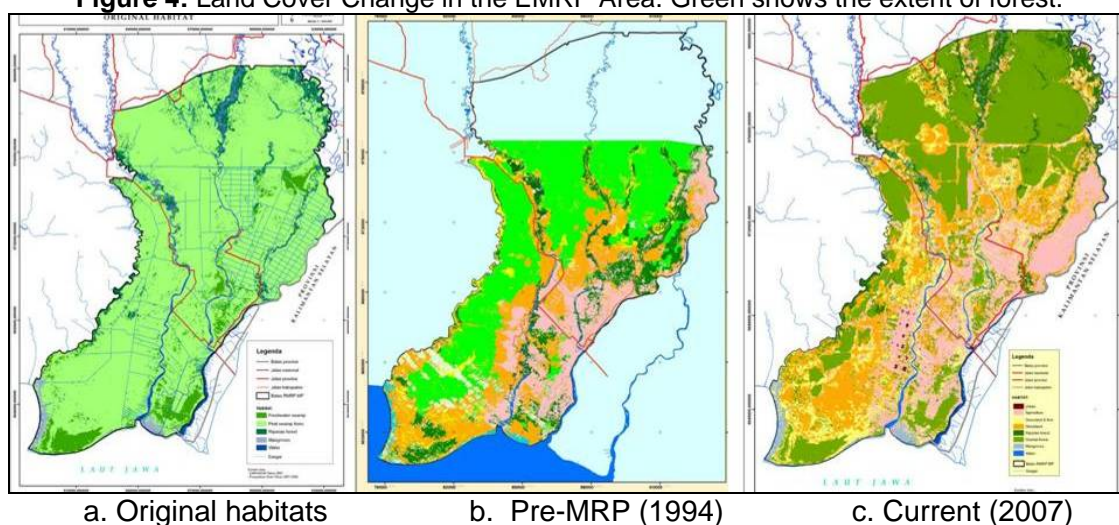
**Figure 3** – Digital Elevation Model of the EMRP area to the south of the SPI (left) and transects across the landscape (bottom right) and between canals in block A (top right). The DEM and transects across the landscape (bottom right) show the existing shape of the peat domes. The impact of the canals and the new mini-dome topography between canals can be seen in the top right figure, which shows groundwater levels at various dates. Groundwater levels are seen to be several metres higher than the canals and broadly follow the surface topography - only near canals do we see impacts on groundwater levels.



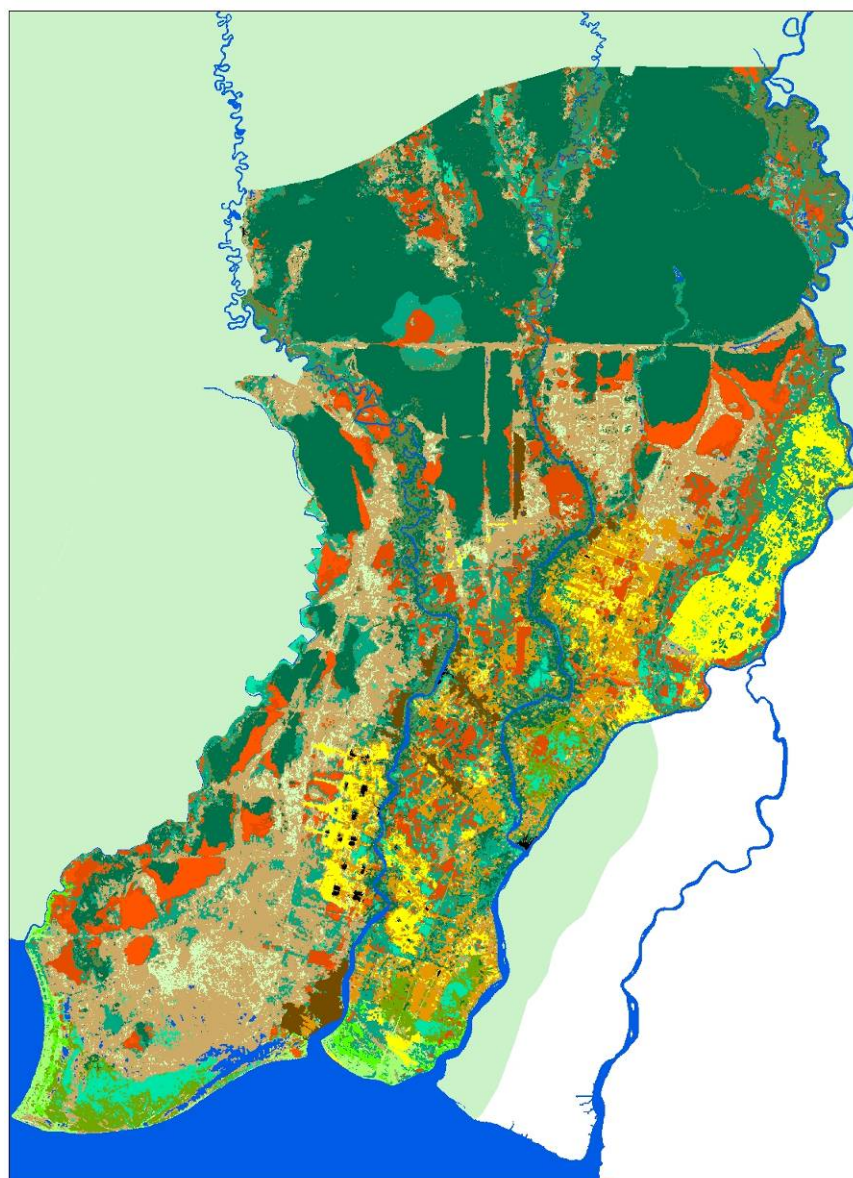
**Hydrological assessment of the peatland suggests that groundwater levels in most of the peatlands are determined principally by local rainfall and evapotranspiration – groundwater flows are relatively limited.** The extensive canal systems dug during the MRP extend across all the major peat domes (with the exception of Block E to the north of the main SPI canal) and have acted to drain the peat domes, causing loss of vegetation and ‘hummock-hollow’ microtopography over great distances. Even though the impact on groundwater depths is greatest near canals, drainage has thus resulted in faster runoff of rainfall from peatlands and have created a dry, fire prone landscape. The pronounced rainfall gradient from the north of the area (over 2500mm/yr) to the south (below 2000mm/yr) has implications for the rehabilitation of the peatlands as well as for agricultural development options (see Annex 4).

**Current land cover is dominated by forest, shrubland, degraded forest, agricultural land (including tree crops) and burnt forest and shrubs (see Annex 6 for details).** As recently as 20 years ago, much of the EMRP area was covered by forest (Figure 4). For example, in 1997 almost 50% of block C was forested while now less than 10% is forested. Peat swamp forests were the most widespread with other areas under lowland forest and the coastal fringes covered in mangrove forests. As a result of logging, the MRP and fires, the situation has changed dramatically. Now healthy, or slightly degraded forests cover about 550,000ha or 38% of the total area, while severely degraded forests cover a further 14%, shrublands and grasslands cover 37%, and agricultural land makes up the balance with 12% (Figure 5). Much of the 700,000ha of severely degraded forest, burnt areas and shrub and grasslands will need to be the focus of forest rehabilitation, especially on the peat. Overlay of the land cover map (Figure 4) with the peat depth map (Figure 1) suggests that roughly 400,000ha of peat more than 1 metre depth is now without forest cover.










**Figure 4:** Land Cover Change in the EMRP Area. Green shows the extent of forest.



**The area still has significant biodiversity value, especially in the remaining peat swamp forests of Block E and the northern parts of Blocks A, B and C and the mangroves in the coastal area.** Important species include the proboscis monkey (*Nasalis larvatus*), the silvered langur (*Trachypithecus (Presbytis) cristata*), the false gavia (*Tomistoma schlegelii*) and a significant population of the orangutan (*Pongo pygmaeus*). Most of the forest patches in the south are dominated by gelam (*Melaleuca cajuputi*) or belangiran (*Shorea balangeran*); this forest has lost most species associated with mixed freshwater swamps. The main challenges to biodiversity conservation are: (i) illegal logging and fires (threaten PSF in Block E and northern Blocks A & C), (ii) plantation development (threaten PSF in Blocks A & B), and (iii) tambak development (threat to remaining mangroves).



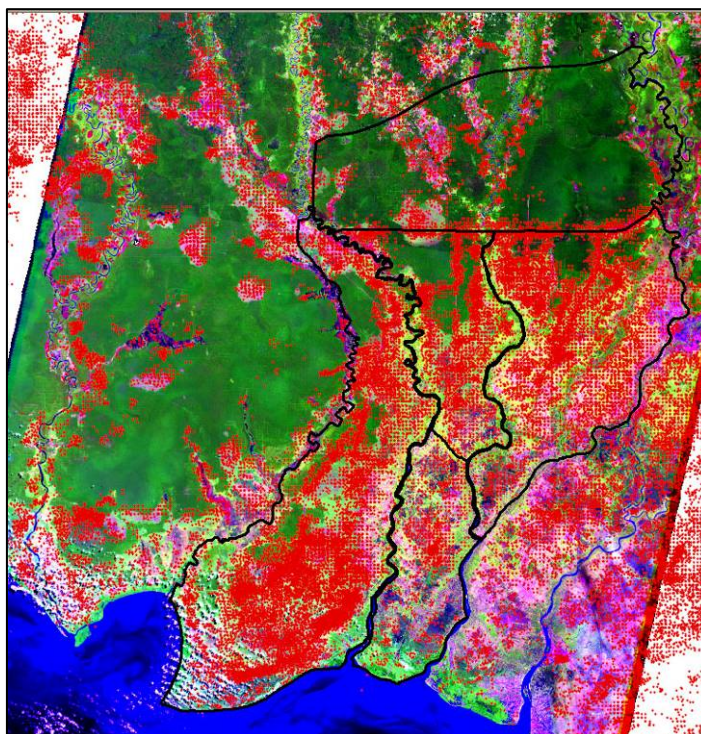
### Legend

 Riverine-Riparian forest	 Grassland and ferns
 Peat swamp forest	 Recently burnt forest
 Swamp forest	 Recently burnt shrubs
 Mangrove	 Dryland agriculture
 Mangrove, degraded	 Tree crops
 Severely degraded forest, woodlands	 Sawah (productive / abandoned)
 Shrubs	 Water bodies
 Shrubs, sedges, flooded	 Settlement

**Figure 5:** Land Use and Land Cover Analysis and Classification for the EMRP Area (based on SarVision 2008). See Annex 6 for details of the classification and legend.

**Fire is the most critical cause of forest loss and degradation since the MRP.**

Drainage of peat and loss of forest cover has created ideal conditions for outbreaks of fire, which not only have created haze problems throughout the region (with commensurate health problems and economic losses in Indonesia and neighbouring countries) but also contribute to global climate change. Almost all areas of the EMRP that are now non-forested have been burnt at some time between 1997 and 2006 (Figure 6) with fire hotspots especially concentrated near access points provided by canals and roads (see Annex 7). Fires have been limited in 2007 and 2008 as a result of relatively high rainfall during these dry seasons, supported by a strong government policy forbidding land clearance by fire during this period. Further details of the fire history of the EMRP area are provided in Annex 7.



**Figure 6:** Hotspots (red dots) for fires between 1997 and 2007 and Landsat image from 2000 showing forest (green). Source: RSS - Remote Sensing Solutions GmbH.

### 2.3 Socio-economic Conditions, Agriculture and Livelihoods

The area's economy is dominated by agriculture and a diversity of farming systems are found - rice based, tree crop based, and livestock based - depending on local conditions and the social groups involved. While the EMRP area covers only 10% of Central Kalimantan it is home to almost one quarter of its population. Significantly, the poverty levels of 36% in the EMRP area are the highest for the whole province, particularly in the transmigration settlements established as part of the Mega-Rice Project where poverty rates are as high as 60-70%. Further details are provided in Annex 8.

At present the biophysical conditions place limits on agriculture, but improved agricultural techniques, better land and water management infrastructure and practices, and upgraded support services could help farmers raise productivity and provide easier access to markets. Across the area, fisheries and to a lesser extent forestry, provide an important contribution to local income, while new opportunities are emerging in the plantation sector, especially oil palm.

**Basic services and rural infrastructures are poorly developed, especially in the remote areas.** Although most villages have some access to health services and education, quality of service and staffing levels of health professionals and teachers remain in need of improvement. Much of the area lacks adequate transportation systems, good quality fresh water and basic sanitation services. The passage of the Presidential Instruction No 2/2007 could provide a real boost, in terms of financing, to address these issues and make positive and much needed improvements in the provision of rural infrastructure and basic services. Further details are provided in Annex 9.

**Land and water management practices are critical to agriculture in the area and are closely related to the ethnic and cultural background of communities and the biophysical conditions.** An important difference exists between management needs in the

tidal lowlands and the non-tidal upstream areas, where flooding can be problematic. Dayak communities, predominantly living in the upstream areas, and Banjar communities, mostly in the southern part of the area, have developed similar practices based on simple canals (*handil*) running inland from the river. Large-scale transmigration started in the 1970s and 1980s in the swamp interior especially along the Kahayan with developments in Pangkoh, which is close to the deeper peat in the south of Block C. The layout of these schemes was based on early designs, and water management is not effective, leading to problems of limited water control, flushing and drainage, and acidity. The transmigration sites developed during the MRP in Block A are based on improved designs, however the supply canals do not function as envisaged as they pass over elevated peat domes. This area has a complex hydrology and construction of these systems was not completed. Overall, the existing schemes in the area need to be reviewed with detailed improvements and upgrading based on appropriate topographical and hydrological data. Further details of land and water management in the area are provided in Annex 10.

**Agriculture, the key livelihood strategy in the area, is mixed in nature and a farming systems approach is taken in the Master Plan.** Farming systems have similar resource bases, enterprise patterns, household strategies and constraints that allow the development of specific development strategies and interventions that support farmers rather than specific commodities. Three main farming systems are identified in the EMRP (figure 7, left; see Annex 11 for details):

- **Rice-based** (upland and lowland) with about 110,000ha of land producing rice in the area (e.g. Lamunti, Dadahup, handil areas),
- **Tree Crop-based** with rubber (e.g. Block E, Mantangai, Jabiren, Jenamas, Dadahup, Pandih Batu), coconut (e.g. Bahaur & Kuala Kapuas) and, more recently, oil palm being the dominant crops, and
- **Livestock-based** with cattle and vegetables being the main produce (e.g. Basarang).

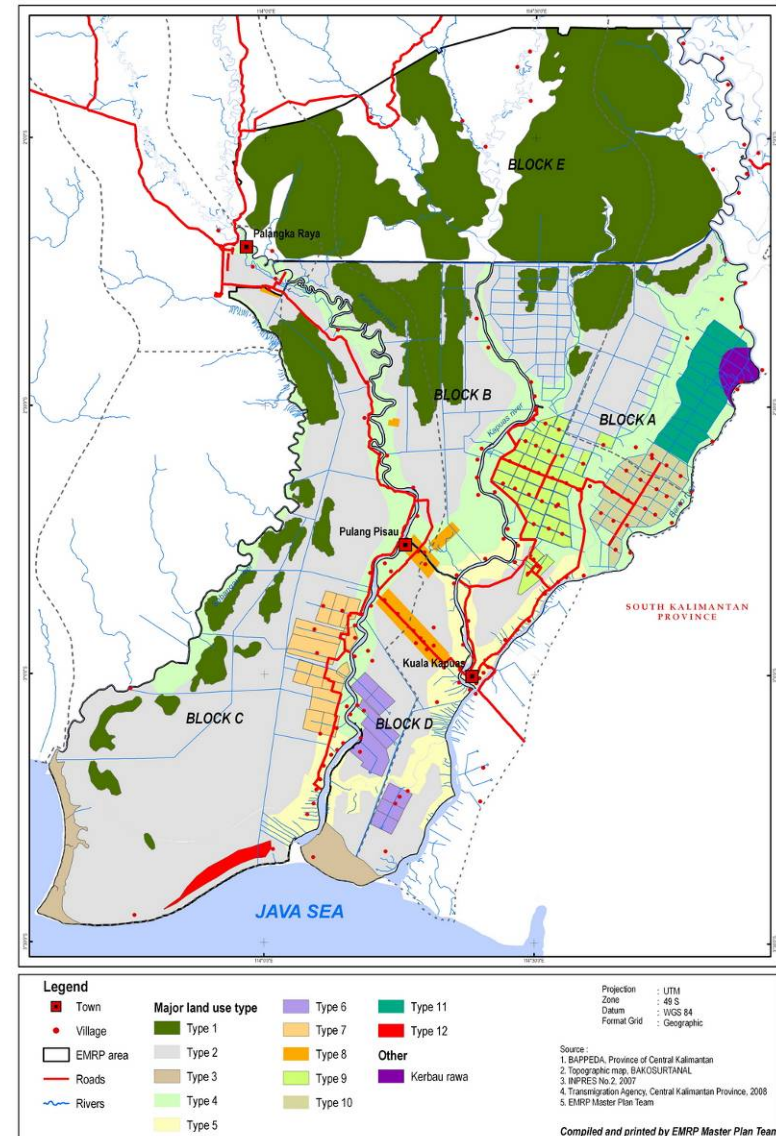
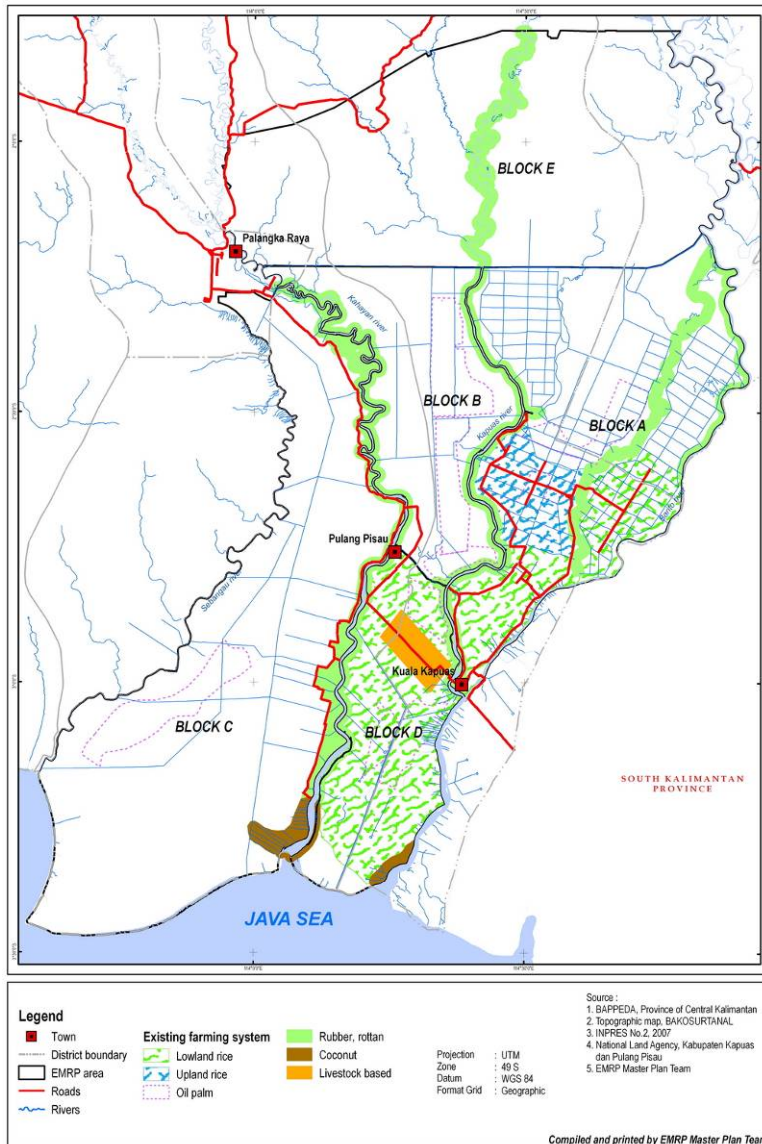
**Many farmers are subsistence farmers or sell only limited produce.** Many depend on off-farm work opportunities and the harvesting of forest products such as rattan, gelam and fish. Average incomes are reported in the region of IDR 2-4 million per year. Support to farmers is limited and the extension service is heavily understaffed and lacks links to relevant research institutions. In 2005, 84 extension workers were serving roughly 65,000 farming households and many lack knowledge of lowland agriculture.

**Fisheries are important to many communities in the EMRP and are a vital source of food.** The MRP affected local fishery systems as a result of acid water leaching from the peat, but traditional fish capture ponds (*beje*) are still widely used in the upstream areas. Capture fisheries occur throughout the project area, while cage culture and freshwater aquaculture in ponds are mostly found in villages along the main rivers. Traditional coastal ponds (*tambak*) are being developed in the south of block C, although this needs to be managed carefully to avoid further degradation of the mangroves.

**The establishment of tree crops and the diversification of livelihood strategies from agriculture to off-farm income generating activities are major trends in the region.** This suggests that agriculture fails to provide a sustainable livelihood for the poor and off-farm work is usually associated with (temporary) migration to urban areas. In particular, the ban on land clearance using fire, combined with favourable commodity prices, has promoted a shift to tree crops and is a major issue for farmers practicing shifting cultivation and those wanting to use idle land that requires practical and workable alternatives. Current problems people faced for their livelihoods include:

- **Land Tenure Issues** – Land tenure issues include (a) land conflicts regarding the traditional *adat* system (*ayungkuh*), access to conservation areas (block E) and impact of new developments such as oil palm and (b) lack of clarity over ownership of land in the MRP transmigration area where 7,107 families have left and in areas with new developments such as oil palm. In some villages, compensation payments following the MRP and establishment of plantations remain an issue.

**Figure 7:** Farm systems (left) and Major Land Use Types (right). Dayak communities farm the fertile land along the upstream parts of the rivers, while Banjarese communities are found in the more downstream areas. Transmigrant communities are generally located further inland, mostly in the eastern and southern part of the area, where land and water conditions are less favourable. Much of the north and west of the area consists of degraded peatland with healthy or degraded forest being found mostly in the north.





- **Access to Finance** – There are limited financial institutions in the area and people are dependent upon moneylenders with high interest rates. Many of the poor are dependent upon the *ijon* system (where a loan is repaid with a share of a crop) and village cooperatives are typically not functional. Micro-credit programs have also failed in the past.
- **Access to Markets** – Market access limits income through high transportation costs, especially for villages with no road access, distance to markets and limited knowledge of market prices.
- **Skills and Knowledge** – Agricultural skills and knowledge remains limited, which requires an improvement of extension services.

**Based on current land cover/land use and socio-economic aspects, the Master Plan identifies 12 Major Land Use Types in the EMRP area.** Each major land use type has specific biophysical and socio-economic characteristics and requires a specific strategy for rehabilitation and revitalization (Figure 7, right). Two main categories as defined:

- **Natural habitats** including (1) Forest and degraded forest; (2) Heavily degraded forest, shrubland and grassland; (3) Mangrove forest
- **Developed areas** including: (4) Traditional Dayak land use along rivers; (5) Traditional Banjar land use with large handils in tidal and semi-tidal areas; (6) Transmigration settlements in tidal area of Block D (Pangkoh IV, VII and VIII, Terusan Raya); (7) Transmigration settlements in tidal area of Block C (Pangkoh I-III, V, VI, IX and X); (8) Transmigration settlements in non-tidal area (e.g. Basarang, Jabiren); (9) MRP transmigration in upstream semi-tidal area (Lamunti); (10) MRP transmigration (Dadahup, Palingkau); (11) MRP transmigration in non-tidal area (Jenamas); (12) Tambak.

## 2.4 Institutions, Plans and Permits

**Past reviews of development in the EMRP area have highlighted the dominance of specific sectoral interests and a lack of integrated and coordinated planning and development in the region.** Prior to the issuance of Inpres 2/2007, development of the EMRP area was dominated by logging followed by the MRP with a focus on development of food crops from 1996-1999. As a result of the cancellation of the MRP, the Government established an Integrated Development Zone (KAPET) as a means of coordinating and promoting development for the Kahayan-Kapuas and Barito area. In 2001, Indonesia implemented regional autonomy that further complicated matters by requiring greater emphasis on vertical integration between the districts, province and central governments. Decentralisation has led to new policy directions in the EMRP area led by sub-national government.

**Positive steps are being taken by sub-national governments to address development needs in the EMRP area although national programs remain important.** District governments have developed policies and programs focusing on the priority sectors of agriculture, basic infrastructure, education and health and have identified the need for fire control, forest conservation and rehabilitation as well as the rehabilitation of the degraded peatlands. Development plans for Barito Selatan and Kapuas also propose the EMRP is made into a special area (*kawasan andalan*). The provincial government, which has been proactive in support of Inpres 2/2007, has made clear policies on fire prevention, is drafting a green government policy and emphasises the need for sustainable development as well as effective environmental and natural resource management. However, estimates of government expenditure on development in the area suggest the regional fiscal capacity is limited related to the needs with almost 50% of total expenditures coming from central government and 40% from the district (see section 4.5). This may reflect that two key functions in the EMRP area – water resource

management and forest management including conservation and forest rehabilitation – remain centralized with the Departments of Public Works and Forestry.

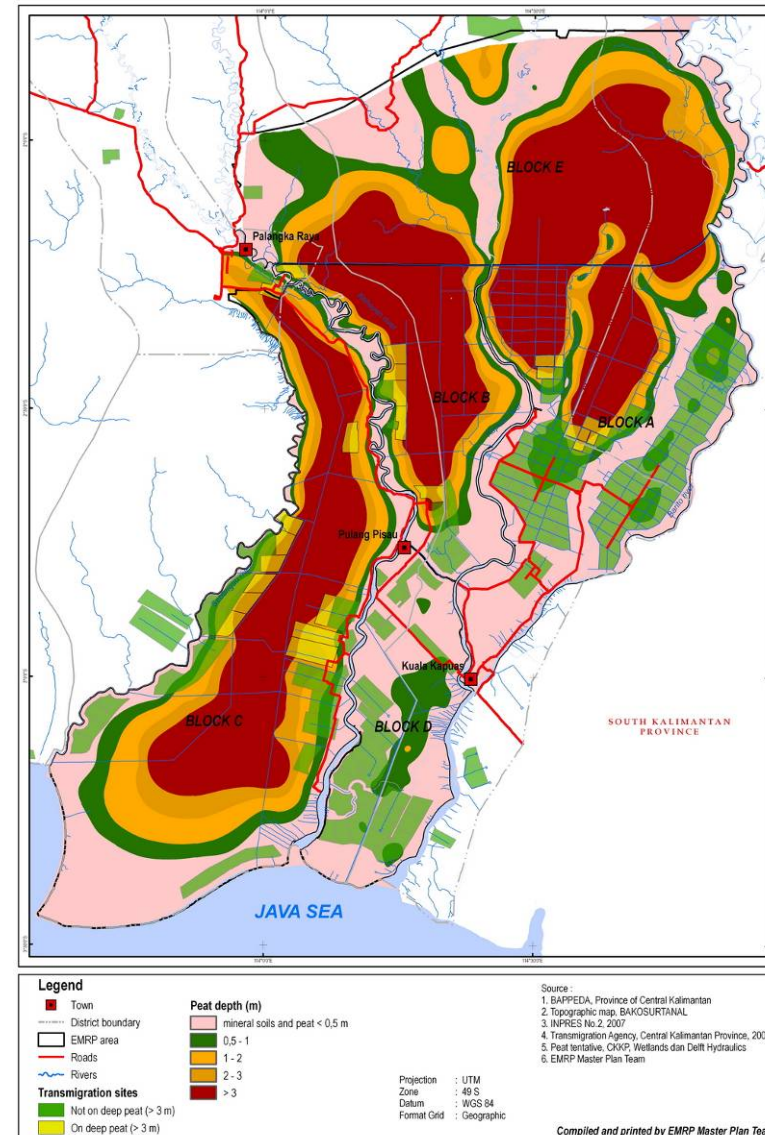
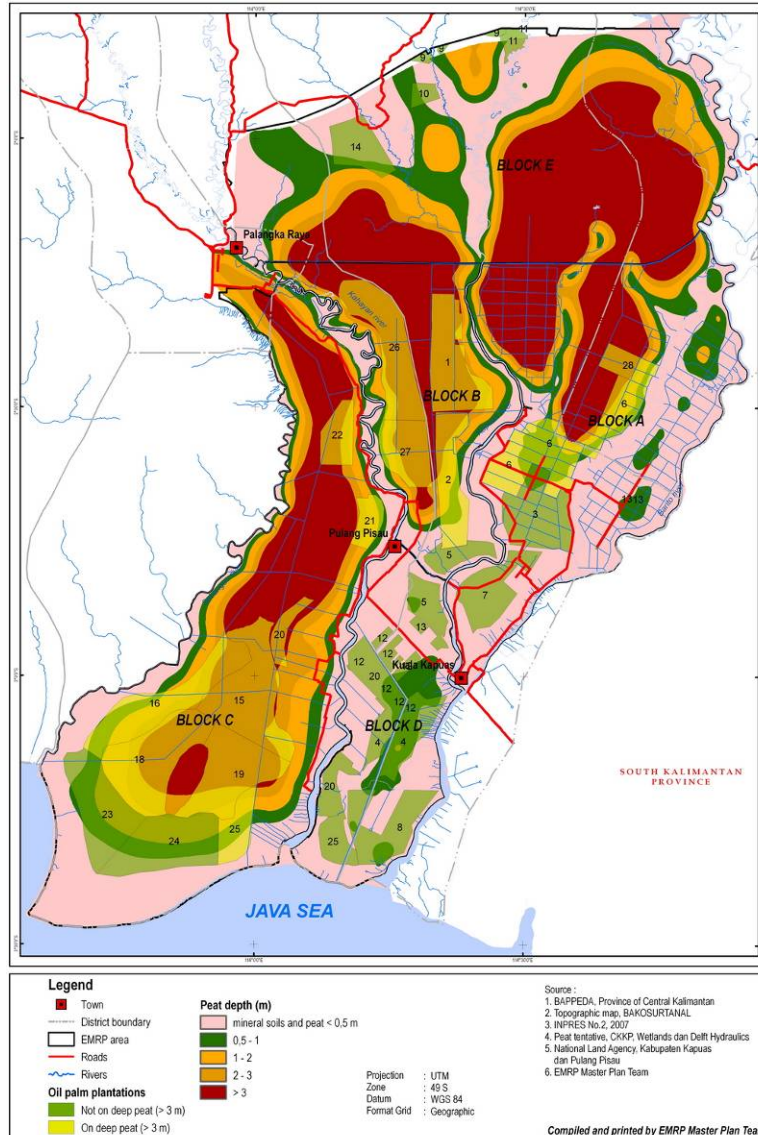
A number of initiatives focusing on community-based development have emerged at both the district and provincial levels. For example, Central Kalimantan provincial government has started the Village Safeguarding and Development program (PM2L). This program aims to strengthen village institutions and promote community-based development through the placement of village facilitators and focusing government resources to meet villagers' needs. Such an approach should be expanded upon in the EMRP area with strengthening of village institutions being a significant need.

**However, the policy for the EMRP area as defined by Inpres 2/2007 remains inconsistent with both a number of regional plans and policies as well as the detail within the annexes of Inpres 2/2007.** Four main areas are highlighted:

- **Plantation permits** – Inpres 2/2007 allocated 10,000 ha of land to oil palm and 7,500ha for rubber. However, a review of plantation permits issued up to March 2008 by district governments indicate that 28 permits covering 391,048 ha have been issued including 22 permits covering 350,796ha for oil palm. Of these 28 permits, half are found on approximately 120,000ha of deep peat (>3m) and 65,000 ha on moderately deep peat (1-3m) (Figure 8; see Annex 12 for details). These permits also cover 200,000ha of the proposed protection area (*kawasan lindung*) in Inpres 2/2007. In order to reach the objectives of Inpres 2/2007, it is strongly recommended that the permits on the 120,000ha of deep peat are revoked or their boundaries revised away from the deep peat according to Presidential Decrees 32/1990 and 80/1999. To ensure sustainable management of the peat, it is also recommended to revoke or revise the boundaries of these away from the 65,000ha of shallower peat of 1-3m. It is believed that many proposed areas do not yet have an approved Environmental Impact Assessment (ANDAL) and are location permits (*izin lokasi*) without the full licensing process being completed. The 10,000ha target in the Inpres is also limited given that there is more land than 10,000ha of suitable land for oil palm in the area.
- **Transmigration** – Inpres 2/2006 proposes 46,500 families to be moved to the area based on the target of 93,000 ha of new irrigated rice land. A review of the proposed locations shows that a number of these are not suitable for transmigration based on factors such as unfavourable soil and water conditions, the presence of deep or medium deep peat and a remote location. It is strongly recommended that the proposed developments along the west side of Block C (Sebangau), the west side of Block B (Jabiren Sebarang) and the northern locations of Gohong (Block B) are cancelled. Further, the current estimated rice area of 100,000-110,000 ha is consistent with the target of 123,000ha of planted rice in Inpres 2/2007. Like previous studies by Indonesian scientists and policy makers, this Master Plan considers that the people currently living in the area – both transmigrant and long-term residents – should be the focus of rehabilitation and revitalisation efforts. New transmigration should not be a current priority, although limited new areas could be developed in block D and the south of block A.
- **Road Development** – Road development in the area may increase risks of further deforestation and peatland degradation. Plans to create an upgraded road link between Mantangai and Timpah will increase access to the area and may have serious negative environmental impacts. The benefits of doing this are not clear in comparison to the financial and environmental costs and a full EIA (ANDAL) is recommended.
- **Rail track** – The provincial government of Central Kalimantan is planning to build a rail track from the north of the province to the south to facilitate the transport of goods and commodities such as coal to the sea. One proposal, which is believed not to be under consideration, was to construct part of this rail track across the peat domes of the EMRP. Such a development would be deleterious to the objectives of Inpres 2/2007 and is not recommended.

Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

**Figure 8:** Overlay of plantation licenses (left, yellow shading) and existing and proposed transmigration (right, green shading) with peat. The red area shows peat >3m deep.



## 3 Challenges, Opportunities and Future Scenarios

Rehabilitation and revitalization of the EMRP area is an achievable policy objective but some major challenges have to be overcome and taken into serious consideration when planning the details of future interventions. In addition, three future scenarios – no significant progress with rehabilitation and revitalization, development of 350,000 hectares of oil palm, or a successful rehabilitation and revitalization program – may occur given the existing situation. Policy makers need to be aware of these issues and possible scenarios before moving forwards with initiatives in the area.

### 3.1 Rehabilitation and Revitalisation: Challenges and Potential

#### Challenge 1: Wildfires

---

Human-induced wildfires are the most serious and immediate threat to the EMRP area. Once started, they are difficult to control, especially in peat, and as they spread they release enormous amounts of smoke and carbon dioxide, which has impacts on the economy and global warming. Estimates of carbon emissions from peatland fires in SE Asia are in the order of 1 billion tons per year on average (equivalent to 4% of global emissions from fossil fuel burning) and they have been the major source of carbon emissions from the EMRP over the last decade.<sup>4</sup> Without proper fire management many of the proposed interventions supporting the improved welfare of people and rehabilitation of the peatlands in the area will be impossible.

**Experiences and Potential for Fire Control =>** Community-based approaches for the management of peatland fires in the EMRP have been developed by the University of Palangka Raya (CIMTROP) through the EU-funded STRAPEAT and RESTORPEAT projects and the Dutch-funded CKPP project. Community fires brigades now exist in about 40 villages with specific tactics for suppressing peatland fires, but these need upscaling and linking to a broader, effective institutional basis for fire prevention, management and suppression. In addition, farmers need viable alternatives to burning and the enforcement (including prosecutions where appropriate) of a “no burn policy” needs to be heightened targeting contractors and the private sector.

#### Challenge 2: Peatland Management and Rehabilitation

---

Past development in the EMRP has not considered the vulnerable nature of peatland and the impacts of drainage and clearance. Peatlands are dynamic systems and drainage leads to oxidation of peat and subsidence through the processes of compaction and peat loss as a result of oxidation. These processes lead to a change in the topography of peatland areas, which further affects hydrology and drainage and leads to potential flooding problems.

An integrated, phased approach to peatland management and rehabilitation is required involving fire management (see above), hydrological rehabilitation, reforestation and community development that raises awareness and support for the proposed interventions and leads to long-term benefits for communities.

---

<sup>4</sup> Hooijer et al. (2006) PEAT-CO2. Page et al. 2002

## **Hydrological Management and Rehabilitation**

Appropriate management of peatland requires stopping the drainage of all deep (>3m) peatland (i.e. stopping the further construction of canals and ditches) and minimizing the drainage of adjoining shallow (1-3m) peatland through water management interventions to control drainage.

**On deep peat, further development should be prevented, current canals and ditches should be blocked and the groundwater level raised where possible (see Box).** However, hydrological assessments conducted by the Master Plan team show that (a) as a result of the mini dome topography, canal sides are now in general about 1m or more below the general level of the peat domes and (b) lateral groundwater flows (horizontal hydraulic conductivity) are relatively limited. As a result, canal blocking is unlikely to rewet large areas of peatland in the short term but is necessary to prevent further degradation, which will make rehabilitation more difficult the later it is implemented. In the short term, canal blocking may in many cases rewet zones of only roughly 300-500m around canals, but this still has value for ecological restoration and fire prevention. On shallow peat, drainage should be limited but, where it exists, water control structures should be introduced to ensure that water loss during the dry season can be minimized while during the wet season excess water can drain.

### **Box: The Challenges of Hydrological Rehabilitation**

It has been shown that drainage and development greatly affects the hydrology of peatlands, drying out and removing the typical 'hummock hollow' top layer that is a key element in natural forested peatlands, and thereby reducing water storage capacity on the peat surface. As residence time of rainwater on the peat surface is reduced, water tables across the peatland are lowered fairly uniformly over distances up to kilometres from canals. Near canals, groundwater tables are further lowered through enhanced groundwater flow. However in much of the EMRP area, this impact zone appears limited in extent due to the low hydraulic conductivity of the peat.

The lower groundwater tables caused by drainage result in subsidence (lowering of the peat surface) through peat decomposition and shrinkage. Peat decomposition results in CO<sub>2</sub> gas emissions to the atmosphere affecting the global climate. It is therefore necessary to raise water levels if CO<sub>2</sub> emissions are to be reduced, which can be achieved by blocking canals with dams. However, hydrological assessments suggest that canal blocking in the EMRP area will generally have limited impact on groundwater depths in the short term. This is because the shape of the peatland landscape has altered drastically since drainage started: there now are relatively steep gradients away from canals so most dams can rewet only narrow areas around canals. Furthermore, the limited rate of groundwater flow in EMRP peat implies that groundwater levels will only be affected over relatively short distances from canals when they are blocked.

The limited effect of canal blocking in bringing up water levels over large area implies that the effect on CO<sub>2</sub> emissions will also be limited in the short term. Nevertheless, canal blocking is required for longer-term peatland rehabilitation because it creates a 'base-level' beyond which peat decomposition cannot proceed. For canal blocking to be effective in this way, robust dams will need to be in place for decades and regular maintenance will be required. Canal blocking may also create the wet zone immediately around canals, which will help reduce fire susceptibility in this area. In dry years however, when fire susceptibility is highest, canal blocking in most areas will not be able to keep canal sides wet. Fire prevention and management is thus required.

Where dams are built to block canals, they should be built to bring up water tables as much as possible. It is best to build dam crests high enough to remain above the water during all but the highest flows and to build dams where there are wide flat plains on at least one side, so peak water flows are not forced over the dam but can spread over the land. Water steps over dams should be less than 0.5m so as to minimize water pressure on the structure. It should be kept in mind that different peatlands have different hydrological characteristics. In some areas, peat deposits are less humified and deeper, allowing more groundwater flow; in such areas canal blocking will have a more immediate and wide-reaching impact on water depths.

**While canal blocking by itself will not greatly reduce CO<sub>2</sub> emissions and fire risk in the short term, it is likely to be most effective in combination with fire prevention measures.** One of these fire prevention measures is limiting human access, to which dams can contribute. Another is maintaining or promoting a good vegetation cover. In

forest, the top layer of peat and litter (the 'fuel') is kept moist and fires rarely spread far. When forest cover is removed, the top peat dries out because of greater exposure to sunlight and wind, and fire risk is greatly enhanced. It is therefore recommended to prioritize the blocking of canals in remaining forest areas, followed by deforested areas where suitable conditions exist for natural regrowth or in combination with tree planting schemes. Tree planting, however, should not disturb the peat soil surface or interfere with natural regrowth, which might actually increase CO<sub>2</sub> emissions rather than decrease them. In all cases, measures such as canal blocking or tree planting are unlikely to be successful without effective fire prevention.

**Experiences and Potential for Hydrological Rehabilitation =>** Both the CIMTROP and CKPP initiatives have constructed dams to block canals with varying success. Dams constructed are typically composite dams consisting of gelam poles filled with either sand or peat. Problems include overtopping (water flows over the top of the structures), seepage (water flows through and around the structures) and destruction of dams through community action to bypass the dam or storm water flows. Data from monitoring conducted by CIMTROP show the dams have a positive impact on groundwater levels near to canals but as yet there is no data on the impact of dams more than 500m from the canal side. Further piloting of different structures is required combined with hydrological monitoring and research up to 1km or more from the canal sides. More dams are also required in addition to the ones already constructed to reduce head differences to 0.2-0.3m between dams. The Master Plan Guideline on Canal Blocking presents proposed design modifications and more detail on this issue.

### **Reforestation and Forest Rehabilitation**

An estimated 400,000 ha of peat more than 1m deep is now without forest cover and much of this needs to be reforested as part of the peatland and forest rehabilitation intervention. An additional 130,000ha of shallow peat (0.5m-1m) without forest could also be targeted for reforestation, although part of this area is likely to be used for agriculture by local communities.

**Enabling natural regeneration and succession to proceed is the most cost effective and important approach to reforestation, which requires wildfires to be eliminated from the area.** In the absence of fire, parts of the EMRP peatland area regenerate naturally, especially through pioneer species such as tumih (*Combretocarpus rotundifolia*) and gelam (*Melaleuca cajuputi*)<sup>5</sup>. An IPB study at Kalampangan close to a remnant forest area found that although the seed bank was destroyed, wind-dispersed tumih regenerated four months after the 1997 fires and by 2004 a total of 103 species were found in their one-hectare study site.<sup>6</sup> The study expected tree biomass to recover within 30-40 years but full floristic recovery would take more than 100 years, and perhaps even several hundred years. Promoting natural regeneration should be the initial focus for reforesting much of the 400,000ha of deeper peatland (>1m depth) now without forest.

**Given the regeneration barriers that exist and utility of trees for agro-forestry and other uses, reforestation through tree planting will be needed in the area.** In general, forests in the area have a range of regeneration barriers: the absence of seed in the soil (the seed bank), reduced seed dispersal, competition, fire and soil nutrient availability. Repeated fires lead to peat loss and local changes in flooding depth and duration, and different species assemblages are adapted to these conditions. Although natural regeneration does occur, tree planting will be needed in (a) highly degraded areas that are not regenerating successfully, (b) in priority areas for biodiversity where enrichment of regenerating stands with certain PSF tree species is valuable and (c) in

<sup>5</sup> Gelam occurs on mineral soils, and shallow to moderately deep peat.

<sup>6</sup> Simbolon, H., S. Kahono, T. Artiningsih, D. Girmansyah & A. Sadeli (2003) – Hutan Gambut Kelampangan, Kalimantan Tengah Pasca Kebakaran: Monitoring keadaan hutan, jamur dan serangga perombak dan penyerbuk. Laporan Perjalanan Lapangan, 27 Mei-8 Juni 2003, Bogor 14 pp.

and near villages where trees can provide livelihood opportunities and an incentive for peatland rehabilitation. In reforestation programmes, conditions of each site need to be understood so that appropriate species (and species-groups) are selected: blanket approaches are inappropriate. In most cases, using indigenous pioneer species appear most successful.

**Experiences and Potential for Reforestation =>** A recent review of peat swamp forest restoration and replanting attempts in Southeast Asia (Giesen, 2004) showed that experience in the region was limited and that the largest and most successful trials were outside Indonesia. Over the past few years, however, various PSF restoration trials have been carried out in Central Kalimantan under the STRAPEAT, RESTORPEAT and CKPP projects by CIMTROP and various NGOs (Wetlands International, WWF, BOS Foundation). At the same time, the Forestry and Agriculture departments of Central Kalimantan have also been involved in replanting programmes, most notably under the Gerhan programme.

All replanting trials in the EMRP area have used only a limited number of species, often planted in single-species groups rather than in mixed assemblages, which will lead to artificial monocultures and potential pest problems. Also, the replanting trials have not recognised differences in hydrology and natural succession between areas to be replanted and have taken a similar approach in all greening areas. Lastly, monitoring of seedling survival in greened areas has been variable, varying from zero monitoring to monthly monitoring. Monitoring is vital, as this provides information about survival, guides species choice, and will provide valuable lessons about the success or failure of planting methodologies. Further details of reforestation in the EMRP including species selection and approaches are provided in the Master Plan Technical Reports on Forestry and Biodiversity.

### **Community Development in Peat Areas**

---

The peat areas present specific issues for community development in addition to general issues discussed in Challenge 6 below. The peat areas are predominantly inhabited by Dayak communities living along the main rivers bordering the peat domes in the EMRP area. In general, these communities have traditionally used the peat swamp forest and its waters for a range of timber and non-timber forest products such as rattan, fish, *gelam* and *gemor*. Local rice varieties were planted in suitable areas either in mineral or shallow peat areas using shifting cultivation that created limited disturbance of the ecosystem. Increased access and the extensification of rubber and other crops are now leading to more of the deeper peat being brought into cultivation. Furthermore, a number of transmigrant communities also live close to and on peat, especially in Block C (Kalampangan, Pangkoh and Paduran Sebangau), Block B (Jabiren Seberang) and Block A (Lamunti). In these areas, permanent agriculture is leading to the visible loss of peat through oxidation. Ultimately, agriculture in these areas may be unsustainable as eventually peat in these areas will be lost.

**Experiences and Potential for Community Development in Peatland Areas =>** Experiences of pilot projects in the area show that a community-based approach to peat rehabilitation is critical to the success of interventions. Village-based participatory planning is important and has been developed by CKPP (Care) in 25 villages. Planning in peatland areas will need to focus on how to minimize and mitigate unsustainable practices (e.g. deep drainage canals and ditches) and the sustainable management of peatland and its water resources (e.g. community involvement in the planning and construction of dams, promotion of sustainable agricultural practices). Pilots of reforestation programs based on Payments for Environmental Services (e.g. CIMTROP Buy Living Trees, CKPP Biorights) have also been piloted, where communities are rewarded financially for successful reforestation outcomes.

A number of social challenges exist in the peat areas including: a broad range of people use the canals for transportation, which will require detailed participatory planning and negotiation of canal blocking in different areas; land tenure and boundary issues need resolving, requiring community mapping for resolving disputes; communities may wish to construct drainage canals for rubber and other crops, which can have negative impacts on the peat; and new transmigrant farmers may have limited knowledge of effective ways of farming in peatland. The main goal here is to encourage more sustainable agricultural practices that are beneficial to communities as well as the peatland.

### **Challenge 3: Conservation and Environmental Management**

About 555,000ha of peat swamp forest remains in a relatively good to slightly disturbed condition with high conservation value and includes: (i) the **Mawas peat swamp forest** (288,000 ha), which comprises the eastern half of Block E and the northern part of Block A; (ii) the **Kapuas-Kahayan peat swamp forest** (250,000 ha), which comprises the western half of Block E and the northern part of Block B. and (iii) the **Sebangau-Kahayan peat swamp forest** (roughly 17,000ha) at the northern end of Block C.

**Fire, illegal logging and plantation development are the main threats to conservation in these peat swamp forest areas.** Illegal logging occurs on a wide scale, especially in the western half of Block E and northern Block A, but also in the Mawas area (eastern Block E). Log rafts are a common sight on the main canals, as are small sawmills and camps. Plantation development threatens about 25,000 ha of existing forest in Block B with two licenses that are located predominantly on deep peat and on land with forest cover. See Annex 12 for details.

**Mangroves in the south of the area are rich but threatened by tambak development.** The Kiapuk (7,500 ha) area has mixed, diverse mangroves abundant in wildlife, while the Sebangau South (15,500 ha) mangrove area, although disturbed, is rapidly regenerating and important for migratory wader and other birdlife. Tambak (brackish-water fishponds) have been developed in mangrove areas between the Sebangau and Kahayan Rivers and are expected to expand further. Most development occurs without prior plans or studies, and is carried out on the basis of trial and error. Tambak development forms the key threat to remaining mangrove biodiversity.

Environmental management in the area is beginning to address the key issues but needs to be strengthened to ensure effective outcomes. While there is awareness about the importance of environmental issues in the area including peatland management, there remains a lack of detailed knowledge amongst government agencies about environmental management needs. For example, EIAs (ANDAL) produced to assess the impacts in peatland areas do not address the likely environmental impacts on the peatland system. Despite this, there is growing interest in improving environmental management including the development of a provincial Green Government Policy.

**Experiences and Potential for Conservation and Environmental Management =>** A number of conservation initiatives exist in the area: BOS and BKSDA are working to preserve the Mawas area (eastern Block E), which requires its formal status to be clarified; the Sebangau National Park Agency (*Balai Taman Nasional*) and WWF are working together in the Sebangau National Park to the west of the EMRP area; and CIMTROP manages the Sebangau Natural Laboratory Research area and a site in the north in Block C.<sup>7</sup> Development of further partnerships and support for these organizations, including strong community partnerships in the Mawas and Sebangau areas, is required in order to improve conservation outcomes in the area. Strengthening environmental management including the EIA (ANDAL) process with a direct consideration of environmental impacts of development in peatlands is required.

<sup>7</sup> CIMTROP was formed as a focus for international cooperation on peatland research at the University of Palangka Raya and since the mid-1990s has collaborated (amongst others) with the Universities of Nottingham (UK), Leicester (UK), Wageningen (Netherlands) and Hokkaido (Japan) as well as IPB and UGM.



## Challenge 4: Agriculture

---

About two-thirds of the total EMRP is dominated by peat while the mineral areas have extensive areas of (potential) acid sulphate soils, which create significant challenges for agriculture. Sustainability of agriculture in the EMRP area depends largely on proper management of these biophysical assets (i.e. the 'wise use' of peatland and improved management of land and water resources) and proper investments in human assets (e.g. agriculture, education and health services). The challenge is to identify specific rural development needs and opportunities and to focus investments in areas where there greatest impact will be achieved.

### Strengthening Farm Systems and Agricultural Development

---

#### *Rice-based Farm System*

**The current biophysical conditions in the rice producing areas (mostly Block A and Block D) are marginally suitable for rice production.** Currently about 110,000 ha is planted with rice with average yields of 1.5-2.5 tons per hectare, although some farmers using high yielding varieties and appropriate inputs achieve 3.5 tons per hectare. Key issues for rice-based farm system in the area are (i) low yields (especially as a result of poor biophysical conditions and poor land and water management practices), (ii) small farm size, (iii) limited farm diversification, and (iv) the absence of adequate local markets for agricultural products.

**A strategy of optimization and intensification of existing rice producing land to increase rice yields has the greatest potential for success.** Large increases in rice production through expanding the area of rice under cultivation is not a promising strategy due to the bio-physical limitations of the area, especially considering that current schemes are not performing well. However increasing yields in existing rice producing areas is more feasible. This will require attention to land and water management, and upgrading of agricultural (rural) infrastructure and support services, especially the extension services. Yields are low also due to poor soil fertility, but recommended inputs of lime (2000kg/ha/yr) and other fertilizers generally remain beyond the financial scope of most farmers. Strategies for increasing rice yields should also target local farming communities located inland near the peat. See Annex 13 for further details.

#### *Tree-based Farm Systems*

**Tree crop farming systems are important in the EMRP area and are linked to traditional Dayak and Banjar livelihood strategies.** Rubber (33,500 ha in the EMRP area) and coconut (24,500 ha) are well established and are linked to smallholder agriculture, while oil palm is emerging as an estate crop with potential for jobs and a possible access to a new market for smallholder farmers. At present, there is suitable land for oil palm (perhaps 100-200,000ha) in the EMRP area, however more permits have been issued than suitable available land (see p.25). In general, there are a number of competing interests for suitable agricultural land and the allocation of land for plantations requires revision.

**More farmers in the EMRP area are specializing towards tree-based and other cash crops.** With relatively low labour requirements (e.g. rubber, fruit trees and vegetables), these provide opportunities to seek off-farm diversification to secure income. In areas of block C, for example, where fire was typically used to prepare fields for rice and other crops, the fire ban has accelerated this trend along with increasing prices of rubber and other agricultural commodities. However, many farmers in the EMRP are constrained by lack of resources (e.g. land, finance and quality seed) to make the transition to cash crops.

**Low yields, access to markets and farmer skills are the key challenges for tree-based systems in the EMRP area.** The key challenges in the rubber farm systems are: (a) low yields due to the use of low yielding clones, old and less productive trees,

traditional management and poor tapping practices; (b) limited farm diversification; and (c) poor access to markets with farm gate prices controlled by middleman and rubber factories. For coconut farm system, the key challenges are: (a) low yields due to low external inputs and the dominance of old trees of the late-maturing variety; (b) limited primary product processing (e.g. copra); (c) inadequate farmer skills, and an extension program is currently lacking; (d) a lack of alternative enterprises; and (e) poor access to markets with coconut having to compete with oil palm.

#### *Livestock-based Farm System*

**The extent of the livestock-based farm system in the EMRP is limited to a number of the older transmigrant communities.** The system consists of livestock and horticulture crops and is found scattered in households of Basarang, Selat, Kapuas Kuala, Pandih Batu and Maliku sub-districts. Initial investments are high and without government support farmers do not have the financial capacity to buy livestock. No local breeding is done and all cattle are sold with new animals provided by the government.

**Prospects for livestock (cattle and chicken) seem good but need to consider how to integrate livestock into the traditional cropping systems.** Integration of livestock into existing rice based or tree crop farming systems is a potential option to increase household income, but farmers currently lack the knowledge and experience to make this transition. Research and local governments should address this opportunity to support farmers integrate livestock in their system. For peat areas, livestock can offer income without the need for extensive land use and drainage, assuming feed is readily available.

**Potential for Agriculture =>** Land and water management improvements are a pre-requisite for improving agricultural productivity. Assuming these are achieved, improving the skills of farmers remains a key issue. Current practices are based on local experiences, but the exchange of knowledge between farmers is limited. Farmer field schools linked to research networks and strengthening of extension services could be developed. This would also involve a reorientation of field research away from experimental plots to on-farm research.

Major investments in agriculture should be focused on the more fertile mineral soils of the area. Greater access to markets (through improved infrastructure) and better market information to farmers to ensure higher prices for produce are required. Intensification to improve yields in existing rice and tree-based farm systems and diversification of farm systems are strategies with the greatest potential for successful outcomes.

#### **Land and Water Management**

---

**Drainage management is the key to sustainable development of the EMRP area.** However, drainage in and near peat areas (and to some extent mineral areas) will bring about irreversible changes that conflict with peatland rehabilitation goals. The lowlands are dynamic landscapes and the sustainability of drainage schemes and reclamation projects is determined by present and future topographical relations of the land with river hydrology. Situations with poor drainage, both now and in the future, will lead to poorly performing reclamation schemes and the potential for increased flooding problems.

**As essential feature of land and water management in (tidal) lowlands is the capability of the water management infrastructure to maintain a proper soil and water quality through controlled drainage, flushing and leaching of acids and toxins.** Poor water management and stagnant water conditions are a problem in the EMRP area and current designs and water management practices are either not complete or not adapted to the principles of controlled drainage, leaching and flushing. Careful attention needs to be given to water management between the peat and neighboring agricultural areas that requires a hydrological landscape perspective to land and water management, planning and development. See Annex 14 for further details.

**Potential for Land and Water Management =>** Land reclamation is a long-term and dynamic process. Interventions and designs need to take future drainage and flooding into account and planning is needed at the landscape hydrological scale rather than just scheme level. Undeveloped land in and around agricultural areas, especially in the MRP transmigration sites of Lamunti, Dadahup and Palingkoh, needs to be brought into production and management: the proposed transmigration “refill” program can contribute positively towards this goal. However, conservation and development areas should be spatially separated, preferably with buffer zones between them. Successful development of existing transmigration areas is required to reduce pressures on forest and other peatland resources. Peatland rehabilitation and agricultural revitalization should be seen as part of an integrated lowland development strategy.

## Fisheries

---

Acidity, resulting from drainage canals across the peat domes, and saltwater intrusion into the rivers places limits on the development of fisheries in the area and sedimentation of rivers as a result of deforestation causes a decrease in fish stocks. As a result, aquaculture practices are often unproductive due to the inappropriate selection of sites. Illegal fishing activities such as electro-fishing create social conflicts and affect the long-term sustainability of the fishery. There remains a need to improve technical knowledge, access to finance and markets, and extension services from the Fisheries Agency. See Annex 15 for further details.

**Potential for Fisheries =>** Opportunities in the future include (a) freshwater aquaculture and brackish water ponds in coastal lowlands (*tambaks*), freshwater ponds (*kolam*) and cages (*karamba*) located in the rivers with the Department of Fisheries hatchery in Pulang Pisau being an important asset for this, (b) expansion of traditional pond capture fisheries (*beje*) and (c) development of ornamental fish of peatland waters. Current capture fisheries (including *beje*) require fish stock assessments to be undertaken along with community engagement programs to avoid unsustainable exploitation of the fishery. In general, an integrated plan for fisheries development is needed (for example, conversion of mangroves for shrimp and milkfish negatively impacts mangroves and offshore fisheries) along with capacity development of the Fisheries Agency. Further details are provided in the Master Plan Technical Report on Fisheries.

## Challenge 5: Community and Socio-economic Development

---

Communities in the EMRP area have many positive assets: traditional (*adat*) laws, traditions and leadership (e.g. the *damang* in Dayak communities); mutual help and social cohesion; traditional knowledge of the peatland and forest environment; and diverse farming systems and household livelihood strategies. These form the basis for providing assistance for community and socio-economic development. However, communities in the EMRP also face a range of problems and constraints on their development.

Consultations and workshops with community representatives at sub-district and district levels identified four main issues:

- **Locally weak institutional relationships:** From the village upwards, local people are poorly represented in terms of policy and decision-making. There is a major need to strengthen village institutions and community representation and participation at the sub-district, district and provincial levels and clarify the role of the village institutions at the community level. A particular issue concerns the forty-three transmigrant communities in Dadahup and Lamunti that still have the status of Transmigrant Settlement Unit (UPT); these need to become “definitive villages” and formally become part of Kapuas district.

- **Poor supportive infrastructure and services:** Rural infrastructure including transportation and basic services including health, education, agricultural (including forestry and fisheries) extension, business development and financial services all need upgrading and improving.
- **Lack of producer (including farmer) groups, associations and cooperatives:** These groups need to be formed through the work of village facilitators to support communities in terms of developing agriculture, processing of products and value chain addition, and accessing markets and finance.
- **Lack of secure land tenure:** Land tenure issues, especially for local communities, requires to be addressed.

In order to improve local livelihoods and reduce poverty, issues regarding social, institutional and economic isolation and lack of power need to be addressed. These issues are difficult for communities to address on their own and require specific support from government.

**Programs need to focus on the four core issues, but need to be adapted to the socio-economic context of the communities in the area.** Based on socio-economic conditions, the Master Plan makes an important distinction between (a) Dayak communities, living mainly in upstream semi-tidal to non-tidal river areas, (b) Banjarese communities, mostly along the downstream, tidally affected parts of the rivers and (c) transmigrant communities living in the swamp interiors. There are significant differences between each community, in the specific issues that affect them and in the details of interventions that need to be developed. Further details can be found in Annex 16.

**Potential for Community and Socio-economic Development =>** On-farm and off-farm livelihood diversification strategies to reduce risks are common in the EMRP area. There is a clear trend away from rice cultivation towards tree crop farming and vegetable growing. The provincial policy on zero burning has accelerated this process. Village development visions include (a) to increase tree crop farming: rubber, rattan and fruit trees; (b) to increase food self-sufficiency; (c) good market access through road improvements and strengthened marketing networks; (d) good access to health and education services; (e) rehabilitation of secondary canals; (f) farming skills and strong farmer organizations; and (g) strong partnerships with government and other partners who can support agricultural development.

## **Challenge 6: Institutional and Organisational Capacity**

The rehabilitation and revitalisation of the EMRP area is an immensely challenging program that requires integration and an innovative collaborative response from government, donors and NGOs.

**An effective institutional mechanism from Jakarta to Palangka Raya and through to the villages needs to be established.** The existing institutional framework is based on the policies covering regional autonomy, specific sectoral policies and Inpres 2/2007. The establishment of the National Team for Inpres 2/2007 and the three working groups (*Pokja*) provides the potential for the development of an integrated response, which needs to be assured through effective planning, monitoring and evaluation (through a Standard Operating Procedure for integrated implementation of Inpres 2/2007) and the establishment of a supportive institutional mechanism from Jakarta to the villages. In Palangka Raya, a secretariat staffed by full-time professionals is required to drive an integrated response with the coordinating teams at the province and district levels. Sub-districts (via the Camat) and villages (via village leaders) need to be a focus for action in the field and can play a key role in supporting an integrated and participatory approach.

**The technical knowledge base needs further development with a strong emphasis on monitoring and understanding outcomes.** Work undertaken by the Master Plan team has established that the knowledge base for successful rehabilitation and

revitalization of the EMRP area remains limited. Basic inventory data is required, especially on topography, hydrology, peat characteristics, characteristics of PSF tree species and land suitability. Current knowledge of the functioning of the tropical peat ecosystem, while having advanced in the last 10 years, remains far from complete. Basic and applied research, especially relating to peat rehabilitation and carbon, remains needs to be completed. International, national and local expertise, especially from the University of Palangka Raya, needs to be mobilized to support development of this knowledge base.

**Local government and NGO capacities need to be stretched to cope with the potential interventions and new approaches that need to be initiated.** Rehabilitation and revitalization of the EMRP area will require local organizations to acquire new knowledge and build capacity for the implementation of programs. Within government training institutions, there is limited capacity to train staff in lowland and peatland management, which therefore requires upgrading. International and national expertise on peat and lowland management issues and training capacity should be mobilized and development of key government training institutions and the University of Palangka Raya should be a priority for increasing knowledge and skills in local government, NGOs and communities.

**Potential for Institutional and Organisational Development =>** Building on the current national, provincial and district institutional arrangements, institutional mechanisms for implementation should be developed including (a) sub-district teams (via the Camats) with village representation and (b) village teams and groups supported by external community facilitators. To support this, a fulltime Secretariat for Inpres 2/2007 and a Technical Facility should be established in Palangka Raya that can service the needs of GOI as well as donor and NGO projects in the area. A capacity building platform could be associated with this. A commitment to joint planning, review and evaluation through established procedures such as the *Musrenbang* and *Rakorbang* can help integrate and improve interventions (a) between sectors, (b) between Inpres supported and regular programs, and (c) between GOI, donor and NGO initiatives.

## Challenge 7: Climate Change

---

Climate change should become an integral part of all planning in the EMRP area. Climate change will most likely affect Indonesia and the EMRP area through longer dry seasons and an increase in frequency of floods.<sup>8</sup> Indeed, analysis of historical rainfall data for the EMRP area suggests that rainfall has already decreased in the dry season. Climate change may therefore lead to an increase in fire risk and will affect agriculture. Although climate change is a global issue it needs to be addressed locally. There are two basic approaches to deal with this: (a) mitigation through reducing emissions and (b) adaptation to the expected impacts of climate change.

**Successful rehabilitation and revitalization of the EMRP can make a significant contribution to climate change mitigation.** At present, drained peatlands in the area may emit in the order of 40 to 80 Mt/y of carbon dioxide per year, about half of which is caused by fires and half by peat oxidation.<sup>9</sup> This could further increase to over 100 Mt/y if more peat is drained (for oil palm plantations), or it could be greatly reduced (to below 40 Mt/y in the short term, more in the longer term) if the peatlands are rehabilitated including blocking of all canals. Conservation of peatlands and forests (which store carbon), and fire prevention (which prevents the emission of carbon) are given a high priority in this Master Plan.

**Real incentives need to be developed to mitigate the risk of such emissions.** Carbon finance mechanisms such as REDD (currently under development), CDM (which

---

<sup>8</sup> PEACE (2007) Indonesia and Climate Change: Current Status and Policies.

<sup>9</sup> See Master Plan Technical Report on Peatland Subsidence and CO<sub>2</sub> Emissions.

as yet has no approved methodology for tropical peatlands), and “voluntary” carbon emission reduction schemes could make peatland rehabilitation economically attractive and provide a significant source of income for the region. Strong support and action from the Government to develop these mechanisms through pilots and other initiatives would be a strategic means of achieving the goals of Inpres 2/2007.

**With livelihoods so strongly rooted in climate sensitive sectors (agriculture and fisheries) adaptation will also have to be considered.** It is projected that sea levels will rise in this century by 0.2 - 0.6 meters<sup>10</sup>. This will increase flooding along the coastal zone by 2050 (assuming a 20 cm rise in sea level) and saltwater intrusion in coastal areas, which will create problems with drinking water availability and tidal irrigation schemes. Future planning will need to take these issues into account.

**Potential for Responding to Climate Change =>** The EMRP area has been proposed by GOI as a pilot for REDD projects focusing on peatlands. At present, Australia has initiated the Kalimantan Forest and Climate Partnership focusing on 100,000ha of forested and degraded peatland in Block A and Block E; the CKPP consortium is planning a second project phase with a focus on carbon including mobilization of resources through Wetland International’s proposed private sector supported Global Peatland Fund; and a private sector initiative to establish a carbon project in 50,000ha of degraded peatland in Block C. With interest in such initiatives since the UNFCCC meeting in Bali in December 2007, other donors are also interested in exploring opportunities to support carbon-related projects in the area.

### 3.2 Future Scenarios

Given the range of challenges as well as the prevailing biophysical and social conditions in the EMRP area, the Master Plan considers three possible scenarios for future development. These are not predictions of the future but have been developed to shed light on possible consequences of present decisions. The three scenarios and their potential outcomes 25 years from now (2033) are discussed in turn and summarized at the end of each discussion (see also Table 2). Further details of how these scenarios were developed are provided in Annex 17.

#### **Scenario 1. There is no change in the current development paradigm**

In this scenario there is no more blocking of canals, no further issuance of plantation permits, no more transmigration, government services remain stable, no carbon finance programs are implemented and fires continue at current frequencies with major fire outbreaks every 10 years (associated with the El Niño phenomenon).

**Outcomes** - By 2033, the population of the EMRP reaches approximately 630,000, land use remains suboptimal due to land and water management problems and is dominated by smallholders who by 2033 will have used up most of what currently remains of idle land. Fire outbreaks occur at current levels within a ten-year cycle, and peat subsistence continues. Illegal logging in forests continues with a resulting reduction in locally needed forest products. Flooding becomes an increasing problem and the EMRP area remains a net emitter of carbon through fires and peat subsistence. Poverty is not alleviated and emigration continues.

**Summary – A future of low growth and continued environmental degradation.** With this scenario there will be very slow growth in per capita income and poverty remains high. The area will remain a major source of global carbon emissions.

<sup>10</sup> Bappenas (2004) Sumber Daya Alam dan Lingkungan Hidup. Antara Krisis dan Peluang. Badan Perencanaan Pembangunan Nasional (BAPPENAS), Jakarta.

## **Scenario 2. Plantation development is implemented as currently planned**

---

Large parts of the EMRP area are converted to oil palm concessions, there is no peatland rehabilitation, population growth naturally increases. Market conditions and government services remain stable at current levels, no carbon finance programs are implemented, and major fires occur at on a ten year cycle (20 years for plantation areas).

**Outcomes** - The population of the EMRP area reaches approximately 630,000 by 2033. Small holder farms cover less land area than the scenario above. Approximately 400,000 ha of the total EMRP area will be under plantations - mostly large oil palm estates. Land use will be suboptimal due to land and water management problems. Fires remain at current frequencies. Peat subsidence remains high in the peat areas drained for oil palm and near the MRP canals. Peat may largely disappear in the southern parts of their current distribution in blocks B and C. Illegal logging continues in peat swamp forests - meaning less forest and non-timber products for local communities. Flooding will greatly increase as peat subsides in the areas of peat with oil palm. Agricultural pest and diseases become a serious problem in the plantations. Carbon emissions continue at high rate - especially if fire is used for land clearance for plantations. Although emissions might be reduced to a small extent by growing oil palm, these limited gains will be offset by the much greater emissions of carbon from the oxidizing peat. Regional economic growth will be largely dependent on the price of oil palm. Total tax revenues could be in the region of USD 70-80 million per year from the oil palm but the direct revenues for the province and districts would be in the region of USD 2 million dollars. These earnings could be offset by the need to build addition infrastructure to deal with the increased flooding caused by the loss of peat. Up to 60-100,000 low wage jobs could be created, but the risks regarding income (based on the reliance on CPO prices) would be higher than the diversified strategy farmers currently adopt.

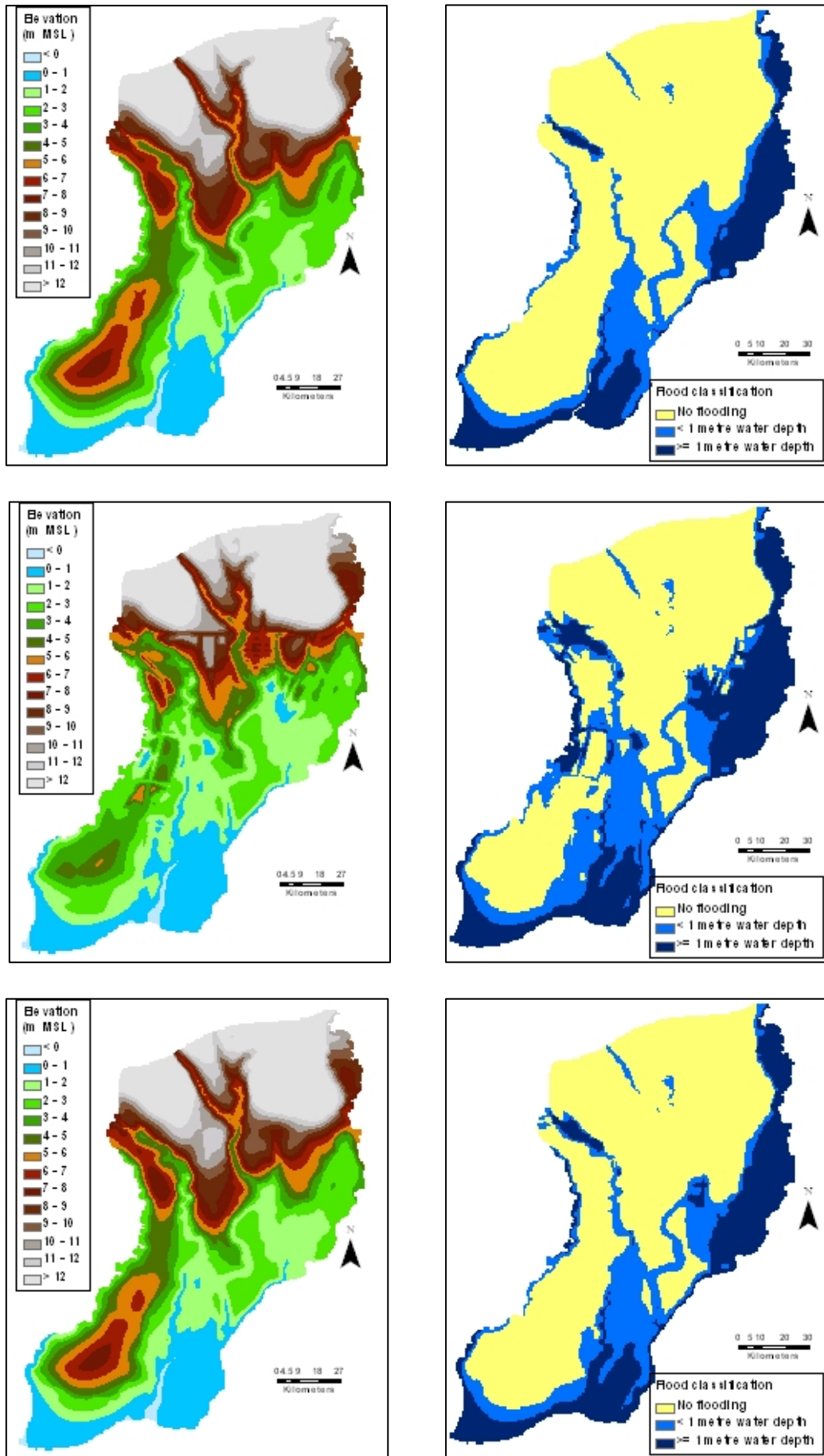
**Summary** - **This scenario may produce high growth in the medium term but at a higher economic risk in the longer term and with negative environmental impacts on the peatland.** The livelihoods of tens of thousands of people who work on plantations are dependent on continued high commodity prices and lack of pest invasions. Negative impacts on the peatlands and local hydrology are unacceptably high. Within decades, the productivity of many oil palm plantations in peatlands may be reduced by increased flooding caused by peat subsidence. Carbon emissions remain high.

## **Scenario 3. Peatland Rehabilitation and Agricultural Revitalisation**

---

Peatlands and their forests are rehabilitated, water levels are raised so that peat subsistence eventually stops, tree crop plantations are established on suitable shallow peat areas, population growth increases naturally and carbon finance schemes are developed and implemented. Agricultural productivity improves - led by farmers and the private sector – doubling yields in 25 years.

**Outcomes** - Population reaches approximately 630,000 by 2033. Land cover includes large areas of regenerating forest along with oil palm (approx 100,000 ha) and other tree crop plantations (rubber, oil palm etc.). Land use is improved due to better management of land and water, which contributes to higher yields of rice in areas suitable for agriculture (ie. further away from peat swamps). Rehabilitation of peat swamps facilitate fire control resulting in a reduction in fires. Carbon emissions are greatly reduced through carbon financing schemes. Fire frequency and intensity are reduced and peat oxidation and subsistence reduced to low levels by hydrological rehabilitation ensuring long term sustainability.



**Figure 9:** Results of scenario analysis for elevation (left) and flood risk (right). The top figures show the current situation; the middle figures show the possible outcome of the plantation scenario analysis in 50 years; the bottom figures show the possible outcome of the rehabilitation and revitalisation scenario analysis in 50 years.



Annual economic growth averages 5% and is driven by higher yields based on the revitalization program spread over a range of commodities. Around 15-25,000 new jobs are created, especially in the plantation sector but positive impacts on poverty are mostly as a result of the higher yields and better marketing opportunities. Carbon financing (due to rehabilitation of forests and fire control) brings in revenues in the region of USD 50-100 million dollars per year or more, which are shared between government, communities and carbon project proponents.<sup>11</sup> Carbon projects could employ several thousand people in fire protection, water control, and reforestation etc. Household incomes rise due to improved agriculture and carbon revenues, improved infrastructure (through carbon financing) and poverty rates will be reduced.

**Summary – The scenario produces a balanced, sustainable development outcome.** The economy grows, poverty is reduced, environmental services are sustained, and carbon emissions are reduced.

**Table 2:** Comparison of the Summaries of the Three Future Scenarios

Parameter	Scenario		
	No Change	Plantations	Rehabilitation / Revitalisation
<b>Land Use</b>	Smallholder farms & degraded peatland	Widespread oil palm with smallholder agriculture with degraded peatland	Mixed land use of regenerating forests, timber / agro-forests and revitalized agricultural land
<b>Environmental Goods and Services</b>	Flooding problems and continued carbon emissions	Flooding problems linked to subsidence in plantations and higher long-term carbon emissions	Limited flooding problems, forests recovering and with large reduction in carbon emissions
<b>Regional Development Summary</b>	Limited economic growth	Potentially high economic growth but with higher risk	Good economic prospects augmented with carbon finance
<b>Poverty Alleviation</b>	Poverty remains a chronic problem	Poverty alleviation possible but linked to price of oil palm and performance of companies	High potential for poverty reduction through increased yields and employment
<b>Summary</b>	<b>'Low growth and continued environmental degradation'</b>	<b>A 'high growth, higher risk strategy' with negative environmental impacts and potential poverty reduction</b>	<b>A 'balanced development strategy' with positive environmental impacts and poverty reduction</b>

<sup>11</sup> This estimate is based on estimated current emissions from the EMRP area of 40-80 Mt/yr of carbon dioxide (roughly 11-22 MtC/yr). Assuming emissions reductions of 50% from interventions and a carbon price of USD10 per ton of carbon, this is equivalent to USD 50-100 million per year. For more information on the estimate of carbon emissions, see the Master Plan Technical Report on Peatland Subsidence and CO<sub>2</sub> Emissions.

## 4 Strategy for the Rehabilitation and Revitalisation of the EMRP Area

The analysis of three future scenarios – supported by the feedback during consultations with stakeholders - indicate that “rehabilitation and revitalization” is the most positive future for the EMRP area, reinforcing that the issuance of Inpres 2/2007 was a highly appropriate policy decision. Consultations conducted with stakeholders support this, but while these have highlighted agreement with the aims of Inpres 2/2007, stakeholders have consistently raised concerns regarding the Annexes of Inpres 2/2007 and have proposed that these Annexes be revised.

This section develops a strategy for rehabilitation and revitalization of the EMRP area based on the existing situation, challenges and potentials and Inpres 2/2007. As requested by Government, the Master Plan uses Inpres 2/2007 as a key reference but uses the information and analysis developed during the Master Plan to propose a refined strategy. The section concludes with a summary of proposed refinements to the Annexes of Inpres 2/2007.

### 4.1 Goal and Strategies for Rehabilitation and Revitalisation

The proposed long-term management goal for the EMRP area is to:

***“Create long-term prosperity for the local population through the restoration of the area’s ecosystems, developing appropriate infrastructure and services, and providing an enabling environment for increased productivity of agriculture”.***

This goal has a three-pronged strategy as illustrated in Table 3. It is anticipated that achieving long-term sustainable management of the EMRP area will take more than five years. The strategy for rehabilitation and revitalization presented here should be considered as an initial phase during which important steps can be taken and lessons learnt.

**Table 3:** Lead Strategies and Types of Interventions.

Lead Strategy	Types of Interventions
<b>Rehabilitate and conserve forests and peatlands</b>	Construct water resource management infrastructure (dam blocking etc), buffer zone development, reforestation, improved fire management, limited large scale plantation development
<b>Provide enabling environment for increased productivity of agriculture</b>	Provide reliable electricity to support the developing of processing industries, build and rehabilitate trunk roads to improve access to markets, provide farmers with access to low cost credit and microfinance services, implement “one village-one extension worker” strategy.
<b>Support provision of basic infrastructure and services</b>	Build access roads, increase provision of piped water and basic sanitation, upgrade health and education services,

#### **Medium Term (Five Year) Goals for Rehabilitation and Revitalisation**

- Eliminate wildfires from the area.
- Establish detailed spatial plans, effective systems to manage spatial development and develop macro-infrastructure.
- Rehabilitate and conserve existing peatland and forest resources.

- Increase agricultural productivity in the area through intensification and diversification of farming systems and limited development of new agricultural areas.
- Reduce poverty through community empowerment and socio-economic development.
- Establish an effective institutional basis and capacity to rehabilitate and revitalize the EMRP area and achieve long-term sustainable management of the area.

#### Short-term Priorities for 2009

- Manage and mitigate risks especially fire.
- Resolve outstanding or potential conflicts regarding the draft provincial spatial plan (RTRWP) and oil palm plantation expansion.
- Develop the knowledge base, approaches and detailed plans for the achievement of the medium term goal.
- Review, continue and initiate new projects for rehabilitation and revitalization.

#### Master Planning in Inpres 2/2007

Inpres 2/2007 instructs three Master Plans to be produced for the Conservation, Agriculture and Community Empowerment programs, respectively. By October 2008, only the Master Plan for Rehabilitation and Conservation has been completed (see Box).

#### BOX: Master Plan for Rehabilitation and Conservation

In 2007, the Department of Forestry completed a Master Plan for the Rehabilitation and Conservation of the EMRP area (Permen 55/Menhut-II/2008). The Master Plan considers three periods: (i) 2007-2011 to improve structure, (ii) 2011-2017 to rehabilitate function, (iii) 2017 onwards for long-term management.

The goals of the Master Plan are: (1) Protection of forest and establishment of boundaries according to function and (2) Forest rehabilitation and ecosystem restoration on the context of revitalization.

The Master Plan for Rehabilitation and Conservation has three main *demand-driven* principles:

1. Confirmation (*pengukuhan*) of the forest area that will be delineated must be completed *after* allocation of other land uses with commitment and support for the agreed forest land allocation;
2. The presence and recognition of communities living based on customary law (*adat*) shall be seen as an integral part of the conservation of the area, and in the process of confirming the forest area and its status as state forest (*hutan negara*), forest under rights (*hutan hak*) and/or customary forest (*hutan adat*);
3. Conservation of the EMRP area will prioritise "access tenure" over "land tenure".

#### Target Area and Villages of Inpres 2/2007

The Master Plan recommends the programs under Inpres 2/2007 are targeted at all 187 villages within the EMRP area and 40 villages in the surrounding areas of Sebangau, Palangka Raya, Kahayan, Block E and to the east of the Kapuas River to the provincial border (see Annex 18 for details). As an area-based regional development initiative, Inpres 2/2007 will have greater impact if these additional villages are included. Programs will need to be adapted to the specific needs and socio-economic conditions in the villages.

## 4.2 Key Principles for Implementation

In translating strategies into management interventions and programs, several key principles will be adhered to:

#### **Principle 1: Adaptive Management**

Adaptive management promotes a process of "learning by doing" and integrates planning and design with ongoing monitoring, assessment and evaluation. It is neither possible nor desirable to provide a "blue-print" for implementation of the Master Plan. During implementation lessons will be learned as to what works and what does not and these

lessons should be included in future planning. Decisions on the course to follow will be based on scientific findings, monitoring data, and feedback from local people.

**Principle 2: Adoption of an Integrated Approach**

Implementation of the Master Plan will be complex and will involve a large number of sectors, each with its own interests and responsibilities. A major challenge will be to integrate and harmonise these needs so as to reduce any conflicts and to maximise synergies.

**Principle 3: Planning and Implementation at a Landscape Ecosystem scale**

The different parts of the landscape should not be considered in isolation, but as integral components of a complex landscape mosaic, with each part having effects on its neighbours. The rehabilitation and revitalisation program needs to take a resource-based approach to lowland management.

**Principle 4: Meaningful Involvement of Communities**

Communities in the EMRP area should aware of and have a voice and role in planning for their environment and the development of their respective areas. Feedback from local communities is essential to measure the effectiveness (or not) of interventions and will serve to constantly improve planning and future actions. Community rights including traditional land rights need to be identified and respected.

### 4.3 Spatial Zoning of the EMRP Area

Spatial zoning is a key aspect for management of the area. The Master Plan defines two levels of spatial categories - Management Zones and Management Units.

#### Management Zones

---

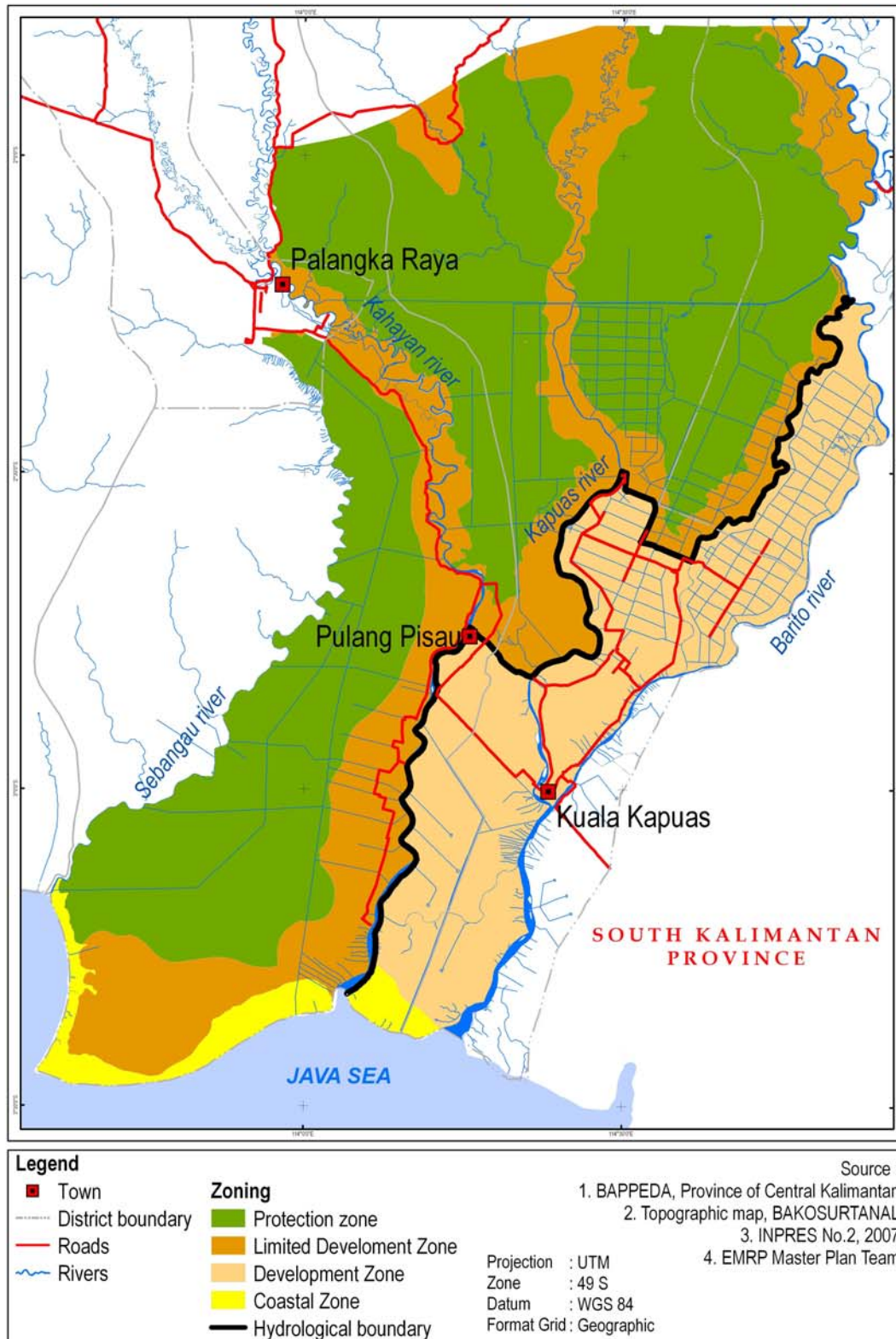
Management Zones recognize that peat and lowlands need to be managed at a landscape level and are based on natural hydrological boundaries. The natural hydrological boundary that separates the peatland and predominantly mineral areas runs from the mouth of the Kahayan River to Anjir Kalampan, up the Kapuas River and through block A to the Barito River (Fig 10, black line). Further details of the definition of the management zones are provided in Annex 19. The EMRP area has four kinds of Management Zones:

**1. Protection Zone (*Kawasan Lindung*) - 773,500 ha.**

This zone is defined by combining the deep peat (>3m) and areas with high biodiversity value. The first priority in this zone is to conserve the remaining forest and peatlands by strong action against illegal logging and fires, and, where deforestation has taken place, through rehabilitation. Drainage should be minimized or stopped altogether. Where drainage canals exist, canal blocking will be needed. Intact forests in this zone may qualify as conservation areas.

**2. Limited Use Buffer Zone (*Kawasan Penyangga Budidaya Terbatas*) - 353,500 ha**

This zone is effectively an interface between the protection zone and the agricultural development areas defined by the hydrological boundary (black line, Fig. 10). This land surrounding peat domes with a peat depth of less than three meters needs to be managed by limiting drainage. The zone also includes the strip of mineral soils near to the rivers where mostly Dayak communities live. Interventions in Buffer Zones can only be done if they do not conflict with the functions of the protection areas and the regional hydrology. Large-scale developments requiring drainage such as oil palm plantations and transmigration are not recommended for this zone. Smallholder, principally tree-based agriculture is practiced by Dayak, Banjar and existing transmigrant farmers in this zone: support should be provided to assist farmers in limiting the hydrological and other negative impacts on the peat (e.g. how to curb/limit canal and ditch construction, land clearance by fire).



**Figure 10** - Proposed Management Zones for the EMRP. The Conservation Zone (green) is made up of (a) deep peat protected areas and (b) biodiversity conservation areas. The Adapted Management Zone should have limited development that does not involve extensive drainage in the shallow peat areas.

**Box: Criteria for Development in the Limited Development Buffer Zone**

Laws and regulations in Indonesia define that peat more than 3m in depth should be protected and conserved. However, this boundary is not a natural boundary and peat less than 3m deep still forms part of the peat dome and is hydrologically linked to the deeper peat. Peatland rehabilitation and 'wise' sustainable use of peatland therefore requires careful management of peat less than 3m deep, which in the EMRP area covers about 450,000ha of the area.

Given that peat less than 3m is not legally protected, the Master Plan proposes a limited development buffer zone. Within this zone large scale development, especially in peat over 1m should not occur if the area's peat resource is to be managed sustainably. As a result, development that requires extensive drainage of the peat such as large-scale plantations and transmigration should be prohibited in areas with extensive peat over 1m depth.

Where communities already exist in this zone, such as Dayak communities living along the Kahayan, Kapuas and Barito Rivers and transmigrants in Pangkoh, Lamunti and other transmigration areas, support should be given to assist communities to utilize the peat resource sustainably. This will require action to limit and control drainage (depth and intensity of drainage canals, water control structures) and to minimize new drainage in deeper peat areas. A combination of village-based resource planning and extension can help with this. Overall, the aim is to minimize drainage and degradation of the peat in this zone, while enabling communities to make sustainable use of their resources. Further definition of criteria in this zone is required, which could form the basis for local legislation on this issue.

**3. Development Zone (*Kawasan Budidaya*) - 295,500 ha.**

This zone constitutes areas that are hydrologically independent of the peat domes and that have no associated biodiversity value. The zone has no significant peat deposits and is dominated by mineral soils, so development for large scale agriculture, plantations, animal husbandry and fisheries can be the priority policy goal.

**4. Coastal Zone (*Kawasan Pesisir*) - 40,000 ha.**

This zone is comprised of mangrove forests and other coastal land cover in the southern part of the EMRP area. Mangroves are important for sustaining commercial offshore fisheries and mitigating coastal erosion. Some have high biodiversity values. Mangrove forests in good condition and those that are regenerating have been proposed for conservation. Highly degraded areas could be considered for semi-intensive aquaculture.

## **Management Units**

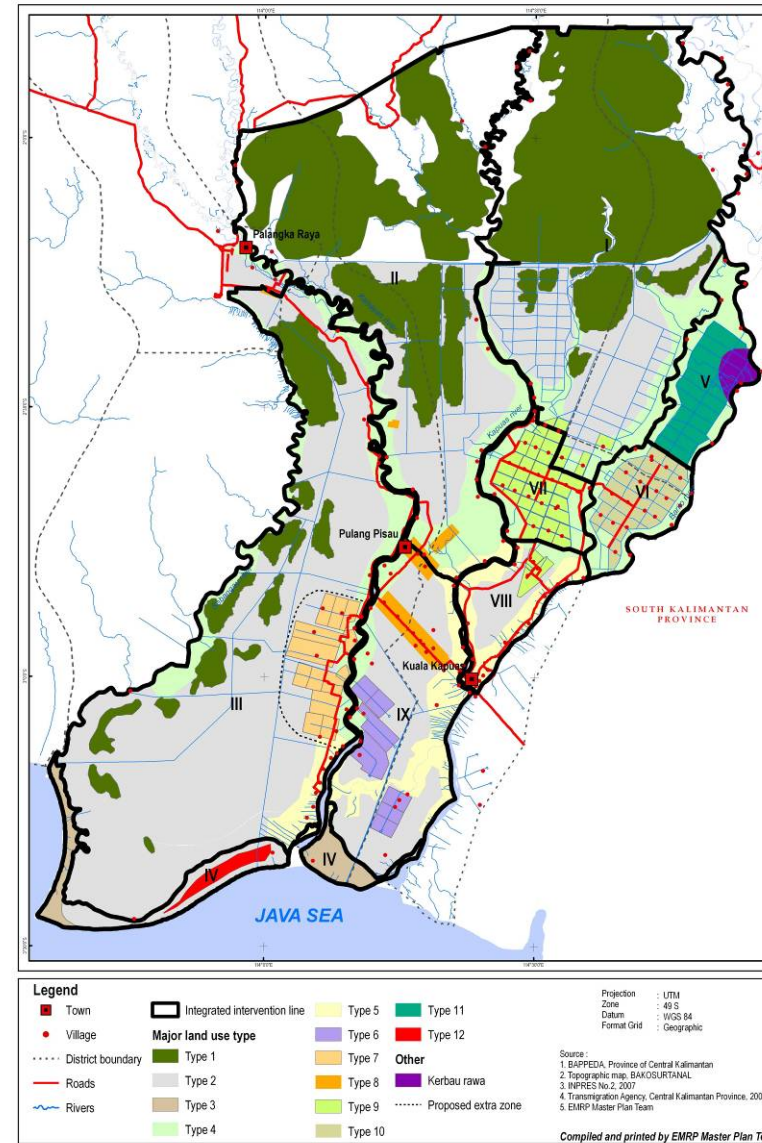
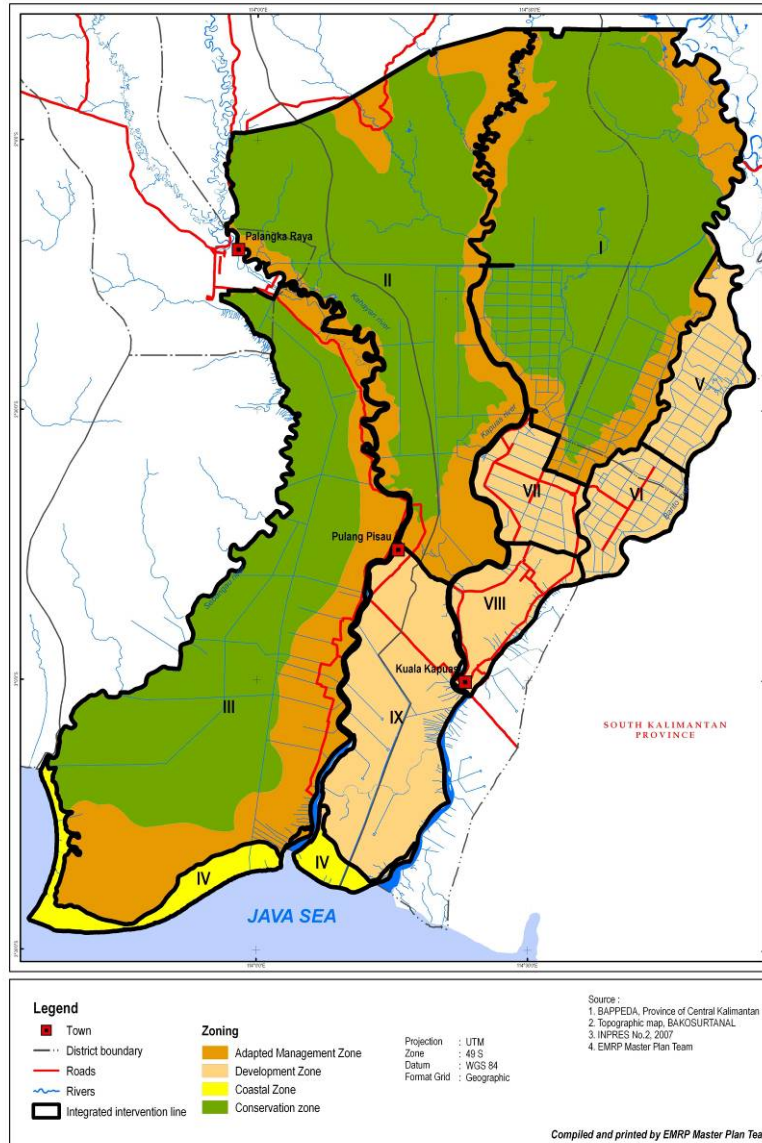
Management Units are areas within the Management Zones that have similar bio-physical and socio-economic conditions and which require integrated management to achieve the overriding policy goal. Further details of the management units are provided in Annex 20.

In the Protection Zone and Limited Use Buffer Zone, the Management Units are defined by the hydrological boundaries of these combined zones: hence 'protection' and 'limited use' is managed within a single unit. Management Units in the Development Zone are delineated in accordance with bio-physical and socio-economic factors. The Coastal Zone is a single management unit. In total, nine management units are defined (Table 4, Figure 11):

- Management Units I-III: Focus on peatland rehabilitation and revitalisation
- Management Unit IV: Focus on coastal rehabilitation and revitalisation
- Management Unit V-IX: Focus on agricultural rehabilitation and revitalisation

It is recommended that implementation of rehabilitation and revitalization of the EMRP area begins with detailed planning of interventions in each of the management units. Short-term priorities such as fire prevention and management should focus on the high fire risk areas in management units I-III. Rehabilitation and revitalization pilots could be initiated in a number of management units that represent the diversity of conditions in the area. Further details of the key issues in each management unit are provided in Table 4.

**Figure 11:** Proposed Management Units in the EMRP with (left) EMRP management zones and (b) major land utilisation types (see p. 24 for details of Major Land Use Types).



**Table 4: Management Units in the EMRP Area and the Main Interventions.**

Unit	Location	Description	Major Land Use Types	Key Issues
<b>Protection / Limited Development Buffer Zones</b>				
I	Block A/E	Peat area between Kapuas, Mengkatip and Barito rivers, with indigenous communities settled along river banks, PLG transmigration Block A	<ul style="list-style-type: none"> <li>Dense (peat) forest</li> <li>Degraded / logged (peat) and lowland forest</li> <li>Shrub, grass and burnt land</li> <li>Plantations</li> <li>Dayak settlements</li> <li>PLG Transmigration scheme</li> </ul>	Peat and forest degradation (carbon emissions), drainage, fire, illegal logging; orangutan conservation; quartz sand quarries; land and (adat) resource rights poorly defined or disputed (e.g. forest conservation areas, ex-PLG lands); fires, especially along SPI and other PLG canals; isolation, poor market access and lack of village markets; low prices of agricultural commodities produced in the area; 'fire ban' for local farmers.
II	Block B/E	Peat area between Kahayan and Kapuas rivers, with indigenous communities along river banks, older transmigration Block B, oil palm permits	<ul style="list-style-type: none"> <li>Dense (peat) forest</li> <li>Degraded / logged (peat) forest and shrubland</li> <li>Plantations</li> <li>Shrub / grass land</li> <li>Dayak settlements</li> <li>(Proposed) Transmigration</li> </ul>	Peat and forest degradation (carbon emissions), drainage, fire, illegal logging; plantations and transmigration proposed in and near deep peat areas; quartz sand quarries; land and (adat) resource rights poorly defined or disputed (e.g. forest conservation areas, ex-PLG lands); fires, especially along SPI and other PLG canals; isolation, poor market access and lack of village markets; low prices of agricultural commodities produced in the area; 'fire ban' for local farmers.
III	Block C	Peat dome between Sebangau and Kahayan rivers, with indigenous and Banjar communities along river banks, older transmigration, oil palm	<ul style="list-style-type: none"> <li>Degraded / logged (peat) forest</li> <li>Limited dense (peat) forest</li> <li>Shrub, fern and grassland</li> <li>Plantations (rubber, palm oil)</li> <li>(Proposed) Transmigration</li> <li>Dayak settlement</li> </ul>	Peat and forest degradation (carbon emissions), drainage, fire, illegal logging; plantations and transmigration proposed in and near deep peat areas; land and (adat) resource rights poorly defined or disputed (e.g. forest conservation areas, ex-PLG lands); floods and fires; isolation, poor market access and lack of village markets (south and west of area); low prices of agricultural commodities; fire ban' for local farmers; poor land and water management arrangements.
<b>Coastal Management Zone</b>				
IV	Coastal Zone Block C/D	Coastal zone between Sebangau and Kapuas rivers, villages and tambak	<ul style="list-style-type: none"> <li>Dense (mangrove) forest</li> <li>Degraded (mangrove) forest</li> <li>Tambaks</li> </ul>	Hydrological restoration; mangrove conservation and rehabilitation; flood protection; water management; socio-economic development.
<b>Development Management Zone</b>				
V	Jenamas Block A	Ex-PLG area, uninhabited, with indigenous communities along river banks, swamp buffalo	<ul style="list-style-type: none"> <li>Degraded (lowland) forest</li> <li>Shrub, fern and grassland</li> <li>Traditional Dayak settlements</li> <li>Ex-PLG transmigration</li> </ul>	Severe flooding, unsuitable for agriculture and transmigration; mostly deserted transmigration area; – options for limited number of households needs reviewing; isolation, poor market access and lack of village markets; social / land rights; swamp buffalo ( <i>kerbau rawa</i> ) area.
VI	Dadahup Block A	Ex-PLG area, partly developed with indigenous communities along river banks	<ul style="list-style-type: none"> <li>Degraded (lowland) forest</li> <li>Traditional Dayak settlements</li> <li>Ex-PLG transmigration</li> </ul>	High poverty levels; isolation, poor market access and lack of village markets; low prices of commodities; fires and 'fire ban' for local farmers; slight to severe flooding in parts of the area; partly deserted transmigration areas; social / land rights.
VII	Lamunti Block A	Ex-PLG area, partly developed, with indigenous communities along river banks, oil palm	<ul style="list-style-type: none"> <li>Degraded (lowland) forest</li> <li>Traditional Dayak settlements</li> <li>Ex-PLG transmigration</li> </ul>	High poverty levels; isolation, poor market access and lack of village markets; low prices of agricultural commodities produced in the area; fire and the 'fire ban' for local farmers; partly deserted transmigration / lahan tidur; social / land rights.
VIII	Handil Block A	Banjar communities along river banks, lowland swamp interior	<ul style="list-style-type: none"> <li>Secondary forest</li> <li>Shrub</li> <li>Traditional Banjar settlements</li> <li>PLG Transmigration</li> </ul>	Unutilised land ( <i>lahan tidur</i> ); weak village government and locally weak external institutional relationships; low prices of agricultural commodities produced in the area. Special attention should be given to improving access to agricultural fields and drinking water.
IX	Block B/D	Banjar communities along river banks, older transmigration areas and lowland swamp, oil palm	<ul style="list-style-type: none"> <li>Degraded (lowland) forest</li> <li>Traditional Dayak &amp; Banjar settlements</li> <li>Old transmigration</li> <li>Plantations</li> </ul>	Salinity intrusion; soil acidity; cropping patterns; unused land ( <i>lahan tidur</i> ); farming systems; marketing. Tidal irrigation is utilized in the traditional Banjar areas and the transmigration areas near Terusan Raya.



## 4.4 Main Programs

Six main programs are proposed to reach the medium-term objectives:

Program	Lead and Supporting Technical Agencies
1. Fire Prevention and Management	BNPB, Environment, Forestry
2. Spatial Management and Macroinfrastructure	Public Works and others
3. Peatland Management, Rehabilitation and Conservation	Forestry, Public Works, Agriculture and others
4. Agricultural Development	Agriculture, Public Works & others
5. Community and Socio-economic Development	Employment & Transmigration, Home Affairs and others
6. Institutional and Capacity Development	Bappenas, Bappeda and others

### 1. Fire Prevention and Management

**Objective:** Eliminate wild fires from the EMRP area

It cannot be over-emphasized that prevention of fires is a major and urgent intervention. Without it, existing forests will be further destroyed, peat will burn, people will be affected locally and regionally, and the EMRP area will continue to contribute to global warming. Without effective fire prevention and management, rehabilitation and revitalization efforts remain at great risk of failing.

**Approach:** Effective fire management requires several components. This first is effective fire management institutions and Indonesia is now fortunate in having a ministerial level agency *Badan Nasional Penanggulangan Bencana* (BNPB) to coordinate the prevention and response to fires and acts with its provincial offices BPBD. Other components considered important for the Master Plan are the development of a **Fire Information System** to analyse fire risk and to predict where fires might break out, a **Fire Prevention Capability**, **Fire Preparedness** to ensure that the human and logistics resources are ready and adequate, **Fire suppression** as a response to fires that have already started, and **Fire impact analysis** to assess the causes of the fire and to identify any culpable parties and if necessary to instigate any legal follow-up. Existing community-based approaches need to be expanded and linked to the broader fire prevention and management system. Further details are provided in Annex 21.

**Priority Actions:** The following actions are recommended by the Master Plan to improve fire management in EMRP area (and Central Kalimantan as a whole):

- Clearly define and respect the roles and tasks of the agencies and bodies tasks with helping in fire management.
- Ensure effectiveness and finance of parties involved with fire management at all levels - national to village.
- Promote the establishment of clear operating procedures to ensure full coordination, cooperation and communication between the parties involved.
- Support capacity building for all parties involved and have this reflected and supported in government programming and budgeting
- Promote the consistency of policies and regulations concerning fire management across all levels of government integrated with other sector plans.
- Strengthen and expand existing community-based fire management (and suppression) capacities and integrate the existing organizational framework
- Strengthen and expand other fire management (and suppression) capacities.
- Implement in concert with existing regulations and policies the aims of the Palangka Raya declaration on forest and land fires.

## 2. Spatial Management and Macro-infrastructure

**Objective:** Establish detailed spatial plans, effective systems to manage spatial development and develop macro-infrastructure

As one of the main goals of spatial planning is to define the pattern of macro-infrastructure development in support of regional development, these are combined into one programmatic focus. However, these are cross cutting issues and require an integrated development approach in the area. Currently, spatial and development plans are not yet aligned to the plans for rehabilitation and revitalization in the EMRP area. Furthermore, there has been a systematic failure of the control of spatial development evidenced by the issuance of plantations licenses on deep peat. Existing spatial plans – including the draft provincial spatial plan (RTRWP) - need to be revised and mechanisms developed to ensure that future spatial development is controlled in accordance with spatial plans. For example, the draft provincial spatial plan (RTRWP) currently under review by the Department of Forestry for the EMRP area is based on the indicative spatial plan attached in the annexes of Inpres 2/2007, with one exception: part of the deep peat dome (> 3m) on the west of Block B has been assigned to production development area (KPP) in contravention of Keppres 32/1990. Detailed spatial planning for the EMRP area (potentially as a *kawasan khusus*) is needed. See Annex 22 for further details.

Macro-infrastructure (roads, bridges, river transportation, water and flood mitigation) should be developed in accordance with the revised spatial plans for the EMRP area. This will include ensuring adequate transportation infrastructure is in place, but that environmental impacts are mitigated and macro-infrastructure is not developed that compromises the rehabilitation and revitalization goals. An example of such development is the construction of roads into deep peat areas and through conservation areas, which will inevitably lead to peatland degradation through human encroachment and drainage. The Master Plan Technical Report on Green Engineering offers some suggestions for limiting environmental impacts of infrastructure development in peatland areas.

**Approach:** The Master Plan provides guidance for development of the area based on a vision of a rehabilitated and revitalization EMRP area, which can be used to develop detailed spatial plans that guide investments for macro-infrastructure in the area. At the present time, consultants mobilised by the Department of Public Works (Directorate General for Spatial Planning) are completing a review of spatial planning in the EMRP. Once completed, a detailed spatial plan (e.g. *Rencana Tata Ruang Kawasan Strategis / Khusus*) will need to be completed by technical consultants that have an understanding of peat and lowland development. Institutional mechanisms based on Law 26/2007 on Spatial Planning will need to be implemented to control spatial development in the area.

**Priority Actions:** The following actions are proposed by the Master Plan for spatial planning and infrastructure in the EMRP area:

- Revise the Indicative Spatial Plan in the Annexes of Inpres 2/2007 and the draft provincial spatial plan (RTRWP) for the EMRP area using the new information from the Master Plan;
- Conduct detailed spatial planning in the EMRP area based on the Master Plan using technical consultants with experience and knowledge of peat and lowland areas;
- Update district spatial plans (RTRWK) based on the above;
- Ensure integration between spatial planning and development planning;
- Implement a mechanism from provincial to district levels that ensures spatial development is controlled according to spatial plans based on Law 26/2007;
- Produce a macro-infrastructure investment strategy based on the detailed spatial planning; and
- A multi-year construction program of macro-infrastructure based on the macro-infrastructure investment strategy.

### 3. Sustainable Peatland Management, Rehabilitation and Conservation

**Objective:** Rehabilitate and conserve existing peatland and forest resources

Peatland management, rehabilitation and conservation is focused on the Protection and Limited Use Buffer Zones. Primary interventions include (a) restoration of hydrological functions and water management, (b) forest management and rehabilitation, (c) conservation and (d) establishment of protection and conservation boundaries and management arrangements. An integrated, phased approach should be developed that combines these actions with (i) fire prevention and management and (ii) community and socio-economic development.

#### **3.1 Hydrological Rehabilitation and Water Management**

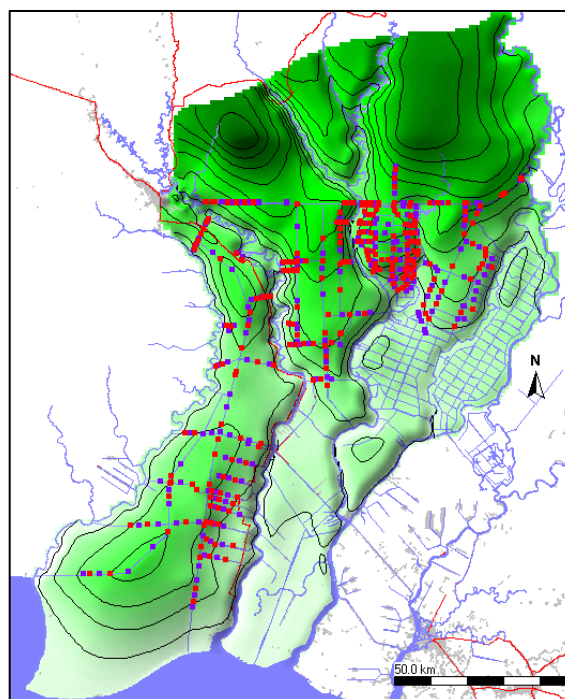
The rehabilitation of hydrological functions will take a long time, measured in decades, but the process should begin as soon as possible so as to prevent further degradation, reduce peat oxidation, allow natural regeneration of forests, and provide water for surrounding agricultural areas during the dry season.

**In the Protection Zone, the approach calls for the development of a system in the order of 700 or more composite dams to block drainage canals.** In order to withstand peak discharge flows and keep water tables as high as possible, the dams should be spaced to create a difference in water head levels between dams of 0.2-0.5m (Figure 12). The first dams will be built at the center of the peat domes and then the network will be gradually expanded toward the periphery of the domes. Different designs are proposed by the Master Plan Technical Report on Canal Blocking that need to be matched to the width of canal or ditch and the canal side topography and canal transport functions. Further piloting of different designs should be undertaken combined with monitoring and research to assess their performance.

**These dams are expected to help limit peatland degradation near to canals in the short term, but across the peat domes only in the longer term.** Hydrological rehabilitation of the peat domes in the short term is likely also dependent on establishing forest cover and a new equilibrium in the eco-hydrology of the system. Long-term monitoring and applied research will be required to assess the impacts of canal blocking.

**In the Limited Use Buffer Zone, the approach requires control structures to be introduced to canals and ditches to enable effective control of water levels** (i.e. drainage during the wet season and maintenance of high water levels during the dry season). For the existing transmigration areas of Pangkoh, this should be combined with a review of the overall water management design in the area (see p.54).

**In all areas, a community-based approach is required to plan, operate and maintain water control structures.** Community-based planning is critical for the success of hydrological rehabilitation as canals are used for transportation. It may, at present, not be viable to block certain canals and other approaches may need to be developed. For construction, in some area, community-based construction may be possible and desirable, but in many



**Figure 12:** Map of potential peatland canal blocking locations for an interval of 1.0 meter (as red dots) and additional locations for an interval of 0.5 meters (blue dots).

areas contractors (possibly in association with the local community) will be needed to complete the number of structures needed.

**Priority Actions:** The following actions are proposed by the Master Plan for hydrological rehabilitation in the EMRP area:

- Selection of priority areas for canal blocking and construction of water control structures - including the MRP canals (block A north, block B, Block C and the main SPI canal), ditches excavated for illegal logging and more recently constructed canals and ditches – and undertake consultative planning to produce a ‘Hydrological Rehabilitation Plan’ for each area.
- Establish a system to monitor the impacts of canal blocking **before** and **after** construction of the structure including at varying distance from the canal.
- Implement construction of canal blocking and water control structures.
- Review effects and impacts using the monitoring system and an adaptive management approach to raise water levels as high as possible (without excessive flooding) in the Protection Zone and establish effective control of water levels in the Limited Use Buffer Zone.

### **3.2 Forest Management and Rehabilitation**

Reforestation should be scheduled as an intervention **after or parallel to** the completion of hydrological rehabilitation interventions in an area **and** the establishment of fire prevention and management capacity. When planning the intervention, consideration should be given to the fact that while tree growth may benefit from wetter conditions following canal blocking prior to planting, the canals are often the only transport route available to bring in tree saplings to the planting sites. Establishing small tree nurseries within the peatlands to be rehabilitated may offer a solution. As part of an integrated approach, the resolution of land tenure issues and the planting of economically valuable trees species can play an important role in providing an incentive to landowners and farmers for effective fire prevention and management.

For reforestation, six broad approaches are defined in the Master Plan:

- **Natural Regeneration:** allowing the system to regenerate naturally.
- **Assisted Natural Regeneration:** interventions to overcome barriers to natural succession including enrichment planting, site modification to stimulate growth and survival, and (large-scale) sowing of seeds.
- **Reforestation with Native Trees:** replanting with native species.
- **Commercial Reforestation:** private sector-led tree plantations.
- **Community-based Forest Management:** such as community forestry rights (HKm).
- **Community-based Agro-forestry:** planting of economically valuable tree crops.

The approach to reforestation in a particular area should depend primarily on (a) the condition of the forest cover, (b) the level on natural regeneration and succession and (c) social aspects (see Table 3) as well as the hydrological state of the area. Further details are provided in the Master Plan Technical Report on Forestry.

**Table 5:** Matrix of Reforestation Interventions.

Forest Cover	Estimated Area (ha)	Natural Regeneration?	Social Aspects	
			Community	No community
Tree cover > 50%	175,000	Yes	Community-managed forest	Natural regeneration
		Limited	Community-managed forest with planting	Assisted natural regeneration and enrichment planting
Tree cover of 11-50%	613,000	Yes	Community-managed forest / agro-forestry	Natural regeneration
		Limited		Assisted natural regeneration / enrichment planting
Tree cover <11%	478,000	Yes	Community agro-forestry	Assisted natural regeneration / Reforestation with native trees
		Limited		Reforestation with native trees / Commercial reforestation

**Further research, studies and trials are required focusing on (a) species selection, (b) silvicultural treatments and (c) natural regeneration and succession and ways of assisting it.** In general, pioneer species are likely to be tolerant of open, unshaded conditions and flooding, while species characteristic for primary peat swamp forest are likely to be more shade tolerant or shade requiring, and are less tolerant of (deep or prolonged) flooding. However, many replanting trials seem to ignore this principle, and it would seem that at least some of the past failures can be attributed to selection of shade requiring or flood intolerant species for replanting trials. On the whole, it would seem best to begin replanting with (fast growing) pioneer species, and conduct enrichment planting with species characteristic for mature peat swamp forests during later stages.

**Priority Actions:** The following actions are proposed by the Master Plan for forest management and rehabilitation in the EMRP area:

- Studies of natural regeneration and succession that identify the main patterns of succession in the area and the barriers to natural regeneration and succession;
- Species selection trials with a broad range of species under different shading, soil (peat depth), flooding, and rainfall conditions (at least at 3 different locations in the EMRP area);
- Setting up of a silvicultural systems project to develop different silvicultural treatments which can be applied for the restoration of degraded peatlands;
- Set up a forestry rehabilitation platform involving all stakeholders involved in rehabilitation which will be used to develop and evaluate concrete restoration plans.

### **3.3 Conservation and Environmental Management**

Conservation interventions will focus on the focus establishing and managing the main areas with conservation value in the EMRP area. These include the Kiapuk and Sebangau mangrove swamps (totaling 23,000 ha), the Sebangau-Kahayan peat swamp forest (57,000 ha) in the northern part of Block C, the Mawas Peat Swamp forest (288,000 ha) in Blocks E and A, and the Kapuas-Kahayan peat swamp forest (250,000 ha) in Blocks E and B. Further details are provided in the Master Plan Technical Report on Biodiversity.

**Priority Actions:** The following actions are proposed by the Master Plan for conservation in the EMRP area:

- The abovementioned areas of high biodiversity value should be delineated and receive official status as conservation (*konservasi*) or protection (*lindung*) areas.
- Action against threats including on-going illegal logging in Block E and *tambak* development of mangroves needs to be taken.
- Participative, collaborative management arrangements for these area involving representatives from government, local communities and third parties such as NGOs need to be defined and implemented.
- Strengthen environmental management capacities and guidelines for peatland management (including ANDAL)

### **3.4 Establishing Boundaries and Management Arrangements**

Forest land survey and inventory work is needed to (a) establish appropriate boundaries for the protection and conservation areas in the area, (b) better understand the existing conditions and successional status of the land cover in the Protection Zone, (c) as a resource for detailed forest planning and (d) to ensure that community and *adat* rights are recognised and provided.

**The Master Plan proposes that the three blocks that comprise the Protection Zone are defined as Forest Management Units (KPH) to achieve conservation and protection management objectives.** At present, there is limited active management of the area's forest and peatlands and this is required for the goal of peatland and forest rehabilitation and the long-term management of the area. A decision will need to be made where management authority for these FMUs (KPH) lies, either with the Department of

Forestry and its technical agencies (UPT) or the Provincial Forestry Agency. Once established, each FMU / KPH will need to complete a detailed zoning and management plan of the forest area under its jurisdiction. This process will need to include a mechanism for establishing and accommodating community rights and access to these areas.

**Priority Actions:** The following actions are proposed by the Master Plan for establishing boundaries and management arrangements in the EMRP area:

- Forest resource surveys and inventory in the Protection Zone.
- Community-based participatory land and resource mapping in villages within and neighbouring the Protection Zone to establish forest resource management and access rights.
- Establishment of three Forest Management Units (KPH) and collaborative management arrangements for the three blocks of the Protection Zone (Block E east-Block A north protection area; Block E west-Block B protection area; Block C protection area). Proposed conservation areas in these areas may be managed as part of the FMU/KPH.
- Production of detailed zoning and medium-term management plans based on the above.

#### 4. Agricultural Development

**Objective:** Increase agricultural productivity in the area through intensification and diversification of farming systems and limited development of new agricultural areas

The approaches and strategies to improve agricultural production vary between the Limited Use Buffer Zone and the Development Zone.

**The basic principle for management of the Limited Use Buffer Zone is that there must be water management to reduce unnecessary drainage of the peat.** The key will be to bring production in line with better water management practices to limit peat degradation and, as such, new large-scale developments are discouraged. In general, while rubber and other crops are often favoured in this area, the planting and management of commercial species tolerant to these wetland conditions (e.g. jelutung, belangiran, ramin, pulai and *Melaleuca*) will be promoted. For smallholder crops that require drainage such as rubber, water control needs to be introduced. Widespread development of oil palm is not recommended for this area as it will lead to extensive degradation of the peat.

However, some areas in this zone may be too large, too much at risk from fires, too far away from communities or too difficult to manage hydrologically without significant investment. Here there are possibilities for the development of industrial scale plantations managed by private companies with an interest in and capacity for growing appropriate species and developing the techniques to deal with the minimum drainage. Opportunities could be developed for the production of paper pulp using trees that are water and acid tolerant.

**Management of the Development Zone can proceed without consideration of peat conservation and rehabilitation.** This area is dominated by (mixed) rice-based, tree-based and livestock-based farm systems and the main goal for agricultural revitalization is to increase the productivity of these systems. The Jenamas area developed during the MRP remains mostly uninhabited and unsuitable for agricultural development as a result of flooding, and mitigating actions are unlikely to be cost effective. Part of the area is used for rearing swamp buffalo, which is an entirely appropriate land use. Flood control measures in specific inhabited areas along the Barito River needs to be undertaken, especially in the Dadahup area and further north beyond Jenamas.

**Until major technical and social constraints in the existing transmigration schemes are resolved, new development and transmigration is discouraged.** Existing schemes remain marginal, facing significant problems and challenges. The revitalization programs under Inpres 2/2007 should focus on these areas, but detailed and accurate topographical and hydrological data are still needed.

#### **4.1 Strengthening Agricultural Productivity**

The main engine for improved agricultural production will be: the provision of appropriate infrastructure; strengthening and enlargement of the extension services; supporting increased access to finance and market opportunities; and upgrading of land and water management infrastructure and practices.

**Different approaches will be required for the Dayak, Banjarese and transmigration villages.** Each group tends to have different cultural and technological backgrounds and farming practices, but also tend to live in different physical environments. Programs should be designed based on the specific needs of the three main farming systems as well as the fisheries sector.

#### **4.2 Upgrading Land and Water Management**

Local Dayak and Banjar residents land and water management practices based on *handils* do not need to be changed drastically, but may need improved control of drainage and control structures between peat and non-peat areas. Transmigrants in the EMRP are generally settled in the swamp interior, where land and water management conditions and options are less favourable and significant improvements are required. Only in a small part of the swamp interior will tidal irrigation be possible; not in continuous blocks as in previous designs, but along minor depressions.

**The main land and water management improvements in the EMRP area will require redesigns of existing transmigration schemes based on accurate topographical, hydrological and land suitability assessments.** Upgrading of existing schemes should focus on flood control and drainage management, water circulation, leaching and flushing, and will require reducing the length and density of canals by adding new canals, the double connection of dead-ended canals, and water control structures. The upgrading of the existing hydraulic infrastructure of the transmigration schemes is a pre-condition for improvements in on-farm land and water management.

**Development of land and water management at the tertiary and on-farm level requires a different and long-term approach.** Land and water management development must be site-specific, addressing the micro-variations of soil and water conditions, and be closely linked to agricultural and socio-economic developments. Mechanized land preparation is important to further develop the soils, but is only possible when the soil has reached a certain level of ripening. The limited capacity of farmers and government institutions also placed constraints on what can be achieved in a given time frame. The proposed "refill transmigration program" can help address the issue of a lack of farmers in the former MRP transmigration areas as long as significant improvements in agricultural productivity can be attained.

**In the coastal zone the focus of development will be the restoration and maintenance of the coastal protection and fishery functions that the mangrove forests provide.** Only very limited tambak development should be considered here.

**Priority Actions:** The following actions are proposed by the Master Plan for agricultural revitalization in the EMRP area.

For all areas, several actions are recommended:

- Provision and upgrading of agricultural infrastructure and facilities;
- Formation and strengthening of farmers groups with grants for farmer groups;
- Enlargement and strengthening of the extension system with links to research institutes aimed at the needs of farmers;

- Provision of quality seed and fertilizer;
- Access to finance (e.g. through an expanded BRI network);
- Access to markets through improved infrastructure, transport systems and better market information;
- Increased local processing capacity;
- Reorientation of agricultural research to on-farm research linked to extension services;
- Development of practical approaches for land clearance without fire and/or safe burning practices.

Specifically in the Development Zone and existing transmigration areas, the following are recommended:

- Integrated land suitability assessments and hydro-topographical studies in management units VI-IX;
- Review and redesign, where needed, of land and water management infrastructure.
- Reclamation of new agricultural land where potential exists based on integrated land suitability assessments (hydro-topography, soil and climate, socio-economic factors);
- Strengthening of on-farm land and water management (*tata air mikro*); and
- Monitoring and review of performance.

#### **4.3 Fisheries Development**

The priority interventions for the development of fisheries involve:

- Cage / pond aquaculture with indigenous species;
- Support for traditional fish capture ponds (*beje*) for local fish species;
- Ornamental fish raising;
- Limited tambak development in the coastal zone; and
- Supporting development of the fisheries sector through technical capacity building, monitoring of fisheries catches and stocks, integrated planning for fisheries and improvement of extension services.

### **5. Community Empowerment and Socio-Economic Development**

**Objective:** Reduce poverty through community empowerment and socio-economic development

The Master Plan recommends that community empowerment and socio-economic development programs focus on all communities in the proposed 227 target villages. It also recommends that the level of proposed transmigration is significantly reduced and that the Department of Transmigration focus on upgrading existing schemes such as Dadahup, Lamunti, Palingkau, Pangkoh and others. A review of the appropriateness of food crop-based agriculture for transmigrants in the Development Zone should also be undertaken as there may be better alternatives.

#### **5.1 Community Empowerment**

It is vital to place the community at the centre of development through the active participation of communities in the design, planning, implementation as well as monitoring.

The purpose of community empowerment is to enable communities and individuals within communities to play an effective role in their community's development. Community empowerment requires work in a number of areas to achieve empowered communities that can play a positive role in their own sustainable development including:

- Supportive institutional arrangements and local capacity;
- Provision of information about current policies, programs and events;
- Opportunities for participation, inclusion and community action;
- Finance for community development needs; and
- Community focus and engagement in the delivery of basic services.

Priority actions for community empowerment are:



- Strengthening of village institutions (including the transfer of the 43 transmigration settlements to local government as definitive villages, *Desa Definitif*);
- Active involvement of communities in development planning, implementation and action supported by community facilitators;
- Improved governance with strengthened links between villages, the sub-district (*camat*) and district as a key coordination mechanism (e.g. *Forum Rehabilitasi & Revitalisasi Kecamatan*);
- Fiscal decentralization and community grants (e.g. PNPM, Alokasi Dana Desa);
- Placement of village facilitators to support community participation and development initiatives including community grants, problem solving and the integration of rehabilitation and revitalization projects in the villages; and
- A public information campaign to provide communities with appropriate information about the rehabilitation and revitalization policy and associated interventions.

## **5.2 Provision of improved basic services and rural infrastructure**

Community development will continue to depend on the provision of appropriate rural infrastructure and services. Priorities as expressed by the communities themselves include:

- Year round access (to and from the communities) - either by land (roads) or competitive river transport.
- Domestic water supply. Most surface water and shallow groundwater is unusable.
- Improvement of hydraulic infrastructure - for control of water, drainage, irrigation etc.
- Provision of reliable electricity.
- Upgrading of health and education services (focused mostly on quality and staffing).
- A rural infrastructure program possibly through PNPM or other community grants.

Rural infrastructure developments should be planned and implemented in close consultation with the beneficiaries (communities). These have a better chance of being maintained if the local communities have been involved from the beginning in the planning, construction and operation.

## **5.3 Socio-economic Development**

Poverty is relatively high in the EMRP area. One of the reasons is that the opportunities for commercializing agricultural and natural resource based commodities is hampered by poor transportation systems and processing facilities, lack of market information, and weak negotiation powers. The proposed strategy for socio-economic development in the EMRP area has four components:

- **Market development** - Local people can gain benefits from the commercialisation of commodities such as fish and non-timber forest products such as rattan and facilitation of access to markets through improved transportation systems, processing facilities supported by market and value chain analysis.
- **Small and Medium Enterprises (SMEs) development** - SMEs play a crucial role in economic development, generate jobs more rapidly than larger business, are highly diverse and contribute to export and trade. Their competitiveness depends to large extent to the quality of their linkages that affect their critical business inputs. Options for SME development based on agricultural or other sectors include: (a) training for key business skills as well as new technologies and long-term capacity building through training programs and business coaching; (b) feasibility studies for developing SMEs for specific agricultural-, agro forestry-, or non timber forest products with commercial value that are produced in the area; and (c) ensuring access to finance.
- **Agro-forestry development** - Tree farming contributes significantly to livelihoods in the EMRP area by providing edible- and non-edible products and local incomes. Trees outside forests (e.g. village plots) are also important to reduce pressure on existing forests in the EMRP area and provide a local supply of timber. The potential for cultivating trees in farmlands is very high given that there is a large amount of non-

cultivated agricultural land. There are various options for facilitating agro-forestry development: (a) village seed bank and nursery development for raising of trees for home gardens and farm lands; (b) small enterprise development for value addition of important tree products of home gardens and farm lands (e.g. rattan, rubber, fruits and nuts); (c) training for new technologies and long-term capacity building through training programs; and (d) support to enabling conditions for tree planting, in particular clear and secure land tenure for individuals and community groups.

- **Community driven conservation and rehabilitation of degraded peat forests –** The rehabilitation of the peatland in the EMRP area will involve considerable financial resources. Local people can benefit from these in the medium-term if a community driven approach is taken. Furthermore, proposed plans for carbon finance need to ensure that appropriate benefits accrue to communities living in forest and peat areas. In addition, the forests in the area produce a wide range of non-timber forest products (e.g., rattan, rubber, nipa, sago, fuel wood, wood for construction, furniture and equipment, medicinal plants, wild fruits and vegetables) that contribute to local livelihood security and incomes.

**BOX: Conservation and Community Rights**

The establishment of conservation areas should not come at the expense of community access and management rights. Traditional law (*hukum adat*) in Central Kalimantan states that the land five kilometers around a village is recognized as community land (*tanah adat*) and conservation strategies need to reflect this, for example, through supporting community-based land mapping (see Annex 22).<sup>12</sup> In conservation areas where communities should be provided access or management rights (e.g. through *Hak Hutan Kemasyarakatan* as defined in the Regulation of the Minister of Forestry *Permenhut 37/Menhut-II/2007*), support will need to be provided to local communities for community mapping, advocacy and provision of information on local livelihoods, agricultural and land tenure systems. It is essential to link local interests in forest and local knowledge of the forest environment with the aims of forest conservation and rehabilitation/reforestation of degraded peat forests. A process of local negotiation and participatory conservation planning is necessary to resolve competing land management systems and claims and arrive at sustainable forest management solutions. Such solutions need to be found through collaborative partnerships that can ensure the interests and rights of local people are respected. Within this context, payments for environmental services (PES) including carbon sequestration should be explored.

**Priority actions:** Strategies to improve this marketing situation include the following:

- Conduct market research and value chain analysis for key products such as latex from rubber and *jelutung*, rattan, vegetables, livestock;
- Catalyze, through market analysis, the formation of producers' groups, associations, and cooperatives for collective marketing and strengthen existing organisations through capacity building.
- The development of small and medium scale enterprises and agro-processing centers to create added value to commodities and improve the quality of primary processed products (e.g. rubber).
- Further development of agro-forestry and facilitation of community driven forest protection and rehabilitation.
- Possible commercialization of non-timber forest products such as nipa, sago, medicinal plants, wild fruits and so on.
- Development of Payment for Ecosystem Services schemes at the community level including benefit sharing from REDD.

Further details are provided in the Master Plan Technical Reports on Community Empowerment and Socio-economic Development.

#### **5.4 Transmigration**

Limited transmigration can be developed focusing on (a) the former MRP areas of Lamunti, Dadahup and Palingkau and (b) potential new transmigration areas in Block D

<sup>12</sup> See article 95 of "Adat Law of Central Kalimantan" by Damang J. Saililah (1977).

and south of Block A. Potential target numbers of families are roughly 7,500 families for the refill program in the former MRP areas and between 5,000 and 15,000 families in new areas of block D (e.g. Terusan Raya) and south of block A.

## 6. Institutional and Capacity Development

**Objective:** Establish an effective institutional basis and capacity to rehabilitate and revitalize the EMRP area and achieve long-term sustainable management of the area

**1) Working Groups and Coordination Teams:** The three working groups established provide an important platform on which to build further integration and development of interventions in the area. These can build on the Master Plan with detailed project designs developed by multi-sectoral teams appointed by the working groups. Such an approach needs to extend from Jakarta to the province and districts so that detailed project designs are effectively coordinated and integrated with district and provincial plans. Effective coordination and community engagement on the ground can be achieved through village facilitators and the formation of '*Sub-district Forums for Rehabilitation and Revitalisation of the EMRP area*'. Standard operating procedures (*juklak*) for projects carried out under Inpres 2/2007 should be developed where needed.

**2) Partnership, Provincial Secretariat and Technical Facility:** The rehabilitation and revitalization of the EMRP area will involve GOI, donors, NGOs and the private sector. It is proposed to form a 'Partnership for the Rehabilitation and Revitalisation of the EMRP Area' that is led by the Governor of Central Kalimantan. To support this and the implementation of Inpres 2/2007, a full time professionally staffed secretariat should be established in Palangka Raya aided by a Technical Facility to coordinate, support and guide the partnership. The secretariat would facilitate joint annual planning, integrated implementation and progress reviews of GOI, donor and NGO projects (in line with the GOI annual planning cycle) to ensure that an effective, coordinated response occurs. See Annex 23 for further details.

**3) Long-Term Monitoring and Evaluation:** The rehabilitation and revitalisation of the EMRP area is a very complex undertaking. As explained earlier an adaptive (rather than a blue print) approach will be adopted and this will depend critically on information and feedback on the impacts of interventions used to promote development and conservation in the area. For this reason detailed and accurate monitoring is essential. Monitoring of compliance with approved plans and actions will also be undertaken.

Key types of information needed to support this effort include:

- Detailed spatial data on development in the area
- Data on fire locations and frequency, flooding, forest regeneration etc.
- Data on hydrology, groundwater depths, subsistence rates, rainfall data, and other biophysical parameters to assist in understanding impacts of interventions.
- Monitoring of changes resulting from interventions - tracking of inputs, outputs, processes and impacts.

Data collection over the large area of the EMRP will involve many organisations and will have to be consistent. Protocols will be developed governing data collection and exchange and training given to those who collect the data. Further details of this are provided in Annex 24 and the Master Plan Technical Report on Long-Term Monitoring.

**4) Capacity Building:** A program of capacity building for provincial and district government (including Camats and village heads) is required to (a) increase knowledge and skills related to peatland rehabilitation and lowland development, and (b) increase organization efficiency and effectiveness. Further details of this are provided in Annex 25 and the Master Plan Technical Reports on Capacity Building and Training Capacity.

**5) Design Long-Term Institutional Arrangements:** During the implementation of Inpres 2/2007, a specific activity that needs to be undertaken is to review and design appropriate institutional arrangements for the long-term management of the area.

## 4.5 Financial and Economic Analysis

Much of the financing of interventions needed to implement the Presidential Instruction will come from existing departmental budgets, and will be executed through projects implemented by the technical department offices and technical agencies in the Province of Central Kalimantan. However, significant opportunities exist for additional funding from both the donor community and through carbon financing from the private sector. In this section, an economic and financial analysis of the farming systems is presented, which supports the strategy proposed in this Master Plan. A financing framework is presented, which provides highly indicative cost estimates for investments to achieve rehabilitation and revitalization of the EMRP area.

### Economic and Financial Analysis of Farming Systems

In the short and medium term, most jobs in the EMRP area will continue to be created in the agricultural sector, and not in the processing of agricultural produce or other industries.<sup>13</sup> This suggests that economic development plans should aim at increasing the productivity of agricultural workers. During 2000-2006, agricultural productivity growth was low or negative for rice-based agriculture, which continues a primary source of income for most farmers in the area (Table 6). This implies that the welfare of these farmers has not improved, and reinforces the notion that most farms are not (or barely) financially feasible, forcing farmers to seek additional sources of income.

**Table 6:** Agricultural Productivity In EMRP Area, 2000 and 2006

Crop	Production ('000 ton)*		Cultivated Area ('000 Ha)		Productivity (ton/Ha)	
	2000	2006	2000	2006	2000	2006
Wetland paddy	195.3	232.0	73.4	81.7	2.66	2.84
Dryland paddy	63.9	21.5	11.9	31.7	2.66	1.81
Rubber	20.3	66.3	83.7	105.2	0.24	0.63
Coffee	0.2	0.5	1.4	1.6	0.13	0.29

Source: Consultant, based on BPS, \* *Kadar karet kering* in the case of rubber

The financial feasibility of a farm is difficult to assess, because the financial return on the investment of a farmer is heavily dependent on two highly volatile and inherently unpredictable factors: the market price for the farmer's produce, and the cost of fertilizer. For example, the price of fertilizer doubled in 2005, whereas the world market price of palm oil increased by 25% in the first six months of 2007. Needless to say, farmers are aware of these changes and seek to benefit from expected increases in market prices. For example, many smallholders in the EMRP area are currently investing in rubber trees, to benefit from the historically high market world prices for this commodity, and are abandoning rice-based agriculture.

If the Government wishes to improve the financial feasibility of a farm, it would be better to allow farmers to select the highest-yielding commodities and work to improve farming systems in the area. It is unlikely that the Government will be better at selecting the highest-yielding commodities than farmers themselves. Instead, it should seek to remove or lower barriers that currently prevent farmers (including but not limited to subsistence farmers) from generating higher financial revenue than is currently the case. Measures to achieve this include the following:

- **Improve access to information**, through, for example, the provision of properly trained extension workers and support for re-establishment of village cooperatives.
- **Improve access to markets**. Field research indicates a substantial difference between farm gate prices and market prices of paddy, which is to a large extent

<sup>13</sup> See Master Plan Economic Profile of the EMRP Area for further details.

caused by high transport costs from rice producing areas in the EMRP area to Palangka Raya and Banjarmasin (see Box). Improved water and road infrastructure is needed to reduce this "gap", thereby boosting farmer profits.

- **Improve access to credit.** Because many farmers normally do not have access to credit, they are highly vulnerable to unexpected changes in input and output prices, and are less able (or unable) to switch to financially more rewarding crops (such as rubber or pepper), which require substantial start-up investments. To lower these constraints the Government may consider requesting BRI to expand its micro-credit network in the EMRP area.

**BOX: The Need for Improved Access to Markets**

Paddy (*gabah kering*) is the most commonly traded agricultural commodity in the EMRP area. According to the Ministry of Agriculture, the average farm gate price of paddy was Rp 2000/kg, not including the cost of milling, which was estimated at Rp 50/kg. Field research indicated that prices in *kabupaten* of Kapuas and Pulang Pisau were slightly higher (Rp 2300/kg and Rp 100-150/kg, respectively). In the EMRP area, farmers sell (milled or unmilled) paddy to a "collector" for up to Rp 2500/kg. The collectors resell their product to a distributor. The distributor, in turn, sells the product to the final seller (such as a shop or a market vendor), who sells the milled paddy to the final customer at a price of Rp 5000-5500/kg. The difference between the farm gate price of paddy and the market price of "milled rice" is in the order of Rp 3000/kg. This amount covers the operating costs and profits of the collectors, distributors, and sellers. Compared to other regions in Indonesia, the markup of (3000/2500 =) 120% is high, which is primarily caused by the high cost of transport from the producing areas to the major markets (Palangka Raya and, more importantly, Banjarmasin).

**A Medium-term Financing Plan for EMRP Rehabilitation and Revitalisation**

Six programs are proposed to rehabilitate and revitalize the EMRP area in the short and medium term. Table 7 presents an indicative financing plan for those activities that are scheduled for implementation in 2009-2013, based on the financing policies of GOI and other potential financiers as discussed above. It should be emphasized that this financing plan is highly indicative only<sup>14</sup>. Details per program are provided in Annex 26.

The estimated cost of the medium-term investment plan is estimated at about IDR 6.7 trillion (or approximately USD 600 million) for the five-year period 2009-2013. This estimate is lower than the total amount in Inpres 2/2007 financing plan (IDR 9 trillion for 2007-2011) because over 50% of the funds in the Inpres 2/2007 (IDR 5 trillion) is allocated to transmigration; however, this Master Plan report proposes that a transmigration program will not be a major part of rehabilitation and revitalization of the EMRP area.

**Table 7:** Highly Indicative Financing Plan for Rehabilitation and Revitalisation of the EMRP.

Program	Cost Estimate (IDR trillion)
1. Fire Prevention and Management	0.1
2. Spatial Management and Macro-infrastructure	1.0
3. Peatland Management, Rehabilitation and Conservation	1.5 <sup>a</sup>
4. Agricultural Development	1.7
5. Community and Socio-economic Development	2.2
6. Institutional and Capacity Development	0.2
<b>TOTAL</b>	<b>6.7</b>

a: The cost estimate for peatland management, rehabilitation and conservation is highly dependent on the area targeted for reforestation. The estimate provided here assumes IDR 1 billion (USD 100 million) for a mix of reforestation and enrichment planting covering up to 300,000ha.

<sup>14</sup> Estimates were based on Inpres 2/2007 financing plans, adjusted and supplemented by Consultant's estimates.

## Potential for Financing

The rehabilitation of the EMRP area requires substantial investments from public and private sources in a large number of activities. The selection of the channeling mechanism for an individual activity depends on three factors:

- The potential availability of private sector investment for the activity.
- The formal responsibility for the public financing of the activity (if private sector investment would not be available).
- The revenue-generating potential of the activity.

**Current Public Expenditure.** Since the Mega-Rice Project was halted in 1999, Indonesia has decentralized the delivery of basic public services to the regions. In the EMRP area in 2006, national expenditures accounted for almost one-half of total government expenditure on services and infrastructure and overall district expenditures were more than three times greater than those from the province (Table 8). With the addition of the Inpres 2/2007, financial resources for development in the area may more than quadruple. It is clear that based on fiscal capacity, district governments have a key role to play in the development of the EMRP area but that additional funding from central government and other sources is required.

**Table 8:** Estimated annual public investment expenditures in the EMRP area.

Government Level	No Inpres 2/2007			With Inpres 2/2007		
	Rp (billion)	USD (million)	%	Rp (billion)	USD (million)	%
National	304.0	33.0	48.2%	1,800.0	195.7	84.6%
Provincial	77.3	8.4	12.2%	77.3	8.4	3.6%
District	249.5	27.1	39.6%	249.5	27.1	11.7%
<b>Total</b>	<b>630.8</b>	<b>68.6</b>	<b>100.0%</b>	<b>2,126.8</b>	<b>231.2</b>	<b>100.0%</b>

*Note:* Based on FY 2006 with expenditures in EMRP estimated as a proportion of total expenditure weighted by population. Total Inpres expenditure is assumed to be Rp.9 trillion over five years. Public investment expenditures are defined as expenditures on services and infrastructure development. *Source:* Department of Finance, SIKD.

**Potential Financiers of Rehabilitation and Revitalisation.** Potential financiers of the rehabilitation and revitalisation of the EMRP area consist of:

### 1. Central Government Grant Financing

The central government finances non-revenue generating projects or activities under its responsibility (such as national roads, primary drainage systems or universities) from APBN. Bappenas has publicly stated that it seeks foreign co-financing of the substantial cost of rehabilitating the EMRP area. In November 2007, central government budgets covered less than 20% of the estimated financing requirements for implementation of Inpres 2/2007 in 2008.

### 2. Sub-national Government Financing

Regional governments finance non-revenue generating projects or activities under their responsibilities (such as tertiary drainage or local roads) from APBD. As of November 2007, none of the sub-national governments involved in the implementation of Inpres 2/2007 had allocated a budget for the rehabilitation of the area. The province of Central Kalimantan does not intend to allocate funds for this purpose, based on the (legally correct) argument that the rehabilitation of the EMRP area is a central government responsibility, and should therefore be financed from central government budgets.

### 3. Public Investment by State-owned Enterprises

State-owned enterprises (BUMNs) are required to finance activities that: (i) constitute a central government responsibility according to PP38/2007, (ii) are unlikely to be implemented by the private sector, and (iii) generate revenue.

### 4. Private Sector Investment

The 2005-2009 Medium-Term Development Plan (*Rencana Pembangunan Jangka Menengah* or RPJM), which is issued every five years by BAPPENAS, states that GOI

will only finance projects or activities that are unlikely to be undertaken by the private sector.

Private financiers may be willing to mobilize 'carbon finance' for CO<sub>2</sub> emission reduction projects in conservation areas, provided that GOI agrees to enforce land use rights, and pledges to minimize infringements to the project area. The options for finance related to the Climate Change Framework Convention and the Kyoto Protocol include:

- Reduced Emissions from Deforestation and forest Degradation (REDD),
- Clean Development Mechanism (CDM), and
- Selling Emission Reductions to the Voluntary Carbon Market.

However, at present REDD is still being developed as a concept and only pilot projects may be able to lend support; the CDM does not yet have an approved methodology for reducing emissions in degraded tropical peatlands, although this may change; and the voluntary market has limited demand and value compared to the CDM, although projects could be developed in the EMRP area for this. Further development of appropriate policies, including approved methodologies, is urgently needed at the international level to support the rehabilitation of the EMRP and other areas. See Annex 27 and the Master Plan Technical Report on Carbon Finance for further details.

### **5. Bilateral and Multilateral Development Agencies**

ADB, World Bank and IFAD may be willing to co-finance macro infrastructure and basic infrastructure. This group of financiers is likely to impose the following constraints:

- loan proceeds are channeled through central government agencies, and not as on-lending or on-granting to sub-national governments,
- loan proceeds are channeled as a 'project loan' to finance pre-defined projects (as opposed to 'program loans', for which this is not the case), and
- the implementation of investment projects will have limited – and preferably no – adverse social or environmental impacts. Donors do not offer financing of transmigration programs.

In addition, bilateral and multilateral development agencies also offer carbon finance, and are likely to request similar conditions as private financiers. Australia has already committed A\$ 30 million to the Kalimantan Forest and Climate Partnership, which plans to work in Management Unit I and other donors are exploring possibilities of supporting rehabilitation and revitalisation efforts in the EMRP area.

### **Government Financing Policies**

The utilization of the above financiers for the implementation of the Master Plan is constrained by long-term central government policies, which can be summarized as follows:

- **Forest conservation.** GOI has stated that it does not wish to finance this sector from foreign loan proceeds, but encourages financing from carbon credits and bilateral grants. Bappenas is especially interested in donor support for establishing mechanisms to provide non-cash compensation to communities economically affected by forest conservation. It considers to test REDD and other carbon finance schemes in the EMRP area.
- **Agricultural development.** Bappenas has expressed an interest to finance investments in supporting rural infrastructure from multilateral loans but has not discussed this proposal with World Bank, ADB or other lenders.
- **Transmigration.** GOI does not seek foreign funding sources to co-finance investments in transmigration.

## Overall Economic and Financial Benefits

The proposed expenditure of IDR 6.6 trillion is expected to generate a wide range of benefits for the area and Indonesia including:

- Reduction of widespread fires from the area;
- Labour productivity increases (and subsequent increases in welfare) due to better health and education of people living in the area;
- Increase in yields of key agricultural commodities by 50-100% over a 25 year period;
- Reduction of poverty in the area;
- Reduction of carbon emissions in the order of several to several tens of millions of tons of carbon per year;
- Reduction of long-term problems of flooding and other environmental problems that would require public sector finance for their amelioration.

During the next 25 years, the potential economic benefits to the EMRP area could be:

- Production of an additional 3.7 million tons of paddy over the 25-year period, worth USD 1.8 billion in constant prices (assuming a price of USD 500 per ton) with increases in other commodities grown in the region;
- Emissions reductions worth in the region of USD 50-100 million per year initially (assuming a price of USD 10 dollars, emissions reductions of 5-10 million tons across the area and a carbon market able to purchase CER/VERs from the area). The long-term revenue profile from carbon emission reductions would depend on details of baseline emission scenarios that have yet to be formulated;

## 4.6 Revision of Inpres 2/2007

There have been calls from stakeholders to revise the Annexes of Inpres 2/2007 throughout the process of formulating this Master Plan. These Annexes can be improved and revision is recommended. The main revisions required relate to (a) spatial data and maps and (b) details of proposed interventions.

### 4.6.1 Revision of Spatial Data and Maps

The nomenclature used in Annex II needs revision and some of the areas delineated in these maps need revising to better reflect the existing situation. The following revisions are proposed by the Master Plan:

- In the protection (*kawasan lindung*), the division between deep peat conservation (*konservasi gambut tebal*) and hydrological conservation (*konservasi hidrologi*) is artificial and much of the hydrological conservation area is deep peat. It is proposed that this distinction is removed - all deep peat should be classified for deep peat conservation.
- The Flora and Fauna Areas (*kawasan flora dan fauna*) do not match with the area of highest biodiversity value (see Master Plan Technical Report on Biodiversity). With the protection zone proposed in the Master Plan, revised areas for the conservation of flora and fauna need to be delineated.
- The area proposed as for Black Water Ecosystem Conservation (*konservasi air hitam*) in block C is now heavily degraded and does not have biodiversity value. This area, known as Danau Manyun, is in a slightly different location to the Inpres map and should be simply part of the deep peat area.
- The category of *Melaleuca cajuputi* forest and rushes (*hutan gelam / purun*) is not appropriate as a protection category. *Melaleuca cajuputi* (paper bark tree) is a pioneer species that naturally regenerates in disturbed (especially fire affected) areas and is widely used for poles and pilings in construction. Its presence is not a suitable indicator for the need for protection and it is recommended to (a) remove this category from the maps and (b) remove the proposed protected areas of *hutan gelam / purun* in blocks A and D.



- For the cultivation area (*kawasan budidaya*), the present map does not effectively show the distribution of farm systems in the area - an alternative farm systems map as presented in the Master Plan could be used (see Figure 7).
- The area proposed for *tambak* in the *kawasan budidaya* currently has a land cover of healthy mangrove. This should be conserved and any *tambak* developed be targeted to a limited area to the west of the Kahayan estuary.

In general, it is recommended that the maps of Inpres 2/2007 do not present too much detail until supporting data is more widely available for detailed spatial planning.

#### **4.6.2 Revision of Proposed Interventions**

Annex I of Inpres 2/2007 presents detailed activities, actions and targets. In general, it is recommended that some of the detailed targets are better defined in detailed planning that remains in need of completion and that the Inpres defines the specifies outcomes and target areas for interventions.

A review of the Annex I of Inpres 2/2007 based on the work carried out during the preparation of the Master Plan is presented in Table 9. A draft matrix of programs and activities based on this Master Plan is Section 5.

**Table 9:** Review of Specific Activities Listed in Annex I of Inpres 2/2007.

Program	Activity	Comment
<b>1. Conservation</b>	4. Deep peat conservation.	This activity to be combined with 6. Hydrology conservation as part of the 'peat rehabilitation' activity proposed in the Master Plan.
	5. Gelam forest conservation	Gelam is widely used, naturally regenerates and has a fast growth rate. This activity is not required and there is no need for gelam to be replanted. Gelam is a commercial species that is harvested by communities and may have potential as a plantation pulp crop, especially in the south of Block C. Further economic and silvicultural study of this is recommended.
	7. Flora & Fauna Conservation	The proposed boundaries in Block A and E of the KFF need to be revised based on recent biodiversity assessment undertaken in the Master Plan. For example, this proposed area does not include much of the proposed Mawas conservation area with its important population of orangutan (estimated at 3,000 individuals).
	9. Black Water Ecosystem Conservation	These black water ecosystems are likely to be deep water ecosystems, and although replanting may be attempted in the long term (e.g. with <i>Pandanus helicopus</i> and <i>Hanguana malayana</i> ), it should not be the initial focus of reforestation attempts. What is required in the short to medium term are some trials to assess the feasibility of such attempts, before venturing into large scale restoration trials. The process of natural succession may be very slow, for example, or these areas may be highly inaccessible, leading to unacceptably high costs.
	10. Mangrove Conservation	Replanting of mangrove vegetation in these coastal areas is regarded as unnecessary. Disturbed mangroves south of the mouth of the Sebangau River are naturally regenerating and only require protection against further disturbance, while those east of the mouth of the Kahayan (southern tip Block D) near Pantai Kiapak are in a good condition. The coastal area in between is either unsuitable for mangrove (consisting of beach swales), or have been or are being actively converted to brackish-water fishponds (tambak) by Banjarese and Buginese settlers and/or Fisheries Department. Also, the existing mangrove area (about 23,000 ha) indicates a loss of only several thousand ha of mangrove, much less than the 27,100 ha indicated in the Inpres.
	11. Fire	The importance of this action requires it to be elevated to the level of a program. Effective fire management also has cross cutting issues with cultivation, in particular through the enforcement of fire policies in agriculture (esp. plantations), issues of land tenure and the development of practical alternatives to fire for land clearance and agriculture in the area.
	12. Reforestation	The current Annex targets 40,000ha in total for reforestation compared to the estimated 400,000 ha of deforested peat (>1m deep) in the area. It is recommended that studies of the natural regeneration of the area and an in-depth review of species trials and previous reforestation work are completed before a target is set for reforestation. Donor support may be critical here with Australia, for example, aiming to replant 100 million trees in the area through the KFCP. Assuming 1,000 trees per hectare, this could be equivalent to a target 100,000ha.
<b>2. Cultivation</b>	3. Management of the Swamp Reclamation Network	Detailed data remain lacking to assess the potential for swamp reclamation in the area and detailed topographical and hydrological assessments are required. The infrastructure of the existing schemes is functioning poorly and requires a complete redesign in the context of the hydrological landscape.
	5. Food crop development	Roughly 110,000ha of rice is found in the EMRP. The strategy for increasing rice production in the EMRP is more likely to be successful through intensification rather than extensification of the rice area. The targets for specific commodities (palawija) should be replaced by an approach that aims to strengthen and assist with the diversification, where appropriate, of the specific farm systems.

Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

Program	Activity	Comment
Cultivation (cont.)	6. Horticulture development	The strategy is more likely to be successful through an approach that aims to strengthen and assist with the diversification, where appropriate, of the specific farm systems. The targets for specific commodities (palawija) should be removed and left to detailed planning and farmer choice.
	7. Plantations development	The strategy is more likely to be successful through an approach that aims to strengthen tree-based farm systems, with a specific focus on rubber, coconut and oil palm. The targets for specific commodities should ideally be left to detailed planning and farmer choice with the condition of no development of plantation crops in the Protection Zone and limited, controlled drainage primarily for existing smallholders in the Limited Use Buffer Zone.
	8. Fisheries	The fisheries interventions should not mention specific species, which should be left to detailed planning and farmer choice. A broader range of interventions than pond aquaculture is proposed in the Master Plan.
	9. Livestock	The strategy is more likely to be successful through an approach that aims to strengthen existing livestock-based farm systems and the diversification of other farm systems. The targets for specific commodities should be removed and left to detailed planning and farmer choice.
	10. Processing of agricultural products.	Agricultural processing interventions need to be based on a detailed study of product value chains and local markets, which can be seen as part of the strengthening of the farm system. The targets for specific interventions should be removed and left to detailed planning and farmer choice.
	12. Revitalising agricultural extension	This intervention will require significant work on strengthening the institutional and organizational capacity, relevant training of extension workers and a focus on on-farm research as opposed to dem plots. This should also ensure fishery and forestry extension workers are working with those communities where these are a significant part of local livelihoods.
	13. HTI	The identification of an area for HTI will need to resolve potential conflicts with existing permits, especially for oil palm, and be part of the overall approach to forestry and reforestation.
<b>3. Community Empowerment of Locals and Transmigrants</b>	2. Basic infrastructure	The targets for specific items require revision based on the reduced target for transmigration and coordinating with district government as part of detailed and participatory planning involving communities. There is also no program for village roads. Community driven development and grants can contribute significantly to this activity.
	3. Roads and Bridges	Roads and Bridges should be aligned with a revised spatial plan and the targets for each item revised in accordance with this.
	4. Infrastructure, Facilities & Services for Transmigrant Settlements	The target of 46,500 new transmigrant families should be revised and downgraded. The proposed new transmigration settlement at Terusan Raya, an expansion of an existing settlement, is in accordance with the Master Plan but other proposed areas in Blocks B and C are not. As previous studies by Indonesian experts, this Master Plan recommends that this activity should focus on existing transmigrant settlements and communities, although limited transmigration in Blocks A and D could be part of the overall program. The targets for specific items require revision. A key need – the conversion of 43 UPT from the Mega-Rice Project to definitive villages – needs to be part of this activity.
	5. Human Resource Development	On-going professional development and training could be considered for the newly recruited and existing staff in this activity. The targets for specific items require revision.
	6. Community Facilities	The targets for specific items require revision.
	7. Transport	The targets for specific items require revision.

## 5 Summary of Interventions and Actions

The Master Plan intends to provide a guide to government and other stakeholders on the main issues, directions and actions that need to be taken in the implementation of Inpres 2/2007. The overriding goal in the formulation of the Master Plan has been to take a long-term view to ensuring that the “mistakes of the past are not repeated”. With the broad acknowledgement of the importance of peatland degradation to climate change in the COP-13 UNFCCC meeting in Bali in 2007, the implementation of Inpres 2/2007 has even greater importance and will provide an opportunity to show Indonesia’s commitment to responding to the challenges of climate change in future COP meetings.

The Master Plan and its recommendations and proposed programs have been discussed through a series of consultations with stakeholders. A first draft of the Master Plan was prepared in June 2008 and consultation meetings held at the district level in Buntok, Pulang Pisau and Kuala Kapuas and in Palangka Raya with provincial stakeholders. Further consultations have been held with each of the three Working Groups and the Department of Public Works. These meetings have allowed the Master Plan to be improved through this feedback, which is reflected in this final version. Further details of the consultation meetings can be found in Annex 28.

The strategic considerations and programs for the rehabilitation and revitalisation of the EMRP developed in Chapter 4 provide the basis for the summary of issues (Table 10) and interventions (Table 11). Development of integrated community-based interventions based on a landscape-scale adaptive management approach forms the basis for the rehabilitation and revitalization of the area based on the proposed Management Units.

### Key Actions and Recommendations

The key short-term actions and recommendations of the Master Plan are:

- **Review and revoke permits for oil palm and other large-scale plantations that are on deep (>3m), and preferably also those on medium deep, (1-3m) peat.** Development of these plantations will require drainage of the peat and will lead to an irreversible loss of the peat, changes to the local hydrology and continued carbon emissions through peat oxidation.
- **Revise the Annexes of Inpres 2/2007.** The two annexes include details of interventions and proposed spatial plans for the area. These need to be updated based on new information and knowledge of the area.
- **Revise the EMRP area part of the draft provincial spatial plan (RTRWP).** The draft RTRWP is based on the outdated Inpres spatial plan and does not reflect current knowledge of the peat area. Legislation of this spatial plan for the EMRP area will compromise the objectives of Inpres 2/2007.
- **Focus agricultural revitalization on intensification, optimization and diversification of existing farm systems.** The analysis presented in the Master Plan indicates that the greatest gains in agricultural production with the lowest risks will come from improving existing farm systems.
- **Plan for only a limited expansion of new agricultural areas with a reduction in the target for new transmigrants.** There is limited suitable land available for reclamation for agriculture and this is less than the 93,000 ha targeted in Inpres 2/2007. Further integrated land suitability assessments are required as well as an assessment of available land once land allocation to plantations and other uses has been completed. Consequently, targets for new transmigration should be lowered

accordingly. There is probably in the region of 10-30,000ha of new land that has potential to be reclaimed for agriculture, primarily in Block D and the south of Block A, but this figure will depend on detailed integrated land suitability assessments (integrating hydro-topography, soil and climate, and socio-economic factors) and the allocation of land to other uses, especially plantations.

- **Take immediate action to build up fire prevention and management capacity prior to the 2009 dry season.** Fire remains the key risk and driver of peatland and forest degradation in the area. Although clear policies banning fire have been enacted, the lack of fires in 2007 and 2008 should not be seen as proof that these policies are indeed effective (i.e. enforced) because these have been unusually wet years, which has limited fire risk. Immediate action needs to be taken to build up capacity to ensure there are no further extensive fires in the area as in previous years.
- **Further development of the knowledge base is needed.** Key information and knowledge is lacking for the EMRP area including accurate topography and hydrological information. This needs immediate attention in order to allow further detailed planning to proceed.
- **Plan for an incremental program, starting with pilots in priority areas and learning by doing through an adaptive approach.** The EMRP area is a vast and complex area. The rehabilitation and revitalization program should start in priority areas and taken a phased incremental approach taking note of specific dependencies in interventions (e.g. reforestation is dependent on effective fire prevention and hydrological rehabilitation). Effective monitoring will be vital to learn from early pilots and to adapt subsequent interventions from early experiences.

**Table 10:** Summary of Issues and Strategic Interventions for the EMRP Area by Master Plan Management Zone

Thematic Strategy	Peatland Protection and Conservation Zone	Adapted Management / Limited Development Zone	Development Zone
<b>I. Fire Management</b>	Mostly uninhabited areas but where access exists and where forest cover is limited requires specific strategies for fire management with community-based approaches where possible (Dep. Forestry).	Enabling conditions for fire prevention (i.e. clear and secure land tenure and alternatives to fire for land clearing) Fire prevention finance Management through prevention and village-based fire brigades linked to district and provincial structures.	Limited fire problem - main focus on fire prevention and alternatives to fire for land clearing.
<b>II. Spatial Management and Infrastructure</b>	Overall detailed spatial plan to be completed and effective system of spatial management based on UU26/2007 to be introduced. Major infrastructure (roads, bridges & water management) based on spatial plan and zoning. Economic policy complementing spatial plan. Participatory land use planning and comprehensive micro site mapping as decision bases for demarcation of macro-level planning zones		
	Clear definition of boundaries (Dept.Forestry) with provision of access for communities in line with current regulations. Local participatory land mapping and conservation planning	Sustainable land use practices and boundaries to be socialised to all stakeholders. Infrastructure development to be in line with spatial policy (e.g. roads should not cross peat areas)	Standard approaches to spatial management, land use and infrastructure to be applied in the development zone.
<b>III. Sustainable Forest and Peatland Management</b>	Prevention of illegal logging and burning Hydrological rehabilitation, reforestation. sound NTFP harvesting & management; payments for environmental services. Prevention of illegal logging and burning Sound NTFP harvesting & management; payments for environmental services	Hydrological rehabilitation, effective water management between zones Sound NTFP harvesting & management; Smallholder forest plantation & tree farming; development; sustainable tourism; payments for environmental services	<i>Not applicable</i>
<b>IV. Agricultural Revitalisation</b>	Community access and use of NTFPs	Improved land & water management, extension services & farmer field schools, market access and credit with <b>limitations</b> on drainage and encroachment of deeper peat areas	Improved land & water management, extension services & farmer field schools, market access and credit; Diversification; Limited expansion of schemes
<b>V. Community Empowerment and Socio-economic Development</b>	Prevention of illegal logging, burning and dam destruction. Enabling conditions for community based management and conservation approaches, sustainable tourism, payments for environmental services, Small and medium forest enterprises, Village seed bank and nursery development	Financial institutions for provision of microenterprise credit and other microfinance services Market analysis and development Business development services	Clear and secure land tenure and management rights, value addition, collective marketing, SMEs development, processing centers
		Enabling conditions for community based management and conservation approaches & tree planting / farming, Smallholder forest plantation & tree farming, village seed bank and nursery development, sustainable tourism, payments for environmental services	
<b>VI. Institutional and Capacity Development</b>	Partnership for Rehabilitation and Revitalisation of the EMRP supported by a secretariat and Technical Facility with long-term monitoring, evaluation and applied studies; establishment of institutional arrangements and capacity for the long-term management of the EMRP area.		
	Development of Forest Management Units (KPH) and management plans	Capacity building for basic service delivery (including extension) and administration	

Table 11: Summary of the Programs and Main Interventions Proposed by the Master Plan.

Program	Interventions	Duration (years)	Lead Organisations	Location by Management Unit
<b>1. Fire Prevention and Management</b>	Strengthening and streamlining of policies, institutional mechanisms and operating procedures (including community-based brigades)	1	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Capacity building of regional government for implementation	3	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Integrated planning and budgeting for fire prevention and management	5	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Strengthening and expansion of community-based brigades	3	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Strengthening and expansion of non-community based fire prevention and suppression capacity	3	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Public information campaign	5	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
	Review, monitoring and legal actions (if required)	5	BNPB, BDPB, LH, Dephut, Pemda	I, II, III (priority)
<b>2. Spatial Management and Macro-infrastructure</b>	Revision of maps in Annex II of Inpres 2/2007	1	Bappenas, Pemda	All units
	Revision of EMRP area part of draft provincial spatial plan (RTRWP)	1	Pemda, Dephut	All units
	Review of status of area ( <i>kawasan khusus, kawasan strategis</i> )	1	Bappenas, PU, Pemda	All units
	Conduct detailed spatial planning in the EMRP area	2	PU, Bappenas, Pemda	All units
	Updating of district spatial plans (RTRWK)	2	PU, Bappenas, Pemda	All units
	Program for the standardisation of spatial data management	3	Bakosurtanal, Pemda	All units
	Development mechanism to control spatial development in line with UU26/2007	3	PU, Depdagri, Bappenas, Pemda	All units
	Program to improve spatial data on topography, relevant biophysical characteristics and integrated land suitability	3	Bappenas, Deptan, PU, Pemda	All units
	Produce a macro-infrastructure investment strategy	1	PU, Pemda	All units
	Multi-year construction program of macro-infrastructure construction	5	PU, Pemda	All units
<b>3. Sustainable Peatland Management, Rehabilitation and Conservation</b>	Develop a guideline and detailed plans for integrated peatland rehabilitation and conservation	1	All	I, II, III
	Use village facilitators (see program 5) to develop a community-based approach in planning, implementation, monitoring and evaluation	5	All	I, II, III
	<b>A. Hydrological Rehabilitation</b>			
	Development of 'Hydrological Rehabilitation Plans' for each management unit	1	Pemda, PU, Dephut	I, II, III
	Establishment of hydrological monitoring system (as part of integrated long-term monitoring system)	1	Pemda, PU, Dephut	I, II, III
	Construction of appropriate canal blocking structures including the SPI canal (mostly in the Protection Zone) and/or water control structures (mostly in the Limited Buffer Zone) to maintain dry season water levels as high as possible	5	Pemda, PU, Dephut	I, II, III
	Continuous review of water management and control interventions and adaptation as needed	5	Pemda, PU, Dephut	I, II, III
	<b>B. Forest Rehabilitation and Reforestation</b>			
	Applied research and studies of natural regeneration and succession	5	Dephut, Ristek, LIPI, Pemda and others	I, II, III
	Species selection trials for reforestation	5	Dephut, Pemda and others	I, II, III
Development of silvicultural treatments for forest rehabilitation	5	Dephut, Pemda and others	I, II, III	

Program	Interventions	Duration (years)	Lead Organisations	Location by Management Unit
	Piloting of community-based forest management, reforestation and agro-forestry	5	Dephut, Pemda and others	I, II, III
	Reforestation of up to 500,000ha (depending on need)	5	Dephut, Pemda and others	I, II, III
	Establishment of a multi-stakeholder forest rehabilitation platform	5	Dephut, Pemda and others	I, II, III
	<b>C. Conservation and Environmental Management</b>			
	Delineation and confirmation of key areas with biodiversity value as conservation areas	1	Dephut, Pemda	I, II, III, IV
	Action against conservation threats (illegal logging, inappropriate tambak development, inappropriate plantation development)	5	Dephut, Pema	I, II, III, IV
	Development of collaborative, participative arrangements for the long-term management of conservation areas	5	Dephut, Pemda	I, II, III, IV
	Strengthening of environmental management and EIA's / AMDAL in peat and lowland	3	LH, Pemda	I, II, III, IV
	Review of EIAs (ANDAL) as applied in peatland in the EMRP and development of technical guidelines for these	1	LH, Pemda	I, II, III
	Strengthening of environmental management and EIA's / AMDAL in peat and lowland	3	LH, Pemda	I, II, III, IV
	<b>D. Boundary Establishment and Forest Management</b>			
	Review Ministerial Decree 166/Menhut/VII/1996	1	Dephut, Pemda	I, II, III
	Review, revise and revoke plantation licenses	1	Dephut, Pemda	I, II, III
	Review boundaries of protection area (kawasan lindung) in Inpres 2/2007	1	Dephut, Pemda	I, II, III
	Forest resource survey, inventory and mapping	1	Dephut, Pemda	I, II, III
	Community-based participatory land mapping and consultations on proposed boundaries	1	Dephut, Pemda	I, II, III
	Issuance of a Ministerial Decree defining the state forest area	1	Dephut	All
	Establishment of boundaries on the ground	4	Dephut, Pemda	I, II, III
	Establishment of three forest management units (KPH) to manage the three blocks of the Protection Zone	1	Dephut, Pemda	I, II, III
	Detailed zoning and development of medium-term management plans for the three KPH	2	Dephut, Pemda	I, II, III
	Development of community-based forest and peat protection and rehabilitation along with financial mechanisms for sharing benefits from carbon finance with communities	5	Dephut, Pemda	I-III
<b>4. Agricultural Revitalisation</b>	Detailed planning of agricultural revitalization program	1	Deptan, PU, Pemda	(IV), V, VI, VII, VIII, IX
	Integrated land suitability assessments	3	Deptan, PU, Pemda	(IV), V, VI, VII, VIII, IX
	<b>A. Strengthening Agricultural Farming Systems</b>			
	Provision and upgrading of agricultural infrastructure and facilities (e.g. energy supply, transportation, mechanization, pre and post-harvest storage facilities,	5	Deptan, PU, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX



Program	Interventions	Duration (years)	Lead Organisations	Location by Management Unit
	pest and seed centres, telecommunications, markets, agro-processing and packaging facilities, service centres)			
	Strengthen the agriculture, fisheries and agro-forestry / forestry extension services (recruitment, institutional strengthening and training)	5	Deptan, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Reclamation of new agricultural land in suitable areas	5	Deptan, PU, Depnakertrans, Pemda	VI, VII, VIII, IX
	Provision of increased access to finance (e.g. credit programs and expansion of network of facilities such as BRI) for farmers (including fisheries, agro-forestry and forestry)	5	Deptan, Depkeu, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Provision of increased market opportunities (e.g. through market and value chain analysis, price information and infrastructure development) (including fisheries, agro-forestry and forestry)	5	Deptan, Deperindag, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Provision of quality agricultural inputs to strengthen and diversify the rice-base, tree-based and livestock-based farm systems	5	Deptan, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Through the extension services, conduct local land suitability assessments and pest control assessment with farmers at the village level	5	Deptan, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Initiate on-farm research (as opposed to dem plots)	5	Deptan, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	Development of practical approaches and systems for land clearance without fire (esp. large-scale) including safe burning practices for smallholders as a temporary measure	5	Deptan, Pemda	I, II, III, (IV), V, VI, VII, VIII, IX
	<b>B. Land and Water Management</b>			
	Detailed topographical and hydrological surveys at the landscape scale in the transmigration areas (e.g. Pangkoh, Lamunti, Dadahup)	2	PU, Deptan, Depnakertrans, Pemda	II, III, VI, VII, VIII, IX
	Review and redesign of water management infrastructure in the major transmigration / production areas	2	PU, Deptan, Depnakertrans, Pemda	II, III, VI, VII, VIII, IX
	Construction and rehabilitation of water management infrastructure	3	PU, Deptan, Depnakertrans, Pemda	II, III, VI, VII, VIII, IX
	Strengthening of on-farm water management practices and institutions (e.g. P3A etc.)	5	PU, Deptan, Depnakertrans, Pemda	II, III, VI, VII, VIII, IX
	Assessment and planning of flood control options on main rivers (especially Barito)	2	PU, Pemda	I, II, V, VI
	Implementation and construction of flood mitigation measures	3	PU, Pemda	I, II, V, VI
	On-going monitoring and review of performance of water management infrastructure and on-farm practices	5	PU, Deptan, Depnakertrans, Pemda	II, III, VI, VII, VIII, IX
	<b>C. Fisheries</b>			
	Detailed planning of fisheries programs	1	DKP, Pemda	I-IX
	Strengthening and expansion of (a) cage aquaculture, (b) pond aquaculture, (c) traditional pond capture (beje) fisheries, (d) ornamental fish raising, and (e) limited tambak and related infrastructure and facilities	5	DKP, Pemda	I-IX

Program	Interventions	Duration (years)	Lead Organisations	Location by Management Unit
	Institutional strengthening of the fisheries sector through technical capacity building, integrated planning for fisheries, monitoring of fisheries including catches and stocks	5	DKP, Pemda	I-IX
<b>5. Community Empowerment and Socio-economic Development</b>	Detailed planning of community empowerment and socio-economic development program including integration with other programs	1	Depnakertrans / Depdagri, Pemda	I-IX
	<b>A. Community Empowerment</b>			
	Recruitment, placement and support of village facilitators to facilitate community engagement in the implementation of Inpres 2/2007	5	Depnakertrans / Depdagri, Pemda	I-IX
	Public information on Inpres 2/2007, the Master Plan and programs	5	Depnakertrans / Depdagri, Pemda	I-IX
	Resolution of land tenure and land claim issues	1	Depnakertrans / Depdagri, BPN, Pemda	VI, VII
	Strengthening of village institutions	5	Depnakertrans / Depdagri, Pemda	I-IX
	Community planning, training and technical assistance to villages	5	All	I-IX
	<b>B. Basic Services and Infrastructure</b>			
	Upgrading health services (especially staffing and service quality)	5	Depkes, Pemda	I-IX
	Upgrading education services (especially staffing and service quality)	5	Depdiknas, Pemda	I-IX
	Provision of basic rural infrastructure especially village roads, jetties, drinking water and sanitation (including through a community-driven grants approach)	5	Depnakertrans / Depdagri, Pemda	I-IX
	Program to increase access to electricity	5	Pemda	I-IX
	<b>C. Socio-economic development</b>			
	Market research and value chain analysis for key products (not included in other programs) and commercialization of non-timber forest products	2	Deperindag, Dephut, Pemda	I-IX
	Facilitation of the formation of producers groups, associations, cooperatives for collective marketing and strengthening of these and existing groups through capacity building	5	Depnakertrans / Depdagri, Deperindag, Pemda	I-IX
	Upgrading of services and facilities in existing transmigrant communities	5	Depnakertrans, Pemda	I-IX
	Placement of additional transmigrants in empty plots in Lamunti, Dadahup and Palingkau (once land issues and services and facilities are upgraded)	5	Depnakertrans, Pemda	I-IX
	Development of agro-processing centres (e.g. rattan, cassava, fruits)	5	Depnakertrans, Deperindag, Pemda	I-IX
	Development of small and medium-scale enterprises	5	Depnakertrans, Deperindag, Pemda	I-IX
	NTFP commercialisation	5	Depnakertrans, Deperindag, Pemda	I-IX
<b>D. Transmigration</b>				
Review approach to transmigration (food crops or other)	1	Depnakertrans, Pemda	I-IX	
Refill program for Lamunti, Dadahup, Palingkau	5	Depnakertrans, Pemda	VII, VII, VIII	
New transmigration (5,000-10,000 KK)	5	Depnakertrans, Pemda	VII, VII, VIII, IX	
<b>6. Institutional and</b>	Establish a 'Partnership for Rehabilitation and Revitalisation of the EMRP'	5	Bappenas, Pemda	I-IX
	Continue with existing working groups and coordination teams and create new working groups to address the three new programs (fire prevention and	5	Bappenas, Pemda	I-IX

*Master Plan for the Rehabilitation and Revitalisation of the EMRP Area*

<b>Program</b>	<b>Interventions</b>	<b>Duration (years)</b>	<b>Lead Organisations</b>	<b>Location by Management Unit</b>
<b>Capacity Development</b>	management; spatial management and infrastructure; institutional and capacity development)			
	Establish a full-time Inpres 2/2007 and partnership secretariat in Palangka Raya	5	Bappenas, Pemda	I-IX
	Establish a Technical Facility	5	Bappenas, Pemda	I-IX
	Establish a long-term monitoring and evaluation system	5	Bappenas, Pemda	I-IX
	Review and revise relevant policies where appropriate and design institutional basis for the long-term management of the area	1	Bappenas, Pemda	I-IX

## **ANNEXES**

### **Master Plan for the Rehabilitation and Revitalisation of the EMRP Area, Central Kalimantan**

## **ANNEX 1: Presidential Instruction No 2 / 2007**

The key policy guiding the rehabilitation and revitalisation of the Ex-Mega Rice Project area is Presidential Instruction No 2 / 2007 issued on 16 March 2007. The Presidential Instruction (Inpres) follows on from the report of the Ad Hoc Team and describes a five-year multi-sectoral program. The Inpres forms a National Team at ministerial level, chaired by the Coordinating Minister for the Economy, and a Working Group (Pokja) for each of the main programs of conservation, agriculture and community empowerment. The timeframe puts pressure on the implementing agencies but an integrated master plan for the rehabilitation and revitalisation of the EMRP is lacking.

The Presidential Instruction contains four main programs:

- **Conservation** – Focused on the restoration of the hydrological function of 1.1 million ha through the blocking of canals, ecosystem restoration through planting and promoting natural succession, reforestation of up to 50,000ha, prevention and control of forest fires with the Minister of Forestry having lead responsibility for all activities except fire control and prevention, which is led by the State Minister of the Environment;
- **Agricultural Revitalisation** – Focused on 330,000ha of the area and led by the Minister of Agriculture. The program focuses on rehabilitation and maintenance of the water infrastructure (led by the Department of Public Works), rehabilitation and development of agricultural infrastructure, development of food crops (123,000ha for wet rice production, 62,000ha for secondary good crops), horticulture (17,600ha), plantations (22,900ha), industrial timber plantations (153,000ha), fisheries and livestock, agricultural processing, institutions and services.
- **Community Empowerment** – Led by the Department of Employment and Transmigration, the focus is on support community development and empowerment. These include basic infrastructure, roads and bridges, local settlement improvements and improvements in basic services. The program also contains a proposal for an additional 46,500 transmigrant families to relocate to the area.
- **Coordination and Evaluation** - Focused on reviewing environmental policy in the EMRP, coordinating and evaluating the economic and community empowerment aspects of the Inpres amongst the sectors, evaluating implementation of the programs and evaluating the implementation of conservation policy.

### ***Finance for the Inpres***

Much of the finance for the Inpres is expected to come from existing departmental budgets (APBN) and will be executed through projects implemented via the technical departmental offices (UPT) in the region (e.g. Balai, BP DAS), the provincial technical agencies (through *dekonsentrasi*) and district technical offices (through *tugas pembantuan*).

### ***Targets of Inpres 2/2007***

Inpres /2007 presents specific targets to be achieved within a five-year time frame covering three main programs with coordination and evaluation led by Bappenas. The main targets are shown in the Box: Programs of Presidential Instruction 2/2007.

**BOX: Programs of Presidential Instruction 2/2007**

**Conservation Program**

- Definition of the forest boundary through a Decree of the Minister of Forestry;
- Deep peat conservation (281,200ha) with damming of canals to bring water levels up to 40cm;
- Gelam forest conservation (76,300ha) and planting of 7,000ha of gelam;
- Hydrology conservation (273,400ha) with damming of canals to bring water levels up to 40cm and encouragement of natural vegetation succession;
- Flora and fauna conservation (133,000ha) with reduction in illegal logging, damming canals to bring water levels up to 40cm, enrichment planting and conservation management;
- Heath (*kerangas*) forest conservation (87,700ha);
- Black water ecosystem conservation (18,700ha) with damming of canals and replanting of native species;
- Mangrove forest conservation and restoration (27,100ha) with replanting
- Forest and land fire management to reduce fires to 5% (not specified of what)
- Reforestation of 10,000 ha per year through planting of 12.1 million trees.

**Agricultural Development Program**

- Management of swamp reclamation water management infrastructure through (a) provision of 93,000 ha of new network, (b) rehabilitation of 30,000ha of network, (c) O&M for 230,000 ha each year, (d) flood control for 45,000ha, (e) rehabilitation of community handil (40,000ha).
- Rehabilitation of agricultural infrastructure and land (123,000ha)
- Development of food crops including (a) rice (123,000ha) and (b) palawija (62,000ha)
- Development of horticulture crops (17,600ha)
- Development and rehabilitation of plantations including (a) rubber (7,500ha), (b) coconut (5,000ha), (c) oil palm (10,000ha), (d) other (200ha).
- Fisheries development based on the development of ponds
- Livestock development including development of feed and provision of animals
- Agricultural processing
- Institutional and agricultural service development including extension services
- Timber plantation development (153,000ha)
- Regreening (5,000ha per year) and planting of 2.1 million trees

**Community Empowerment Program**

- Provision of basic infrastructure (health centre, posyandu, clean water, school rehabilitation and construction, sub-district market construction, micro-credit organizations, food and non-food support for PLG transmigrants and places of worship)
- Road and bridge maintenance and construction – provincial roads (143km to be constructed) and district roads (60km to be constructed)
- Services in PLG transmigration communities including (a) population administration, (b) review of land certificates, (c) house rehabilitation, (d) new houses and placement of 46,500 new transmigrant families plus related support
- Human resource development including (a) pembina for transmigration villages, (b) placement of doctors, midwives, teachers and agricultural support workers, (d) training and guidance
- Support services for health and education
- Transportation support including rehabilitation and construction of jetties, provision of village land and river transport

**Indicative Spatial Plan**

Annex II of Inpres 2/2007 contains a proposed spatial plan for the EMRP area. This divides the area into a protected area (*kawasan lindung*) of 897,000 hectares and a cultivation area (*kawasan budidaya*) of 559,900 hectares divided between forest plantations (153,000ha) and agriculture (406,900ha) (Table A1 and Figure A1). This division broadly ensures that the deep peat in blocks A, B and E are in protected areas although in block C, some of the deep peat is not within the protected area

boundary. It is recommended that this boundary is modified to accommodate the deep peat in block C.

**Table A1.1:** Land allocations for the EMRP Area in Inpres2/2007.

Status	Area (ha)	Comment
<b>A. Protected</b>	<b>897,400</b>	-
1. Flora and fauna conservation	133,000	Part of KFF in Block A/E degraded forest but on deep peat – more suitable as peat conservation.
2. Mangrove conservation	27,100	Mangrove in south of block D should be conserved – designated for tambak in Inpres.
3. Black water ecosystem conservation	18,700	From remote sensing images, this system in the south of block C is probably highly degraded and burnt.
4. Hydrology conservation	273,400	Mostly consists of (a) good forest with high biodiversity value suitable for conservation and (b) deep peat.
5. Quartz sand conservation	87,700	-
6. Gelam/sedge conservation	76,300	Scattered areas designated in blocks A and D – difficult to manage and land cover in parts no longer gelam.
7. Peat conservation	281,200	Some deep peat in blocks C and E not included.
<b>B. Cultivation</b>	<b>559,900</b>	
1. Forest (tree crop) cultivation	153,000	Drainage in the south of block C may be problematic – needs careful species selection.
2. Wet rice	43,200	-
3. Rice, vegetables and horticulture and other	309,400	-
4. Fishery (tambak)	12,500	This area should be designated for mangrove conservation as mangrove here is in good condition.
5. Community canals ( <i>handil</i> )	41,800	No area given in Inpres – 41,800ha represents balance of cultivation area after other allocations.
<b>Total</b>	<b>1,415,500</b>	Total area indicated in Inpres maps less than actual area.

### **Master Planning in the Inpres**

Inpres 2/2007 instructs the relevant departments to complete a Master Plan for each of the three main programs. In December 2007, the Department of Forestry completed a Master Plan for the Rehabilitation and Conservation of the Central Kalimantan Peatland Development Project Area, while the Department of Agriculture produced a General Guideline for the Agricultural Development Program in August 2007. It has been proposed that the present Master Plan will form an Integrated Master Plan for the Inpres Rehabilitation and Revitalisation Programs with other program-based Master Plans and strategic plans providing the link to the implementation of specific activities under the Inpres.

### **Conservation and Rehabilitation Master Plan (Permen 55/Menhut-II/2008)**

The strategy of the Conservation and Rehabilitation Master Plan is to:

- Protect and safeguard forest and establish the forest area (kawasan hutan) according to function;
- Rehabilitate forest and restore the ecosystem in the context of revitalising the function of the peat swamp forest ecosystem.

In relation to these strategic goals, a number of demand-driven principles need to be fulfilled:

1. Confirmation of the forest area (pengukuhan kawasan hutan) to be maintained as forest land in the ERMP area must be undertaken after allocation of other land uses such as agricultural land, food crops, transmigration settlements, plantations and other land use allocations such as mining, clearly defined with clear boundaries

together with joint commitment from stakeholders that supports the agreed allocation to forest.

2. The process of confirmation of forest as state forest, forest under rights (*hutan hak*), and/or customary forest (*hutan adat*) according to the clear existence of customary communities is an inseparable activity from the conservation of the EMRP area.

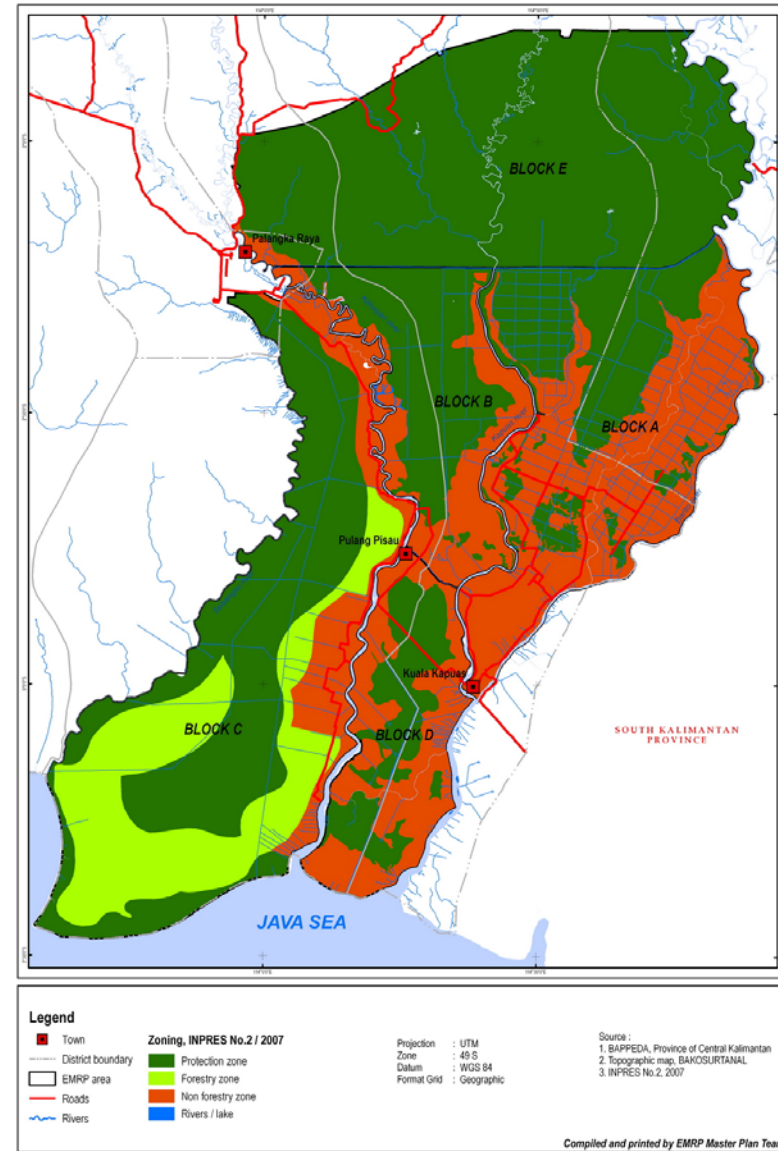
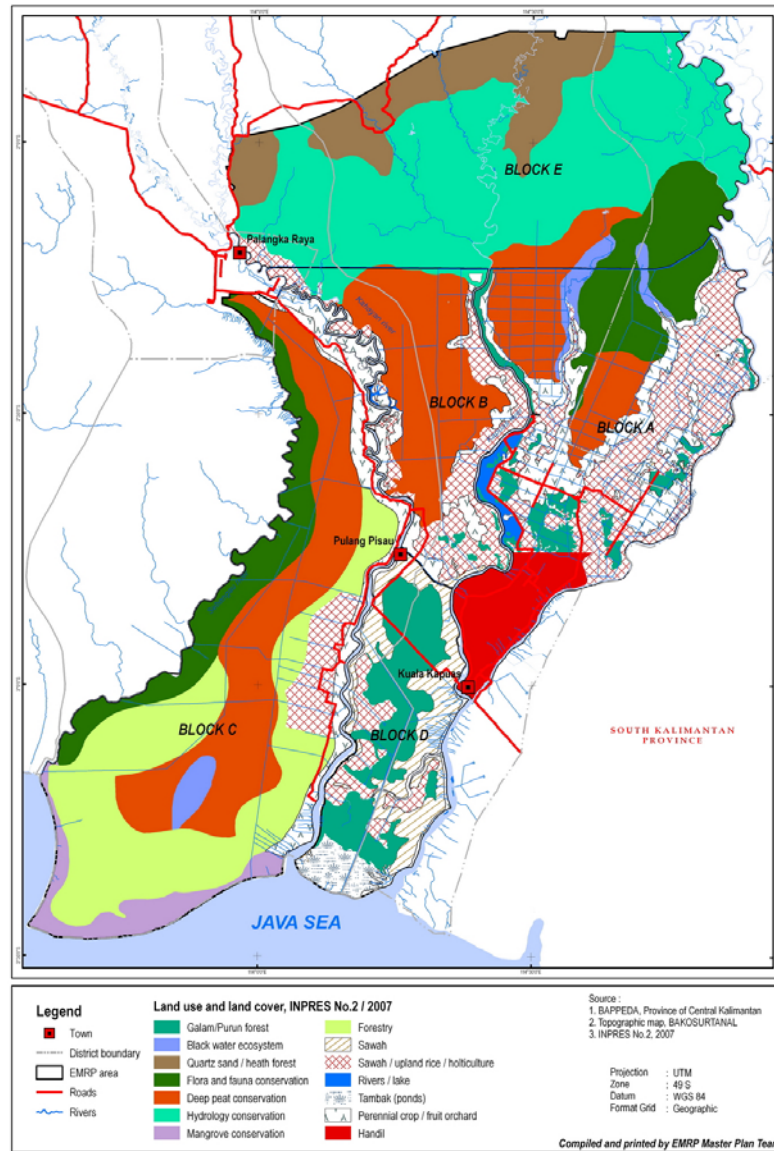
3. Conservation of the EMRP area must prioritise “access tenure” over “land tenure”.

The Conservation Master Plan states that unique ecosystems and biodiversity in the area are to be protected, while resource utilization within such areas is still allowed as long as it does not disturb the continuity of the protected biodiversity and ecosystems. The classes of Hydrological Conservation, Black Water Ecosystem Conservation and Flora and Fauna Conservation are grouped together in Deep Peat Forest Ecosystem Conservation. The identified unique ecosystems are: (a) Deep Peat Forest Ecosystem (706.300 hectares), (b) Gelam Forest Ecosystem (76.300 hectares), and (c) Heath Forest Ecosystem 87.700 hectares). The Mangrove Forest Ecosystem (27.100 hectares) is not considered unique, but listed for conservation because of its coastal line protection function.

The target of the Rehabilitation and Conservation is the whole of the Protection Area already appointed by the Inpres 2/2007, with a total area of 879,400 hectares. This area corresponds with the combined area of the four identified ecosystems for protection. The Plan proposes another area of 151,720 hectares for forest cultivation (production forest). The Plan states that the state forest boundaries need to be officially marked and mapped and that all stakeholders need to respect these state forest boundaries. The Plan further subdivides the main ecosystems based on status of degradation and occupation by local communities. Based on these subdivisions areas are either assigned as Nature Reserve (*Cagar Alam*), Protection Forest (*Hutan Lindung*), Limited Production Forest (*Hutan Produksi Terbatas*) or Wildlife Reserve (*Suaka Margasatwa*).



**Figure A1.1:** Proposed spatial zoning in the Inpres showing (left) the detailed zoning as per Annex II of Inpres 2/2007 and (right) the division between protected areas (dark green), area for forest plantation cultivation (light green) and area for agricultural development (yellow)



## **ANNEX 2: Approach to the Master Plan Project**

The **purpose** of the Master Plan is to “lay out a comprehensive plan addressing technical, environmental, socio-economic, cultural and institutional issues related to and impacting on the long term sustainable rehabilitation of the Ex-Mega Rice Project area”.<sup>1</sup>

The objectives of the Master Plan project are to:

**Objective 1:** To acquire and collate data to provide a foundation on which to make planning recommendations for the rehabilitation of the EMRP area;

**Objective 2:** To assess development and conservation potentials for the EMRP area and to analyse possible scenarios for the future;

**Objective 3:** To provide strategic guidance and a framework for the long-term management and the development of interventions for the rehabilitation and revitalization of the area.

This Master Plan builds on previous studies of the EMRP area, existing developments and plans. In order to ensure that planning reflects local realities and builds on the knowledge of stakeholders working in the area, the approach to the Master Plan has involved:

- Engagement and cooperation with GOI at all levels and cooperation with the Working Groups of Inpres 2/2007;
- A multi-stakeholder approach that has involved consultations and workshops at the sub-district, district and provincial levels;
- Workshops and meetings of technical groups in Palangka Raya to review and assess on-going initiatives along thematic lines (e.g. canal blocking, fire management, reforestation);
- Verification and checking of secondary data;
- Field visits by team members to better understand the problems and potential solutions in the area;
- Cooperation with pilot projects working on peatland rehabilitation in the area including the Central Kalimantan Peatlands Project (CKPP) and CIMTROP;
- Extensive surveys of peat extent, depth, topography and land cover (excluding block E) as well as hydrological monitoring, survey and assessments. Further details are provided in Annex 3;<sup>2</sup>
- A Land Use / Land Cover (LULC) and flood analysis based on remotely sensed images. Further details are provided in Annex 6.

As an Integrated Master Plan, the master planning has been organised into eight thematic clusters that address the key issues relevant to the rehabilitation and revitalisation of the EMRP area (see Table 1.1).

### ***The Master Planning Process***

The development of the Master Plan has been a twelve-month process beginning in October 2007. The analysis presented in the Master Plan is based on newly collected and existing data, which has been synthesized and analysed. The Master Planning process has involved documentation and field verification of the existing situation in the EMRP area for each planning theme, development of spatial zoning and management units based on principles of peatland and lowland management and the diversity of land utilization types in the area, and development of a strategic approach to the long-term management, rehabilitation and revitalization of the area (see Figure 1.1). Throughout the Master Planning process, the team has consulted with national, provincial and district governments and other stakeholders (see Box: Community and Stakeholder Engagement).

---

<sup>1</sup> Royal Netherlands Embassy – Government of Indonesia (2007) Terms of reference for services in the field of conservation and sustainable development of peatlands in Central Kalimantan, Indonesia.

<sup>2</sup> Surveys of peat extent, depth, topography and land cover include an extensive survey implemented as part of the Central Kalimantan Peatlands Project prior to the commencement of the Master Plan project.

**BOX: Community and Stakeholder Engagement**

The Master Plan developed a participatory process that has involved numerous meetings at provincial, district, sub-district and village levels to ensure that the resulting Master Plan reflected the views of communities living in the area and other stakeholders. An initial workshop in November 2007 in Palangka Raya provided strong direction to the master planning process including:

1. Master Planning for the EMRP must include all stakeholders from the community to district, provincial and national levels.
2. The master planning process must refer to, study and build on existing regional and sectoral plans.
3. The master planning needs a mechanism to resolve all socio-cultural, economic, land, policy overlaps and interests that exist at the moment within and around the area.
4. Socialisation to the community is needed regarding relevant policies and the master planning process.
5. Agreement and disagreement between stakeholders will become issues for discussion in all public / multi-stakeholder consultations during the master planning.
6. The approach in the master plan should seek to integrate scientific knowledge with local practices and experience.
7. Master planning must involve local institutions such as universities and those at the district level in the EMRP area.
8. The final master plan must be based on a shared vision and principles developed during the master planning process.

During the course of the development of the Master Plan, workshops and consultations have been organized in six villages, twenty sub-districts and all districts. These have enabled specific issues and interests of the people living in the EMRP area to be raised and reflected in the final Master Plan. Meetings have been held in Bappenas and with all three working groups of Inpres 2/2007. A final series of consultations was held between July and October 2008 to discuss the first draft of the Master Plan.

**Table A2.1: Planning Themes and Main Tasks of the Master Plan Team**

Theme	Main Tasks
<b>1. Spatial Data and Planning</b>	Key role in integrating the spatial aspects of the master planning process through collation and management of spatial data, production of spatial planning products.
<b>2. Fire Management</b>	Analysis of fire risk and recommendations for fire management.
<b>3. Hydrology and Water Management</b>	Provide the hydrological basis for the management of the EMRP area through collection and analysis of hydrological data, identification of eco-hydrological units, development of a hydrological and peat subsidence simulation model, and generation of a new understanding of the area's hydrology.
<b>4. Land &amp; Water Management and Infrastructure</b>	Provide a framework for land and water management for conservation and development and infrastructure including designs for canal blocking devices and guidelines for 'green engineering' in conservation areas.
<b>5. Land Use For Production and Conservation</b>	Determine land use options through an integrated land use evaluation based on physical parameters, ecosystem (agricultural, agro-forestry and natural) characteristics, species and system criteria.
<b>6. Socio-Economic and Community Development</b>	Socio-economic analysis of the area and development of community development and livelihood support options through a consultative process within each of the 19 sub-districts and more detailed analysis at the village level.
<b>7. Finance and Economic Analysis</b>	Assessment of economic costs and benefits, fiscal implications and possible financing options including donor and carbon finance.
<b>8. Institutions and Capacity Building</b>	Analysis of policies and institutional arrangements in the area, development of a capacity building strategy and coordination of specific capacity building interventions during the master planning.

### ANNEX 3: Peat Map for the EMRP Area

**Sources** - During the Peat Soil and Drainage Mapping Project extension of CKPP project in 2007 existing peat depth data for the EMRP area were collected from the following sources: (1) Restorpeat (EU-funded project, 1999), (2) BOS-MAWAS (2003-2005), (3) CKPP (2005-2007), and (4) Puslitanak (1998). New peat depth surveys during the PSDM-CKPP project were carried out in the second half of 2007 increasing overall data density with 150 additional measurements. This Master Plan project completed another 114 measurements in Block A and C.

**Uncertainties** - It was found that significant differences exist between the datasets, where they have peat depths in (nearly) the same location. These differences are most likely due to differences in methods and in interpretation of what is 'peat'. Especially the 'soupy' layer of organic and mineral material between peat and mineral substrate causes problems in this respect. After due deliberations and discussions with Puslitanak (Mr Lili Muslihat) and Restorpeat (Dr. Jack Rieley) we have decided not to make choices on which dataset to use in the peat depth map but to simply use all data, only excluding points that were clearly wrong. Where different peat depths are found on nearby locations, the peat depth map will present a smoothed average. Because hardly any peat depth measurements were available for Block E it was decided to use the Kalimantan Peat Atlas (Wetlands International, 2006) for this area by adding some points to the map which have the same peat depth as the peat atlas indicated. We have tried to obtain the metadata and method on how this Peat Atlas was made but to no avail. This Peat Atlas is included in the spatial GIS database.

**Interpolation technique** - The Topo to Raster interpolation technique available within ArcGIS (a thin plate spline method with settings no drainage enforcement and spot heights as primary input data) was used to create the peat depth map using the complete available datasets, setting peat depth along the rivers at 0 as these are mineral soils. A few additional points were added manually to improve automatic interpolation. A polygon with all the blocks, including rivers, was used as boundary (the same which was used for the DEM generation). The resulting peat map was generated with the function Topo to Raster by File. The input file is displayed below:

```
POINT F:\EMRPGIS_peatmap\utm50S\input\peatdepth-Restorpeat-utm50S.shp PEATDEPTH
POINT F:\EMRPGIS_peatmap\utm50S\input\peat_and_soils-PSDM-CKPP-utm50S.shp PEATDEPTH
POINT F:\EMRPGIS_peatmap\utm50S\input\peat-Puslitanak-utm50S.shp PEAT_DEPTH
POINT F:\EMRPGIS_peatmap\utm50S\input\peat-CKPP-utm50S.shp PEATDEPTH
POINT F:\EMRPGIS_peatmap\utm50S\input\peat-BOSMAWAS-utm50S.shp PEATDEPTH
POINT F:\EMRPGIS_peatmap\utm50S\input\ExtraPeatPoints-v2f-utm50S.shp PeatDepth2
POINT F:\EMRPGIS_peatmap\utm50S\input\NewPeatMP-utm50S.shp PEATDEPTH
CONTOUR F:\EMRPGIS_peatmap\utm50S\input\RiverZeroPeat_50S.shp ZeroPeat
BOUNDARY F:\EMRPGIS_peatmap\utm50S\input\MRParea-utm50S.shp
ENFORCE OFF
DATATYPE SPOT
ITERATIONS 40
ROUGHNESS_PENALTY 0.5000000000
DISCRETE_ERROR_FACTOR 1.0000000000
VERTICAL_STANDARD_ERROR 0.5000000000
TOLERANCES 0.0000000000 200.0000000000
EXTENT 119463.95768302113 9615936.97410069030 271316.74699602561 9927307.33850874750
CELL_SIZE 100.0000000000
MARGIN 20
```

**Peat map** - Despite uncertainties resulting from differences found in the respective datasets and lack of data in certain areas (south of Block C and the whole of Block E) we have confidence in the boundary where deep peat (exceeding 3 metres depth) is found.

#### ANNEX 4: Hydrology of the EMRP Area

The EMRP area is a river delta with a landscape formed by hydrological processes: (i) intermittent flooding and sediment deposition in mineral areas, and (ii) permanent waterlogging and accumulation of organic material in the peatlands. The hydrology of the area is determined by sea tides entering from the coast into the downstream river reaches and by the flow of the major rivers - the Barito, Kapuas, Kahayan and Sebangau. The catchment of the Barito is about 40,000km<sup>2</sup>, roughly twice as large as that of the Kapuas and Kahayan rivers. The tides are mainly diurnal (one high water and one low water each day) and the tidal range fluctuates from an average of 1.2m during neap-tide to 2.4m during spring-tide, with only minor variations throughout the year. An 18.6 year cycle determines the maximum tidal water level, which can become as high as 1.55 metres above Mean Sea Level. Upstream of the fully tidal river reaches the water-levels become more and more determined by the river flow, and seasonal fluctuations become pronounced. Near the upstream boundary of the EMRP area tidal fluctuations are almost entirely absent, and wet season river levels in the Barito and Kahayan rivers can be 5m above dry season levels for periods, while in the Sebangau and Kapuas the wet-dry season difference is typically 2m.

As a result, the area's hydrology sets the boundary conditions for the development of the area and the following hydrological conditions and processes need to be considered in planning and management of the area:<sup>3</sup>

**Tidal Flooding** - In the downstream part of the area, low-lying lands are subject to flooding by high tides. Flooding depth can be up to several decimeters, and while the duration of high tide is a few hours only, the land may remain flooded for some time after the high water has receded from the river or canal. In areas without salinity intrusion, the tidal flooding is highly beneficial for wetland rice cultivation (tidal irrigation).

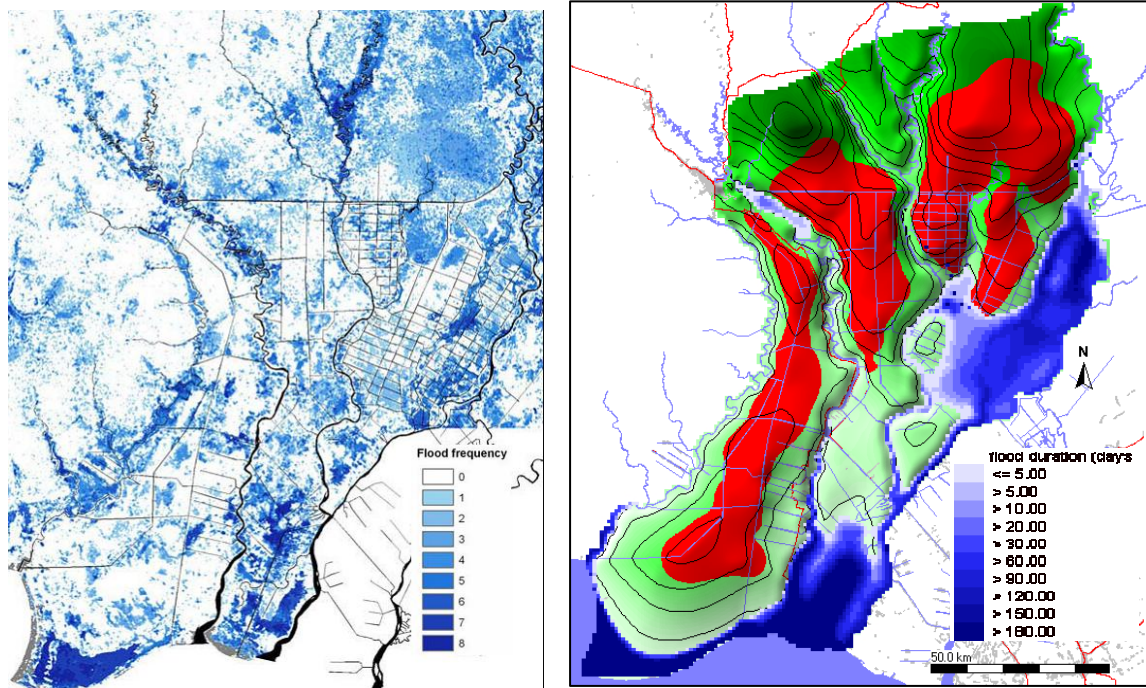
**River Floods** - Upstream of the tidal river reaches increased river flows during the wet season inundate adjacent lands. These river floods may last for weeks or even months, and flooding depth can be up to several meters depending on the local topography in relation to the river levels. Flooding from rivers is determined by water flows from the upstream river basins of the Barito, Kapuas, Kahayan and Sebangau rivers. Hydrological model results and field observations show that large-scale and prolonged river flooding presently occurs mostly along the Barito River, affecting parts of Block A and D as shown in Figure A4.1. Flooding is most frequent and deepest in the Jenamas area and, to a lesser extent, the Dadahup transmigration area.

**Rainwater Ponding** - The flat topography and high groundwater tables can result in rainwater causing local ponding. The water accumulates in depression areas, which then remain inundated for weeks or even months. This type of flooding occurs both in depressional areas in mineral soils and at the foot slopes of local peat domes. It is usually shallower and shorter-lived than flooding by rivers, but it is more frequent and affects a larger area (Figure A4.1, left figure).<sup>4</sup>

---

<sup>3</sup> Further details are provided in the Technical Report on the Hydrology of the EMRP area.

<sup>4</sup> The maps show areas that are flooded by river water, but mostly areas where ponding with rainwater occurs to depths of sometimes only a few cm depth. It is not possible to distinguish the two types of inundation with this technique, but the data have been a useful check on hydrological analyses and modeling.



**Figure A4.1:** River flooding frequency plus rainfall ponding in the EMRP area as observed by satellite (left; provided by SarVision) and as modelled (right). Frequency is the left figure is a relative measure based on the extent of water inundation of eight satellite images from throughout 2007.

### **Drainability**

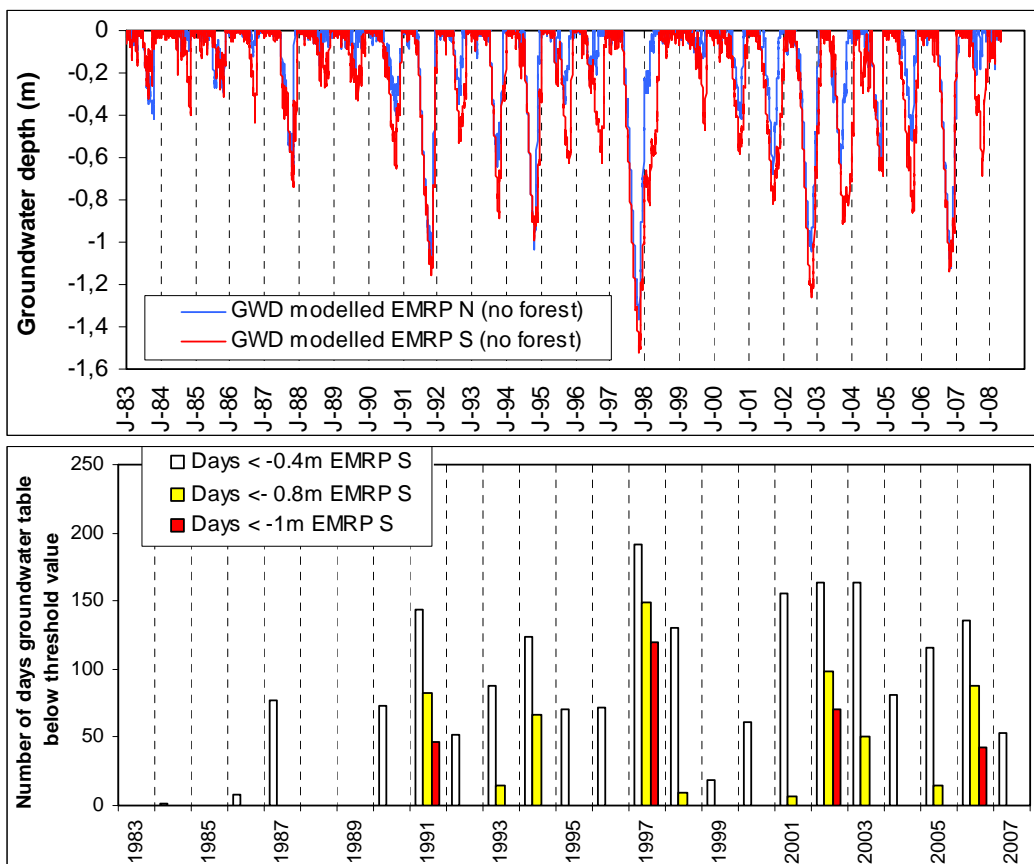
Drainability of existing and possible drainage schemes is a function of surface gradients and river/tidal water level fluctuations. Because of the flooding and high groundwater tables, drainage is essential for development of the land. Areas close to the tidal rivers can easily be drained by gravity during low tide, but drainage becomes increasingly difficult at greater distance from the rivers. Gravity drainage is also problematic for low areas along the non-tidal river reaches (e.g. Jenamas area). Drainability will likely become a major problem after a few decades of continued drainage and subsidence in the peat areas as a result of subsidence of the peat.

This means that the impact zone around canals is more limited than has been reported for some other peatlands. The implications for water management are significant:

- Drainage for development may in the short term have an impact over less than 1km. In the longer term, the rest of the peat dome will also be affected by lower ground water levels and subsidence. The required width of buffer zones to separate drained development areas from peat domes might be limited due to the low peat hydraulic conductivity found. Further investigation on this topic is required, and;
- Canal blocking will have an immediate impact on groundwater levels along the canals. Further away from the canals the immediate impact will be limited due to the low peat hydraulic conductivity found and the subsidence along the canals in the decade since their construction. As a rehabilitation measure, canal blocking should be seen as a long-term intervention, although this will have short-term impacts on subsidence and fire risk near to canals (see Figure 3).

Surface gradients around canals have greatly increased in the 10 years that have passed since EMRP implementation; a ‘mini-dome’ topography has in fact developed that now controls hydrology (Figure 3). This demonstrates how fast subsidence proceeds especially close to canals and greatly complicates rehabilitation of the area as most of the peatland is now well above canal levels and is therefore not affected when canal water levels are brought up by dams. As a result, canal blocking will only be effective in the long-term if it produces a new stable ‘local drainage base level’ below which subsidence cannot proceed.

Evapotranspiration (ET) in forested and non-forested peatlands has is found to be similar to that in non-peatland areas with similar land cover. ET is reduced significantly when water tables are very low and soil moisture becomes limiting to water availability to vegetation. Being able to quantify ET has allowed simulation of long-term historical water depth records (Figure A4.2, top) and estimation of current water depths for early warning purposes (Figure A4.2, bottom).



**Figure A4.2:** *Top:* 25-year series of modelled groundwater depth for the Northern and Southern part of the EMRP area (different rainfall input). *Bottom:* number of days the peatland water is below a threshold value (in the Southern part of the EMRP area; results for the Northern part are very similar). Note that the water level drops below 1m only in years with major fires.

### **Spatial and Temporal Patterns of Rainfall**

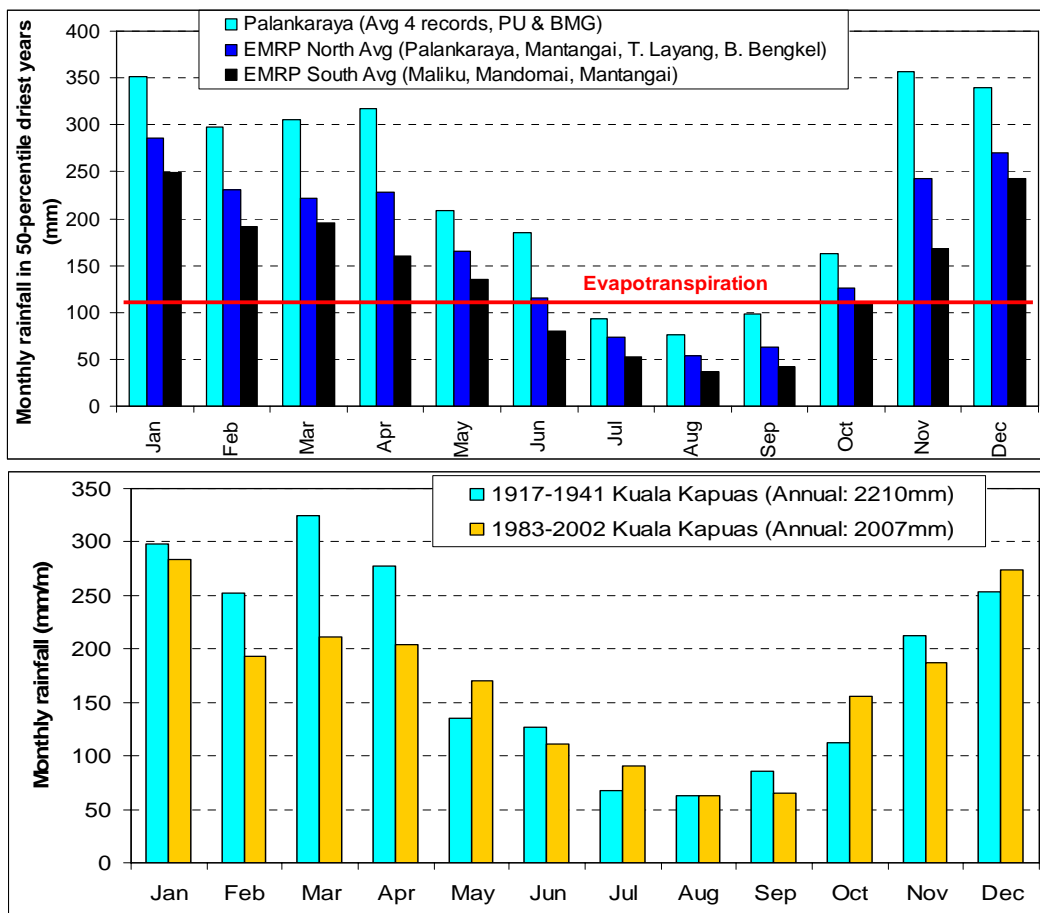
Three important patterns of rainfall in space and time are found that should be taken into account in the planning of peatland rehabilitation and agricultural development.

First, there is a pronounced gradient in rainfall away from the coast, the southern part of the EMRP area receiving rainfall below 2000 mm/y, the northern part around 2500

mm/y, and the river basins further to the north receiving rainfall around 3000 mm/y and higher (Figure A4.3, top). This significantly affects water depths and may determine make the difference between success and failure in rehabilitation. On the basis of rainfall patterns, conditions for peatland conservation and rehabilitation must be considered more favourable in the northern than in the southern part of the EMRP area.

Second, there is a pronounced and long dry season with little rainfall in all of the area, but this is especially pronounced in the south. In most years, a net water deficit exists for 3 to 4 months (June to September; Figure A4.3, top); in 1 in 10 years it exists for up to 6 months (May to October). This means that conditions that allow fires to spread in degraded areas will inevitably occur every few years, whatever the water management will be. It also means that water availability in the dry season may be limiting to some tree crops and should be taken into account in tree planting schemes for rehabilitation and plantation development.

Finally, over the last century, and especially in recent decades, there appears to have been a trend towards dry seasons becoming even longer drier, with rainfall dropping especially from February to May (Figure A4.3, bottom). Rainfall during the other months has remained more or less constant. The implication may be that much peatland may have been too dry for peat accumulation even before drainage started (i.e. most peatlands are now carbon sources even in their natural state), and that peatland vulnerability to drainage has increased due to climate change. It is unsure whether this is a result of local change due to forest loss or of global climate change.



**Figure A4.3:** Rainfall in the EMRP area, showing a clear decrease towards the Coast (top), high seasonality leading to a prolonged deficit in many years (top), and a long-term decrease (bottom).



## **ANNEX 5: Hydrological Database, Hydrological Model and Topography**

### **Hydrological Database**

A database has been assembled containing meteorological, hydrologic, topographic and pedologic information, based on previously available data brought together for the first time and data collected during the project. This database represents the state of the art with respect to knowledge on the EMRP area. Achievements are amongst others a greatly improved Digital Elevation Model (see below) and a first peat depth map for the EMRP area. However, due to limitations in availability and accuracy of data, the results still have a significant inaccuracy, especially for Block E.

### **Hydrological Model**

The information in the database has been used for the hydrological analysis of the EMRP area and its catchment. The analysis has been carried out by integration of information from different sources, comparison and cross-validation and by implementation and calibration of the following of simulation models:

- for the runoff from the upper catchment the Sacramento model in Sobek – Rainfall Runoff;
- for the groundwater dynamics of the peatlands ModFlow;
- for the water level dynamics in the rivers and main canals within the EMRP area Sobek – Channel Flow.

These model implementations have allowed a wider check on consistency of the data and interpolation and extrapolation of available data over space and time to get more insight in the hydrology of the EMRP area. Staff of *Puslitbang Air* have been trained on the job in the application of the Sobek models and the software and data for these models have been transferred to Puslitbang Air.

### **Topography**

Topographical surveys were carried out during this project in Blocks A and C. The surveys were carried out overland and each individual transect started and ended at a benchmark. Benchmarks were installed by Bakosurtanal during a DGPS survey under the PSDM-CKPP project in September 2007. In total about 220 km was surveyed. Part of the surveys (44 km) was paid for and carried out by CKPP. CIMTROP provided a team, which surveyed two transects with a total length of 40 km.

**Uncertainties in Topography** - Most of the data contained within the various sources are accurate and consistent within transects, however none of it could be referenced accurately to mean sea level. The DGPS survey done by Bakosurtanal in September 2007 during the PSDM-CKPP project had already raised many questions on the accuracy of the supplied dataset during the DEM development in the PSDM-CKPP project (e.g. the Palangka Raya Airport BM is supposed to be at 25 metres while we find it cannot be above 13 metres). During this project, the reliability of the dataset was tested by carrying out land-based topographical surveys connecting DGPS benchmarks. It turned out that the elevation of DGPS benchmarks had to be corrected with several meters. For example, a transect in the Lamunti area (Block A) starting at BM43-D (at Block C3) and ending at BM28 (at Manusup) found an elevation difference between the two benchmarks of 0.40 m (8.356 – 7.953 m) whereas based on the DGPS measurements this difference was 3.38 m (8.356 – 4.976 m). Differences such as the one in this example were found for each transect carried out between two benchmarks and created many problems during the development of the DEM.

Coincidentally further errors were encountered discussing the results of the elevation survey carried out by CIMTROP in April - May 2008 in the south of Block C (Pangkoh area). The CIMTROP team made photographs of the BMs they encountered during their survey and found that the BM ID's were different from the data that were supplied by the EMRP team.

The CIMTROP findings initiated a comparison of documents and files supplied by Bakosurtanal. They supplied a report with BM descriptions together with an additional dataset, which included all measured points. After comparing the metadata contained within the BM description report with the dataset it was found that a total of 10 BM ID's were at the wrong location and consequently also had a different elevation.

Unfortunately, the findings did not provide answers for the differences found in the Block A area (wrong BM ID's occurred only west of the Kapuas). It remains unclear whether other DGPS measuring locations (where no benchmarks were installed) were also affected by these mistakes.

**Other Considerations on Topography and Benchmarks** - Apart from the uncertainty in elevation of the DGPS benchmarks it was observed in the field that some of the benchmarks were already sinking into the underlying peat, which would render these benchmarks in the near future useless. Secondly, the benchmarks were installed too close to the river (during the dry season). Consequently, during the cross section measurements in December 2007 surveyors found it difficult to find them as they were flooded.

**Digital Elevation Model** - Results from the topographical surveys carried out in this Master Plan project were used to improve the DEM already produced during the PSDM-CKPP project. With the tidal data collected in the EMRP MP project we have been able to better link survey elevations to sea level. Still, elevation data remain a weak link in the EMRP MP hydrological assessments and modelling, though major improvements were made. Standard error over the entire area is estimated to have been reduced by the combined PSDM-CKPP and EMRP MP efforts from well over 5 metres to below 1 metre.

#### **Future requirements**

In order to reduce the standard error of the DEM over the entire area the following needs to be done:

- DGPS survey starting in Banjarmasin (where there is a permanent Bakosurtanal station with proper reference to MSL) using 10 km intervals between base stations to reduce measurement errors, and including measuring all benchmarks which were installed in September 2007.
- Relate DGPS elevations of benchmarks in the tidal area to water level measurements at a nearby station in order to check the reference to MSL
- Installation of new benchmarks on mineral soil (above high watermark level)
- The DGPS survey should be supervised by an independent (international) consultant (including access to all intermediate data, methods and software in order to ensure proper data quality control).

## **ANNEX 6: Land Cover Analysis in the EMRP Area**

The area is predominantly flat and characterised by a humid tropical climate with mean daily temperatures varying from 25 to 33°C at sea level, high humidity (85-90%) and a mean annual precipitation of approximately 2,400 mm. Normal dry seasons last from May/June to September. During El Niño-Southern Oscillation (ENSO) years such as 1997 however, the dry season may begin as early as March and last until December.

Land use/cover is dominated by (peat) swamp forest, secondary forests, shrub, grassland and cropland. Most forest has been extensively logged. Shifting cultivation and plantations (e.g. rubber, Acacia) prevail close to the rivers and canals, while large scale paddy rice cultivation is found in block A. Low growing grasses and wild ferns are widely found, the latter particularly in recurrently burnt areas.

Large rivers including the Katingan, Kahayan, Barito and Kapuas rivers and streams provide the main transportation routes and few roads exist. People live in small settlements located along the rivers and a small number of transmigration areas.

The following dynamics strongly influence land use/cover characteristics and their signature in satellite imagery:

- Seasonality – peatland covers most of the project area. During the wet season the peatsoil can be largely waterlogged with water levels rising above the soil surface. Contrast in satellite imagery between vegetation types is stronger in the dry season;
- Fire influence - much of the project area (blocks A – D in particular) is known to be severely affected by fires on an annual basis during the dry season, resulting in a complex landscape including various stages of post-fire recovery.

### **Data Sources and Processing**

*Landsat* – Landsat data for the area has a number of problems (see Technical Report on Land Cover Mapping for details). Due to these problems, it was decided not to use the Landsat as a basis for map classification, but for reference purposes only.

*ASTER satellite data* - ASTER imagery was identified as a preferred data source to replace Landsat. However, due to persistent cloud cover, no recent cloud free imagery is available for the project area.

*PALSAR* - In absence of acceptable optical data, the decision was made to use PALSAR L-band radar data as a basis for map classification. Observation by radar systems is unimpeded by cloud cover.

*Reference data* – A range of reference data were used including SRTM digital elevation data, MODIS and AATSR fire hotspot data, reference land use/cover maps, ground survey data from 2007 and 2008 and other data. Detail are provided in the technical report.

PALSAR images were first radiometrically calibrated. As data was received in slant range each individual image was converted to ground range by means of registration to the SRTM elevation data set at 90m resolution. During an extensive ground control point selection process, 250 control points were selected for each image. A 3 degree polynomial transformation was performed resulting in a RMS of less than 0.43. Resulting geo-referenced FB dual polarisation 50m and WB single polarisation PALSAR 100m (resampled to 50m) were stacked and used as the based for the classification process. No speckle filtering was applied as speckle levels are low, having no significant influence on classification results. No topographic correction was performed as the project area is predominantly flat. SAR satellite images were

classified using a newly developed unsupervised classification approach (Hoekman et al. 2007, Tran et al. 2005, Tran 2005). The approach implemented in IDL/ENVI uses an advanced type of spatial mixture modeling and produces a series of classification models.

### Legend Development and Validation

The legend development process is a combination of the radar based legend (created on the basis of radar sensitiveness) and the user needs. Classes that are statistically detected on the classification procedure are the base for the discussion with the users. The extraction of the radar data (backscatter values) associated with each class is followed by proper backscatter analysis for both HV and HH bands and leads to a first radar based legend. A theoretical analysis of the relation between biomass and the radar HV return and the flooding conditions and the radar HH return for both dry and wet period was done based on the radar backscatter values. Backscatter levels were analysed and classes labelled using expert knowledge, the reference data (available LULC maps, MODIS vegetation continuous fields tree cover as well as fire hotspot data, Landsat time-series) and some field survey data (including field and aerial photographs).

The definitions of the Indonesian Ministry of Forestry classification System were used as a general guideline for assigning the preliminary radar based legend to a preliminary LULC classes. This legend was modified to generate land cover classes that could be useful for restoration purposes (e.g. including tree cover). A workshop was held in May 2008 and discussions focused on reaching a compromise between the radar based legend (cover types that can be detected with radar) and the desired cover legend.

It should be emphasised that vegetation cover thresholds are difficult to assign directly from radar data that is mainly sensitive to forest structure. A certain radar backscatter can result from different vegetation structures or combination of them. Therefore the legend is restricted to basic vegetation structures like Grasslands, Shrublands, Woodlands and Forest. Cover percentages are related to biomass levels as could be detected by the HV polarisation. Croplands and rice fields can easily be detected by spatial context, structure, field knowledge and flooding conditions.

### Description of final classes for the reviewed Land cover /use map.

Descriptions of the cover types on the reviewed Land cover/use map are presented below.

**Sedges (16):** Regularly flooded areas including sedges such as (e.g. *Thorachostachyum spp*) and pandans (e.g. *Pandanus helicopus*) (Page et al, 1999).

**Grassland + ferns (herbaceous) (8):** The main layer consists of closed to open herbaceous vegetation. Vegetation cover is >50%. The height is in the range of 0.3-3m. The class includes large areas dominated by ferns in previously burnt areas and grasslands (e.g. *alang alang*).

**Shrubland (cover<10%) (7):** This class has a shrub cover not higher than 10%. Rest of the cover can be high herbaceous or Ferns.

**Shrubland (cover 11-50%) flooded or non-flooded (6):** This class has a shrub cover between 11-50%. The rest can be herbaceous vegetation.

**Shrubland (cover >50%) -non flooded (4):** The main layer consists of broadleaved evergreen closed to open vegetation. Vegetation cover >50%. The height is in the range of 0.3-5m. This class includes regrowing tree cover. For example in previously burnt and collapsed low pole and mixed swamp forest.

**Shrubland (cover >50%) –flooded (5):** The main layer consists of broadleaved evergreen closed to open shrubs. Vegetation cover is >50%. The height is in the range of 0.3-5m. More information is needed about this specific type. The class likely includes many dead dry trees. Flooding duration is estimated on more than 4 months a year.

**Low pole forest (cover >10%) (12):** Tree cover >11%, broadleaved evergreen occurring in elevations <1000m above sea level. This forest type has small diameter trees reaching height up to 25m but with a lot of under-canopy, areas are seasonally flooded and peat can be waterlogged or sometimes flooded in pools, (e.g. Page et al., 1999). More advanced coding is needed, technically coded as aquatic; (peat) swamp forest, fresh or brackish water.

**Low pole forest (cover 1-10%) (13):** This type of Vegetation is located in the peat domes with tree cover not exceeding 10%. Corresponds to open vegetation with standing low pole trees and shrubs. It is regularly flooded with waterpools between the open vegetation.

**Woodland or degraded vegetation (cover 1-10%) (3):** Vegetation with tree cover not higher than 10%, tree cover includes forests that have been degraded by fire and intensive logging over several years or tree regrowths and high shrubs.

**Peat swamp forest (cover >11%) (2):** Tree cover, closed to open (cover >15%), broadleaved evergreen elevation <1000m. Upper canopy layer is tall and stratified, with a second more open layer (Page et al, 1999). More advanced coding needed, technically coded as aquatic; (peat) swamp forest, fresh or brackish water.

**Riverine-Riparian Forest (cover >11%) (3):** The main layer consists of broadleaved evergreen closed to open woodland on temporarily flooded land. The crown cover is >11% and tree height can reach 40m. This class is intermediate between freshwater swamp forest on mineral soil and peat swamp forest (Page et al. 1999). Due to its similar structure and more readily detectable water seasonality under the canopy, Forest regrowth in previously burnt and collapsed peat swamp forest types is (mis)classified as Riverine.

**Swamp forest (cover >11%):** Is known to occur to the north of block E and SNP. It is a distinctive lowland evergreen broadleaved forest type dominated by small diameter trees with a tree cover higher than 11%, occurring on sandy soils of poor fertility, often subject to water stress (either drought or water-logging). It is now included as a distinct forest type in the map since the forest fragments of the 2007-CKPP LULC map were overlaid with the peat depth map available for the area (CKPP-project, 2007). Forest fragment outside the depth peat areas were labelled as swamp forest.

**Burnt area-burnt trees (11):** The main layer consists of closed to open trees. Recently burnt, dead/dry trees standing over green new growth vegetation (stems, canopy cover lost). Burn severity unknown and precise burnt date between 2006 and 2007.

**Burnt area-burnt shrubs and bare (10):** The main layer consists of closed to open shrub dry by burning with remaining or regenerating vegetation (stems, leaf cover lost), although biomass levels are lower than for the tree cover, burnt class. Sometimes areas are completely bare depending on burn severity.

**Mangrove (cover >11%) (15):** The main layer consists of mangrove trees over tidal flooded terrain. The crown cover is higher than >11%. The height is in the range of 5-20m.

**Mangrove (cover (1-10%) (14):** The main layer consists of mangrove trees over tidal flooded terrain with tree cover lower than <10%. The height is in the range of 5-

20m with open canopies and low biomass.

**Dry-land agriculture (19):** Terrestrial, cultivated and managed areas. The herbaceous vegetation cover is artificial and requires maintenance. It is characterised by the periodic removal of the (semi)natural vegetation cover and cultivated crops are managed and/or (partly) harvested at the end of the growing season. These areas have been edited using field information and secondary remote sensing observations (Landsat imagery and a specific colour composite of the radar images). The difference between them is unknown and more field data is necessary.

**Tree crops (21):** Vegetation cover includes perennial cash-crops plantations such as acacia, oil palm, but also tree or shrub cover. Cultivated and managed terrestrial, trees or shrubs/ herbaceous.

**Sawah (18):** Aquatic, cultivated and managed areas. The herbaceous vegetation cover (graminoids), are grown in irrigated or temporarily flooded (rice) areas.

**Open water (9):** Water bodies, permanent, including sea.

**Fish ponds (17):** Areas of artificial or man made water bodies use for fish farming.

**Urban areas (-):** Edited manually, assisted by a settlement GIS shape file available from Bakosurtanal. In the large agricultural area in block C distinct square areas classified as shrub cover were recoded to urban. The land cover consists of artificial surface(s); built up area(s) including cities such as Palangka Raya.

**Table A6.1:** Area of Major LULC Classes

No.	LULC Type	Area (ha)	Percent
1	Riverine-Riparian forest	71,954	4.92
2	Peat swamp forest (including logged-over forests)	456,574	31.22
3	Swamp forest	28,008	1.92
4	Mangrove	6,410	0.44
5	Mangrove, degraded	13,549	0.93
6	Severely degraded forest, woodlands	173,041	11.83
7	Shrubs	276,949	18.94
8	Shrubs, sedges, flooded	40,750	2.79
9	Grassland and ferns	49,343	3.37
10	Recently burnt forest	59,812	4.09
11	Recently burnt shrubs	106,438	7.28
12	Dryland agriculture	82,197	5.62
13	Tree crops	15,449	1.06
14	Sawah (productive / abandoned)	69,817	4.77
15	Water bodies	9,967	0.68
16	Settlement	2,038	0.14
<b>Total</b>		<b>1,462,295</b>	<b>100.00</b>

## ANNEX 7: Fire History of the EMRP Area

Large-scale forest and land fires and associated smoke have become an increasing problem in the EMRP area. Major fires have occurred in 1997/1998, 2002/2003, 2004 and 2006. Most of the EMRP area, particularly Blocks A, B and C, has been affected repeatedly by fire over the last decade (Figure 6, main report), leaving mostly a grass, fern and shrub dominated vegetation, which is highly susceptible to burning in subsequent long dry seasons. Hotspots detected over the EMRP area during 1997-2007 show that fires were most abundant and persistent in the degraded peat areas and the forest edge while forested areas did not burn (Figure 6). Fires were relatively most numerous in Blocks A and C. Recent fires in the southern part of Block C may have been associated with plantation establishment. As this is an almost uninhabited and mostly inaccessible area, fires can last for days and even weeks, out of reach of any fire suppression capacity. Fire prevention is therefore of the utmost importance.

The impact of fires on the peat ecosystem can be assessed through estimating the area burnt, the depth of the peat fire and the frequency of fires over a long-term period. Information is available for the whole area in the major fire episode of 1997/98 (Page *et al.* 2002) and for the period of 1973-2005 for Block C (Hoscilo *et al.*, in press).

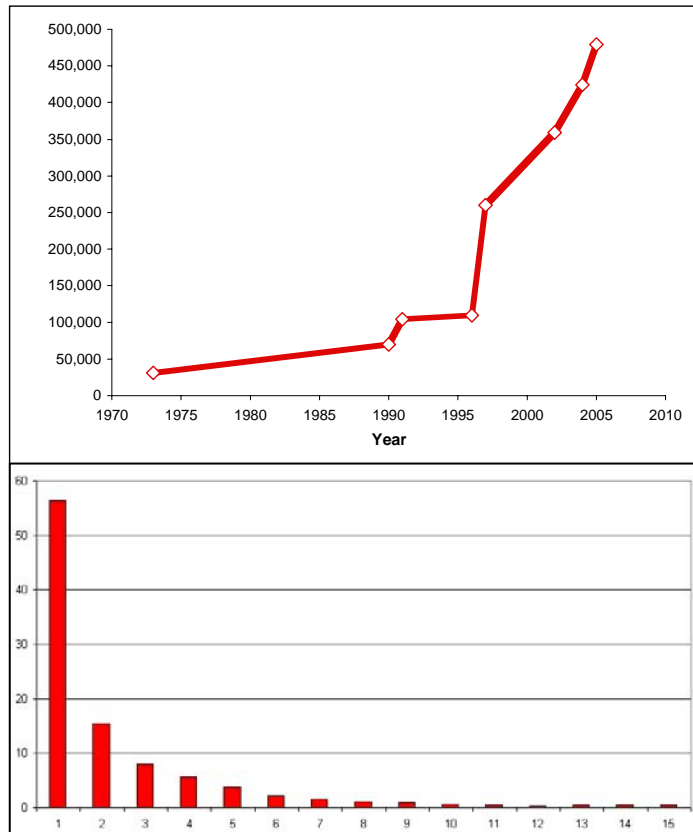
Using satellite images covering a 2.5 million hectare study area in Central Kalimantan (including the EMRP area) from before and after the 1997 fires, Page *et al.* (2002) calculated that 32% (0.79Mha) of the area had burned, of which peatland accounted for 91.5% (0.73 Mha). Roughly half (47.4%) of the fire-damaged area was peat swamp forest, most of which was previously logged or fragmented. Severe damage occurred to large a proportion of the area covered by forest mosaics (54%), shrubland (45%) and agricultural land (37%) but only 4.5% of the pristine peat swamp forest was lost. In the 1997/1998 fires, an average of half a metre of the top layer of peat was burnt and lost in those areas that burnt ( $51\text{cm} \pm 5\text{ cm}$ , Page *et al.*, 2002). Based on this and the extent of the fires, this same study estimated the loss of carbon during the 1997 fires from the EMRP area to be 0.12–0.15 Gt C. A more detailed assessment of fire scars over the period 1973-2005 has been completed for block C (Hoscilo *et al.*, in press). This assessment shows that this area has been regularly and extensively affected by fire but especially over the last ten years (Figure A7.1, top). The immediate consequence of this has been a large reduction in primary forest cover (see Box: Forest Loss and Fire in Block C of the EMRP Area). Yet even though the area of forest has been greatly reduced, fires remain a major issue, especially in the long dry seasons. For example 24% of Block C 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. Overall, more than one-quarter of the area of block C has been burnt three or more times over the period 1973-2005.

### BOX: Forest Loss and Fire in Block C of the EMRP Area

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). *Source:* Hoscilo *et al.* (in press)

Most fires within the EMRP now occur within 1-2 km of a canal or river, highlighting the importance of access along water courses as a contributing factor leading to fire in the EMRP (Figure A7.1, bottom). The predominant land cover that burns is 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.

Repeated fires are the major source of carbon emissions, lead to an increased likelihood of flooding during the wet season as a result of a lowering of the peat surface and reduce the potential for natural succession by eliminating seeds in the soil. A combination of flooding and fire produces conditions that are unfavourable to the growth of woody species, thus without some form of active intervention to control fire, there will be no peatland rehabilitation.



**Fig A7.1:** Fire in the EMRP Area. (Top) Cumulative extent of fires in block C from 1973-2005 showing a sustained increase in area burnt from 1997 onwards. Source: Hoscilo *et al.*, in press. (Bottom) Relationship between frequency of fires and distance from canal / river for the period 2002-2006 showing that most fires occur within 1-2km of a canal. Source: CARE Indonesia.



## ANNEX 8: The Regional Economy and Socio-economic Conditions

The economy of the EMRP area is dominated by agriculture, of which forestry and commercial crops, notably rubber and palm oil, are the most important. In 2006, agriculture accounted for about 50% of GDP (Table A8.1). Palangka Raya and nearby Banjarmasin are the most important markets for the agricultural produce of the area. Most commercial crops are exported via the port of Banjarmasin, which is closer to Kuala Kapuas (the main economic centre of the area) than Palangka Raya.

**Table A8.1:** Economic structure, 2001 and 2006 (Percentage of non-oil GDP)

Economic Sector	EMRP		Central Kalimantan	
	2001	2006	2001	2006
Agriculture	48.9	49.3	40.4	37.6
- Food crops	15.5	15.0	7.2	6.4
- Non-food crops	15.1	17.3	12.0	17.4
- Livestock	3.5	4.6	3.1	4.0
- Forestry	7.6	5.7	11.6	4.3
- Fisheries	7.1	6.7	6.5	5.3
Mining	0.4	0.4	4.9	8.3
Manufacturing	15.1	12.9	14.3	13.3
Services	35.6	37.3	40.4	40.8
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Consultant, based on BPS.

Note: Figures for the EMRP are estimated from district figures for the four EMRP districts weighted by population.

### Employment

The structure of the labour market is similar to that of Central Kalimantan as a whole (Table A8.2). Agriculture remains the single most important source of employment, and provided almost three-quarters of all jobs in 2006, up from about 70% in 2001. However, this sector is characterized by a significant degree of underemployment and low labour productivity. With the demise of the logging industry and since the opening of the bridge over the Kapuas River, a substantial part of the EMRP areas's manufacturing base (which largely consists of the processing of agricultural products) has disappeared because of increased competition from manufacturers based in Banjarmasin. This explains why the EMRP area lost half of its manufacturing jobs from 2001 to 2006. The services sectors accounted for about 16% of total employment in 2006, which was substantially lower than the provincial average.

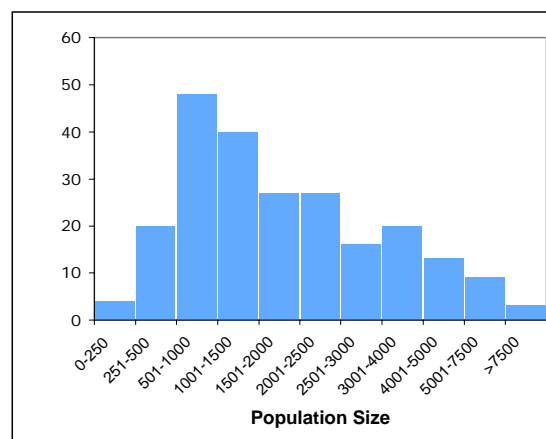
**Table A8.2:** Labor market structure, 2001 and 2006 (Percentage of total employment)

Sector	Kapuas / P.Pisau		Central Kalimantan	
	2001	2006	2001	2006
Agriculture	70.5	74.7	60.6	60.7
Mining	4.7	2.9	3.6	3.4
Manufacturing	13.6	6.0	8.5	8.5
Services	11.2	16.4	27.3	27.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Consultant, based on BPS

### Population

The 227 villages in and around the EMRP area vary in population size from 166 to 13,783 inhabitants with an average population size of 2,013 persons. Most of the villages have a population size of between 500 and 2500 persons (Figure A8.1). More than one-quarter (28%) of households live along the riverbanks.



**Figure A8.1:** Distribution of population in the EMRP's 227 villages.

### Population Change and Transmigration

The population of the area is compared to population data for 1993 (PODES 1993 and 2005). Overall, the population growth rate for the area is 1.3% per year with the villages in the Palangka Raya area growing the fastest (Table A8.3). Pulang Pisau had a net population decrease of 0.7%. In Kapuas, the population increase includes 33,515 transmigrants moved under the Mega-Rice Project and still resident in Kapuas, mostly in Lamunti and Dadahup. If these people are excluded, annual population growth rate in Kapuas is 0.8% per year. When natural population growth is included, it can be considered that much of the EMRP area over the period 1993-2005 has probably had a net emigration from the area.

**Table A8.3:** Population Change (1993-2005) and Poverty (2005) in the EMRP Area.

District/City	Population (1993)	Population (2005)	Annual Change in Population	Poverty 2005 (BKKBN)	Poverty 2005 (GAKIN)
Palangka Raya	6,472	15,749	7.40%	21.7%	45.1%
Kapuas	240,946	300,110	1.80%	40.2%	37.9%
Barito Selatan	27,945	34,691	1.80%	9.9%	13.2%
Pulang Pisau	116,263	106,587	-0.70%	34.9%	35.1%
<b>Total</b>	<b>391,626</b>	<b>457,137</b>	<b>1.30%</b>	<b>36.0%</b>	<b>35.6%</b>

Source: PODES 1993 & 2005. Note that poverty calculated from village data based on the number of poor households and is weighted by the number of households in the village to derive district averages.

During the Mega-Rice project, 17,953 houses were constructed in 43 transmigration settlement units (UPT) in the villages of Lamunti, Dadahup and Palingkuh in block A. A total of 15,594 families moved to the area; however, by 2006 only 54% of these families remained (8,487 families) owing to the difficulties faced. The proportion of families moving away is not evenly distributed across the 43 UPTs – in 17 UPTs more than 50% of families have left the area and in 8 UPTs, less than 33% of the original families moved to the area remain living there. The UPT where the most families have moved away are found in Dadahup along the Barito River and Lamuti near the Kapuas River. It is likely that significant improvements will need to be made in these areas for people to move to these settlements that have empty houses.

### Poverty

Two measures of poverty are analysed – BKKBN and BPS.<sup>5</sup> Both datasets indicate a poverty rate of 36% across the area in 2005 (Table A8.3), although some district governments consider these figures too high. Poverty levels are slightly higher than the area in Kapuas and low in Barito Selatan. At the sub-district level, the highest levels of poverty are found in Kapuas Murung, Kapuas Barat, Pulau Petak and the Lamunti area. In general, BPS poverty rates are higher than BKKBN data. Within the new PLG transmigrant villages of Lamunti and Dadahup, the poverty rate is estimated at 62.3% (BKKBN) and 75.4% (BPS) and is significantly higher than the other villages in the area (33.8% BKKBN and 32.5% BPS).

<sup>5</sup> The National Family Planning Coordinating Agency (BKKBN) poverty criteria are: (i) the household cannot practice their religious principles, (ii) all household members do not eat at least twice a day, (iii) not all household members have different sets of clothing for home, work, school, and visits, (iv) the household cannot seek modern medical assistance for sick children and family planning services for contraceptive users, (v) the largest floor area of house is made of earth. In contrast, BPS uses a basic needs approach to measure poverty based on food and non-food expenditure. These different criteria in part explains the different results of poverty analysis based on these two data sources.

## ANNEX 9: Rural Services and Infrastructure

Data from the Village Potential (*Podes*) database of 2005 and results of the sub-district public consultations show that basic services and rural infrastructure are still poorly developed in most of the area, although the situation is not much different from other parts of Kalimantan. Especially in recent years important efforts have been undertaken by the government in Central Kalimantan to improve the situation.

**Health Services** - Although health facilities are widespread (Table A9.1), local conditions mean that access is an issue with roughly half of the villages reporting difficulty in getting to a health centre (42%), a doctor (55%) or a midwife practice (49%). Overall, 64 villages do not have a midwife (*bidan*) living in the village and 118 villages do not have a maternity post (*polindes*). One-quarter of villages report an outbreak of vomiting and diarrhoea while 18% of villages have had outbreaks of malaria.

**Table A9.1:** Number of Health Facilities and Service Providers in the EMRP area.

District	No. Sub-districts / Villages	Health Centre	Auxiliary Health Centre	Integrated Health Post	Maternity Centre	Doctor	Midwife
Barito Selatan	3 / 18	3	15	33	7	4	9
Kapuas	10 / 139	29	75	247	77	24	138
Palangka Raya	2 / 9	2	5	21	4	0	12
Pulang Pisau	7 / 61	7	32	93	31	16	65
<b>Total</b>	<b>22 / 227</b>	<b>41</b>	<b>127</b>	<b>394</b>	<b>119</b>	<b>44</b>	<b>224</b>

Source: PODES 2005

The public consultations highlighted that diarrhoea and malaria are recurring diseases every year during the dry season, caused among others by use of the river for sanitary purposes. There is a serious shortage of health staff, while health facilities are still marginal and often far away. Use is limited due to high transportation costs. Village midwives do not receive training and courses. Village integrated health posts (*posyandu*) do not have budgets and the health centres often have shortage of medical supplies. The quality of the medical staff and/or volunteers in the health facilities is insufficient or even absent. Traditional medicines are found in some community gardens and widely used in many communities.

**Education Services** - Primary school facilities are widespread over the area (Table A9.2) and most children appear to complete primary school education. However, whether children continue in education depends upon the facilities, family income, distance of the village to the sub-district and district and the policy of the district government towards education. Almost all villages only have primary schools, sometimes combined with pre-school playgroups, however there is a shortage of classrooms. Almost all schools cope with a teacher shortage and many teachers with their low salaries have no civil servant status and do not live in the villages, both of which cause regular absence and the need for extra jobs for additional incomes. In general there is a shortage of junior secondary and high schools as most are located far away from the village, leading to high transportation costs. As a result, many children are not being able to continue their education. The public consultations highlighted the lack of monitoring and transparency of the Education Cost Support (BOS) program from the government.

**Table A9.2:** Number of Schools in the EMRP area.

District	No. Sub-districts / Villages	State Primary School	Private Primary School	State Junior Secondary School	Private Junior secondary School	State High School	Private High School
Barito Selatan	3 / 18	27	4	6	5	2	3
Kapuas	10 / 139	312	102	45	26	16	13
Palangka Raya	2 / 9	16	5	3	1	0	2
Pulang Pisau	7 / 61	144	13	20	6	5	7
<b>Total</b>	<b>22 / 227</b>	<b>499</b>	<b>124</b>	<b>74</b>	<b>38</b>	<b>23</b>	<b>25</b>

Source: PODES 2005

**Transportation and Access** - Traditionally, villages were situated close to a river and transport took place by boat. To date some 26% of the villages still depend mainly or exclusively on water transport but the road network is gradually being expanded. Transmigrant villages are typically situated away from rivers and depend entirely on road access, often provided by inspection roads along the main canals traversing these areas. Overall, some 30% of the villages now have all-weather road access. Internal access within villages is generally better in the transmigrant areas than in areas with traditional settlements. In the transmigrant areas access to agricultural fields is provided by embankments along the tertiary canals, which are often not wide enough for small trucks or tractors and in places are dissected by other (quaternary) ditches without proper bridges.

**Drinking Water and Sanitation** - Though abundant in water, good quality drinking water is scarce in the area with 62% of villages dependent on river water and 23% on rainfall. Only 6% of villages have water supply from the local water company (PDAM), while the remaining 10% of villages use groundwater. Villages along the rivers upstream of the zone of seawater intrusion use river water, either directly or after simple treatment. Canal water and shallow groundwater are often heavily polluted with acids and organic substances, and is not fit for human consumption unless following a much more elaborate treatment. Deep groundwater (below 100 m) has been tapped in several places and mostly found suitable, but the high installation and operation costs are a serious drawback. Rainwater collection and storage is practiced almost everywhere, but cannot cover needs during the dry season. Drinking water supply is still especially problematic in the ex-PLG transmigration sites. Various technical solutions have been implemented over the years, but many of the constructed systems stopped functioning after a while due to insufficient attention to maintenance of the systems after construction, and a lack of budget and expertise among the communities for operation and repairs after breakdowns. Some 40% of the households have their own toilets, while others make use of sheds along river and canal banks. Washing and bathing takes place mostly in rivers and canals.

**Electricity Supply** - Electricity supply from the PLN reaches 64% of the villages, while others may have local arrangements and/or privately owned generators. Some 14% of the villages have reportedly no electricity at all. In many villages with electricity supply not all households are connected; on average 53% of the households make use of PLN electricity. Central Kalimantan is currently facing an acute power shortage.

**Communication and Information** - Television reaches practically all villages. Telephone lines reach only 21% of the villages, but almost all villages are within reach of cell phone networks. Other facilities such as banks, permanent markets (12% of villages), post offices (8% of villages) etc. are only available in a few of the larger villages.

## ANNEX 10: Land and Water Management

Current land and water management practices in the EMRP area are closely related to the ethnic and cultural background of settlers and bio-physical conditions. Bio-physical boundary conditions for land and water management are defined by the climate, i.e. rainfall pattern, the river hydrology in relation to the topography, i.e. drainability, tidal irrigation, flooding, and salinity intrusion, and the soils, i.e. organic or mineral soils, acidity and ripeness. An important distinction is made between the land and water management in the tidal low lands and the non-tidal upstream areas.

Successful reclamation and agricultural development in the tidal lowlands hinges on the effectiveness of drainage to (i) create optimal conditions for settlement and crop production, (ii) accelerate ripening of mineral soils, and (iii) leach and flush out acids and toxins resulting from the soil reclamation process. Agricultural assessment and planning purposes requires detailed information on hydrological and topographical relations to define drainage, tidal irrigation and flooding classes. At present, this information is not available across the whole of the entire EMRP area.

In tidal areas, there are two gravity based water management scenarios. For areas with access to tidal irrigation during spring tides, land and water quality is normally not an issue. In contrast, for areas without tidal irrigation, land and water quality can only be maintained through shallow (controlled), but intensive drainage (leaching and flushing). The tidal lowlands are usually flat, located at about the mean high river water levels, but with a distinct micro-topography. Such minor differences in topography have a large impact on the land and water management options available in the tidal zone.

In the non-tidal areas, land and water management is far more complicated, especially during the wet season. Long duration flooding may occur in the low-lying back-swamp areas and a different approach to land and water management is required ranging from traditional agriculture on receding flood waters to fully fledged polder systems and pumped drainage.

Following this, four main land and water management zones are distinguished in the EMRP (Figure A10.1), based on the river hydrology (it is assumed that the higher peat areas are not influenced by the river water level fluctuations):

- **Zone I: Tidal in Wet and Dry Season** - Rivers are tidal during the wet and dry season, with basically the sea level as boundary condition. The tidal influence will dampen upstream into the river and canal systems. The tidal range will allow gravity drainage and tidal irrigation, depending on the distance from the river, the hydraulic infrastructure and the micro-topography. In the low-lying areas in the swamp interior drainability will be limited, with stagnant water adding to acidity problems. Nearer to the coast, salinity intrusion occurs, usually during the dry season, affecting drinking water conditions but also limiting options for double rice cropping. Tidal flooding (other than tidal irrigation) may affect low areas along the rivers but is normally shallow and of very short duration.
- **Zone II: Reduced Tidal in Wet Season** - The zone is part of the transition from the tidal to the non-tidal zone. High river discharges from the uplands during the wet season occasionally influence the tidal fluctuations, resulting in periods of limited drainage, and occasional flooding. Otherwise the zone has the same characteristics as Zone I.
- **Zone III: Non-Tidal in Wet Season** - This zone is only tidal during the dry season when upland river flows are small. During the wet season, basically the cropping season, the river will be non-tidal, and drainage will be severely hampered. Flooding of long duration may occur.

- Zone IV: Non-tidal in Wet and Dry Season** - This zone is non-tidal year round, and river water levels are determined by upland discharges. This zone is associated with the flood plain and levee and backswamp landscape. Drainage is difficult while deep and long duration floods may occur.

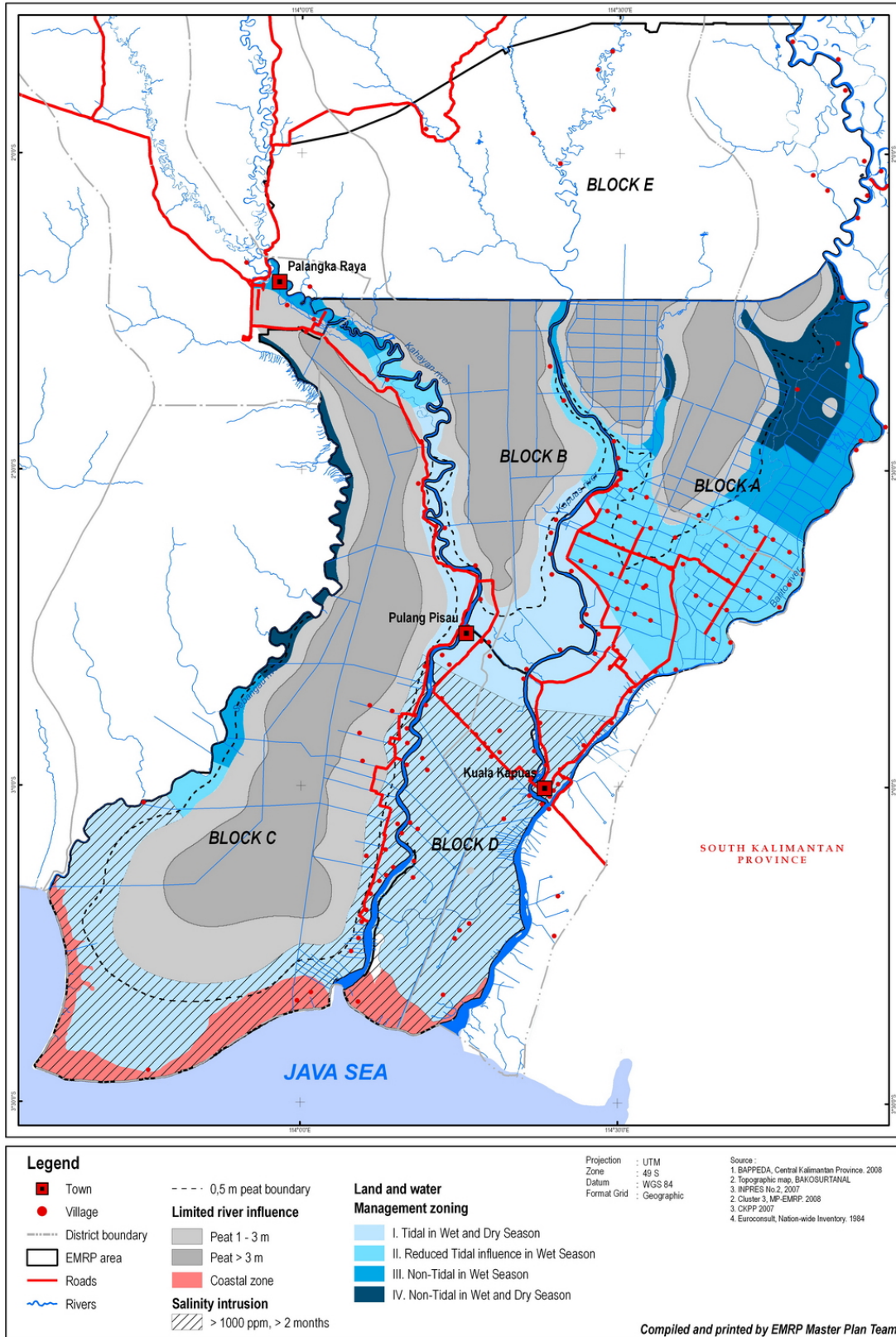


Figure A10.1: Land and Water Management Zones in the EMRP Area.

The land and water management systems present in the EMRP area include that of the Dayak, Banjarese and transmigration communities, as well as those of the private sector plantations and coastal ponds (*tambak*).

**Dayak Land and Water Management** - Dayak livelihoods in the EMRP area involve fisheries, plantations, collection of forest products and agriculture, often in peat areas. Dayak communities incorporated the Banjar drainage design, i.e. relative short drainage canals perpendicular to the river, mainly for the cultivation of rubber along the riverbanks. These extensive systems are found in the upstream parts of the rivers, where flooding may occur, either from the river or from the peat areas. These canals may extend into deep peat areas and so further degrade the peat lands.

**Box: Dayak Land and Water Management**

Pilang village in Block C (Kahayan River) and Katunjung village in Block A/B (Kapuas river) are representative of Dayak land and water management practices. The villages are located along semi-tidal rivers, on a narrow strip of mineral soils and shallow peat, extending into deep peat lands. The canal water levels are much influenced by the run-off from the peat areas. The local handil canals are used both for drainage and transportation. Flooding typically lasts for up to one month and can damage rubber stands and village road infrastructure.

Maintaining the tradition of local fisheries is considered important, even though acidity from newly reclaimed and bordering peat lands has greatly reduced production. Acidity in the fields is traditionally neutralized with ashes from burning, a practice that is currently prohibited, which greatly limits the land use options for the local population. Village areas extend up to 5 to 7 km from the river into the (degraded) peat forest areas, but only a small part is under cultivation.

The Trans Kalimantan highway crosses the village lands of Pilang and cuts off drainage from the upstream fields. Farmers have invested in a new canal into the peat lands to extend the area under rubber. In Katunjung the farmers make use of the new PLG canal infrastructure along which they grow banana's and other crops.

The communities report a lack of technology and the finances to improve their situation and request assistance to improve the land and water management and flood protection.

**Banjar Land and Water Management** - The Banjarese settled along the tidal rivers in the coastal zone and southern part of the EMRP. Banjarese are not merely agriculturists, but fishermen and traders as well and known to maintain extensive networks with coastal settlements elsewhere. The Banjar drainage design consists of simple canals (*handil*) perpendicular to the tidal river. These canals are generally 2 to 4 km long, depending on the tidal influence and land quality. Basically the canals aim at creating drainage and (tidal) supply conditions for the cultivation of wetland rice and coconut on and near the riverbanks.

**BOX: Banjar Land and Water Management**

Bahaur Hilir village is located in the full tidal zone in Block C, along the Kahayan River. Coconut is grown on the right bank of the Kahayan River, near to the peat lands, and (tidal irrigated) rice on the left bank.

The daily tides penetrate deeply into the canal systems allowing for good drainage. However, shallow tidal flooding and wave action leads to some scouring of riverbanks, damage to village roads and erosion in the fields. Salinity intrusion occurs from June until September and is reported to neutralize acidity from the PLG infrastructure and newly opened fields. However, suitable drinking water is not available during this period and needs to be collected from Mintin, located 50 km from the village.

As the canals are used for transport, water control structures are not an option. The larger part of the village area is not under cultivation (*lahan tidur*). The community requests assistance with flood protection, canal rehabilitation and extension of the agricultural area.

**Early Transmigration** –The first government-supported settlement took place on a modest scale in the 1930s and 1950s along the Anjir canals in Pulang Pisau. During the 1970s and 1980s large-scale government-sponsored transmigration and tidal land reclamation started in Central Kalimantan by opening up the swamp interior as the riverbanks were already occupied. Reclamation of the swamp interior is however technically far more complicated than is the case with spontaneous settlements along the tidal rivers, mainly because of lack of drainage and related stagnant water and acidity problems. Furthermore, the transmigrants, mainly of Javanese origin, did not have prior experience in the management of tidal lands, (potential) acid sulphate soils and organic soils.

#### **Transmigration Villages from the 1980s**

Gandang A village is located in the Maluku-Pangkajene older transmigration scheme in Block C, on the right bank of the Kahayan River, which is fully tidal here. Soils are mainly (potentially acid sulphate) mineral soils and shallow peat. The original dead-ended forked canal system is now connected to the PLG macro-infrastructure in the deep peat lands, and partly with the PLG canal near the river. Gandang B and C villages, along the same canal but located on deeper peat areas, were abandoned and transmigrants re-settled, partly in Block A of the EMRP area.

The tidal influence is limited and tidal irrigation is not possible due to the canal conditions and relative higher land elevation. The soil and water conditions are poor, acid, and drainage and water circulation is insufficient. Poor quality drainage water from the bordering peat lands enters the scheme. Only few water control structures are in place, and on-farm water management is not developed. Existing culverts hamper drainage as the elevation is too high following subsidence of the land. Public Works has taken up maintenance since 2005 and O&M staff, *pengamat* and *juru* are active. Water user associations (P3A) were formed but are not active.

Only where the river influence is improved, i.e. where the old canal infrastructure is linked to new PLG canals near the Kahayan river, is soil and water quality better and rice production far higher. Otherwise, mainly dryland and tree crops are grown in combination with raising cattle. The larger part of the village area is not cultivated (*lahan tidur*). Farmers request improved hydraulic infrastructure, water control, on-farm water management and better maintenance.

The situation in Block D is somewhat different as there is only limited peat land. Instead, the centre of the Block consists of (acid) degraded lowland swamps. Soil and water quality is still poor in the traditional dead-ended canal systems where there is little water circulation, a lack of water control, and no on-farm water management. Only in limited areas near Terusan Raya, tidal irrigation results in better soil and water conditions. Farmers along the Anjir canals increasingly grow rubber instead of rice.

These schemes are located in the tidal zone, but the scheme layouts are based on outdated water management concepts, which gave less importance to drainage, flushing, and leaching. These early designs include long dead-ended canals, widely-spaced drainage networks and limited water control, leading over the years to accumulations of acidity in areas with limited tidal influence, especially after long dry seasons. Only where tidal irrigation can be applied, such as in Terusan Raya in Block D, does the soil and water quality remain good. Most other areas report severe acidity issues. Some of these schemes (Block C) are located along deep peat areas, and contribute to the drainage of the peat dome.

**Mega-Rice Project Transmigration** – The hydraulic design of the MRP transmigration sites in Block A, established in 1996, is based on improved concepts of drainage, leaching and flushing, and includes double connected canals and structures to improve the circulation of water. The primary canals are very long. The



early design also assumed supply from upstream areas but this concept was flawed as the supply canals were crossing elevated peat domes and the schemes are located in a complex hydrological environment between the non-tidal Barito and the (semi) tidal Kapuas Rivers. Construction of the water management systems was never completed.

Only the Lamunti and Dadahup units were eventually settled. Jenamas was abandoned as the project is highly flood prone with limited drainage options and is now used for rearing swamp buffalo (*kerbau rawa*). The Lamunti and Dadahup units are located in the semi-tidal zone, with low-lying Dadahup facing flooding from the Barito river. Lamunti is somewhat higher and the Kapuas River is still tidal at that location, hence drainage potential will be better here. The area north of Lamunti was never settled as this is located in a deep peat area. Data are lacking for a more detailed assessment of the hydrological situation.

**BOX: MRP Transmigration Villages**

The Manggala Permai (Block G5) and Rantau Jaya villages are located in the Lamunti scheme. Many farmers left soon after initial settlement. Remaining farmers grow rice, palawija and vegetables, sometimes outside the village areas, where conditions are found to be better. Two-thirds of the village areas is not cultivated (*lahan tidur*). Soils are mainly mineral with only shallow peat. Acidity is a major problem due to lack of drainage, unfamiliarity of farmers with reclamation techniques, and poor land preparation.

There is limited tidal influence in the secondary and tertiary canals but the fields cannot be irrigated. No flooding from the river is reported but shallow and short-term ponding occurs during high rainfall due to a lack of on-farm drainage in combination with obstructions in the main canal system.

Water control structures in the main canal system are not functional and there are as yet no structures in the tertiary system and no on-farm drainage infrastructure. Canals are not maintained in the unpopulated areas, reducing the function of the overall infrastructure. Government is assisting with canal rehabilitation and maintenance but has not fielded *pengamat* or *juru pengairan*. The Water User Association (P3A) is inactive due to lack of support.

Farmers request completion and improvement of hydraulic infrastructure including on-farm water management, re-population of the area, agricultural and water management support (mechanization), and O&M staff.

Gol is currently improving the flood protection in the Dadahup scheme. From several sources (Gandang A, and Banjar villages) it is reported that outside settlers are moving into the Lamunti and Dadahup areas. The Gol is supporting further development of *kerbau rawa* in the Jenamas area.

The Lamunti and Dadahup units are currently under-populated, which is considered to be a serious constraint for development. As the hydraulic infrastructure was never completed, technical constraints are still serious, resulting in poor drainage and flooding. Most of the water control structures have been destroyed, often by outsiders seeking access or to extract the reinforcement steel. Many of the Dayak handil systems along the riverbanks are now connect to the PLG canal infrastructure. When part of the initial settlers left the area, land certificates were given to Dayak communities as collateral to financing the return trip but local transmigrant settlers who returned to their home village still have title to the land.

**Private Sector** - Several private sector (oil palm) plantations have started operations. These plantations are often located in deep peat areas, where drainage in principle will have a negative effect on the peat. Inherent to drainage of deep peat lands for tree crops is that the drainage systems needs adjustment with increased

subsidence, and that the final scenario will be that the peat will disappear or become undrainable.

A recurrent issue is that of the uncultivated areas in the villages (lahan tidur), and the surrounding (degraded) swamp and peat lands. Interflow of poor quality water from undeveloped areas occurs even in flat areas, and interacts with the agriculture. Uncultivated areas are also a source of pests. Canals are not maintained in the uncultivated areas, limiting the effectiveness of the overall hydraulic infrastructure.

Operation and maintenance of the canal systems has been neglected, especially after the crisis of 1997. O&M picked up again in 2005, when more budget became available to the Gol. However, O&M focuses on rehabilitation and maintenance of the existing networks, and not on operation or highly necessary re-designs and upgrading. The pre-1997 O&M organization is still mostly in place in the development areas, except in the PLG transmigration schemes. Pengamats are active and often the only source for farmers on water management issues. While formally the O&M staff falls under the jurisdiction of the district, increasingly use is made of the staff by national level (Balai) and province.

## ANNEX 11: Farm Systems and Livelihoods

In the rural areas of the project area agriculture is the key livelihood strategy, providing food and non-food commodities. Given the mixed nature of agriculture and the importance of agriculture to people's livelihoods in the EMRP area, the Master Plan takes a farming systems approach to agriculture in the region. A farming systems framework can help in understanding local factors and linkages and allow for aggregation of locations with similar development constraints and investment opportunities.<sup>6</sup>

**Table A11.1:** Farming Systems of the EMRP Area.

Farming System	Dominant crop	Location	Principal Livelihoods
Rice based	Lowland rice	Dadahup /Petak Batuan	Lowland rice (mostly local variety and few modern high yielding varieties), banana, citrus, vegetables, livestock (chicken and goat), local fish (beje), off-farm work (construction work)
		Palingkau /Mampai	Lowland rice, rambutan, coconut, vegetables.
		Handil Rakyat (Kapuas Kuala)	Lowland rice (local and modern high yielding varieties), coconut, vegetables, off-farm work (construction work)
	Upland rice	Lamunti /Rantau Jaya, Manggala	Upland rice, cassava, vegetables (sweet corn, <i>bengkuang</i> , cucumber, longbean, chili pepper), fruit trees (jack fruit, rambutan), livestock (free-range chicken and goat) off-farm work (construction work)
Tree crop based	Rubber	Block E	Rubber, fish catching, hired labour for rubber tapping
		Mantangai	Rubber, fish catching, hired labour for rubber tapping
		Jabiren Raya	Rubber, rice, waged rubber tapping
		Jenamas	Rubber, rattan, fish (catching and beje), hired labour for rubber tapping
		Dadahup	Rubber, rattan, fish catching, hired labour for rubber tapping
		Pandih Batu & Maluku	Rubber, upland rice, cassava, coffee, vegetables, livestock (chicken, goat and cattle), off-farm work (construction work)
	Coconut	Bahaur	Coconut, rice, fish (catching and beje)
		Kapuas Kuala	Coconut, rice, fish (catching and beje)
Oil-Palm		Oil-palm (two years old)	
Livestock-based	Cattle and vegetables	Basarang	Cattle, vegetables (chili pepper, mustard greens), fruit trees (cempedak, rambutan, sallaca), pineapples, rubber

Farming systems have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate. It allows for specific farm and policy recommendations that support farmers rather than specific commodities. Depending on the scale of the analysis, a farming system can encompass a few dozen or many millions of households. In the farming systems approach applied to the EMRP, the farm system is defined by the dominant activity as this largely determines farm management (see Table A11.1 & Figure 7, main report).

### Rice-based Farming Systems

In the rice based farming system two subtypes are distinguished namely the lowland rice-based and upland rice-based systems. The first is generally located near the coast in areas with tidal influence and areas that are regularly flooded. The extent and distribution of rice growing areas is shown in Table A11.2.

<sup>6</sup> Dixon et al., 2001 Farming Systems and Poverty. FAO and World Bank.

**Table A11.2:** Distribution of Lowland and Upland Rice Systems in the EMRP Area.

District /Sub-district	Lowland		Upland	
	Area (ha)	Production (t)	Area (ha)	Production (t)
<b>Barito Selatan</b>	<b>1,752.0</b>	<b>4,204.8</b>		
1. Jenamas	528.0	1,267.2	-	-
2. Dusun Hilir	1,224.0	2,937.6	-	-
<b>Kapuas</b>	<b>67,233.0</b>	<b>191,775.0</b>	<b>17,395.0</b>	<b>38,320.0</b>
1. Kapuas Kuala	13,752.0	42,556.0	-	-
2. Kapuas Timur	9,160.0	30,681.0	-	-
3. Selat	10,168.0	29,065.0	-	-
4. Basarang	1,456.0	3,683.0	680.0	1,400.0
5. Kapuas Hilir	2,910.0	7,589.0	-	-
6. Pulau Petak	7,524.0	19,145.0	-	-
7. Kapuas Murung	13,881.0	41,182.0	-	-
8. Kapuas Barat	8,382.0	17,874.0	-	-
9. Mantangai	-	-	16,715.0	36,920.0
<b>Pulang Pisau</b>	<b>16,387.0</b>	<b>52,923.0</b>	<b>6,239.0</b>	<b>18,475.0</b>
1. Kahayan Kuala	2,854.0	8,077.0	-	-
2. Panduh batu	6,698.0	24,126.0	917.0	3,286.0
3. Maliku	1,605.0	5,415.0	2,118.0	6,127.0
4. Kahayan Hilir	3,301.0	10,097.0	2,019.0	5,863.0
5. Sebangau Kuala	1,720.0	4,644.0	-	-
6. Jabiren Raya	209.0	564.0	1,185.0	3,199.0
<b>Palangka Raya</b>	-	-	<b>26.0</b>	<b>63.0</b>
1. Sebangau	-	-	26.0	63.0
<b>Total</b>	<b>85,372.0</b>	<b>248,902.8</b>	<b>23,660.0</b>	<b>56,858.0</b>

Source: BPS (Barito Selatan Dalam Angka 2007, Kapuas Dalam Angka 2007, Pulang Pisau Dalam Angka 2007, Palangka Raya Dalam Angka 2007)

Rice is clearly an important crop in the EMRP and all farming systems include rice to some extent, where it is mainly grown for consumption at the farm level. Because the preference for low yielding ( $1.5 - 2.5 \text{ t.ha}^{-1} \text{ yr}^{-1}$ ) local varieties, which require minimum external inputs (e.g. fertiliser, lime and labour) annual production is not always enough to fulfil household demand. As the local varieties require up to 10 months to mature there is no scope for a second rice crop. In some lowland areas high yielding varieties are grown allowing for a second crop.

### Tree crop-based Farming Systems

The tree crop farming system in the EMRP is closest linked to the traditional Dayak livelihood strategy. Three types are distinguished: rubber, coconut and oil palm systems. Both rubber and coconut are well established in the region and are linked to smallholder agriculture. The latter is emerging as an estate crop with potential for jobs and a possible access to a new market for smallholder farmers.

Rubber is a common crop found in the type C and D areas on mineral soils and in a few locations (e.g. Jabiren) is planted on shallow peat. Only around Mintin in Pulang Pisau, rubber trees are planted on deep peat (peat depth > 3 m). However, rubber requires drainage and at present most is open drainage, requiring interventions to control and minimise drainage, especially in the dry season. The rubber based farming system covers the areas of sub district Kapuas Timur, Kapuas Barat, Mantangai, Kahayan Hilir, Pandih Batu, and Jabiren Raya with a total area of 33,536 hectares (Table A11.3). Rubber is planted and managed exclusively by smallholders and a total of 17,626 households depend on it. Of the total area under rubber in the EMRP, 58% is productive. Of the unproductive area 29% is immature (< 5 years) and 13% are unproductive trees that require replanting. Further details are found in the Master Plan Technical Report on Agriculture.

**Table A11.3:** Distribution of Rubber in the EMRP Area.

District/sub district	Immature Plants (ha)	Mature Plants (ha)	Unproductive Plant (ha)	Total Area (ha)	Production * (ton)	Yield (kg/ha)	No. Households	Average area per household (ha)
<b>Barito Selatan</b>								
Jenamas	29.5	42	5	76.5	39.61	943	60	1.28
Dusun Hilir	68	53.5	7.5	129	50.46	943	108	1.19
<b>Kapuas</b>								
Kapuas Kuala	0	0	0	0	0	0	0	-
Kapuas Timur	809	1827	719	3355	2192.4	1200	2817	1.19
Kapuas Barat	970	1924	516	3410	2308.8	1200	2015	1.69
Kapuas Hilir	78	225	185	488	270	1200	728	0.67
Kapuas Murung	260	920	785	1965	1104	1200	1100	1.79
Basarang	542	359	112	1013	430.8	1200	485	2.09
Pulau Petak	50	50	45	145	60	1200	187	0.78
Mantangai	955	3390	664	5009	4068	1200	3186	1.57
<b>Pulang Pisau</b>								
Kahayan Kuala	40	0	0	40	0	0	40	1.00
Kahayan Hilir	2233	7436	663	10332	5353.92	720	3325	3.11
Maliku	576	45	3	624	32.4	720	423	1.48
Pandih Batu	1423	1839	223	3485	1324.08	720	1237	2.82
Jabiren Raya	1002	1303	320	2625	938.16	720	1142	2.30
Sebangau Kuala	680	0	0	680	0	0	620	1.10
<b>Palangka Raya</b>								
Sebangau	135.8	19.2	4.8	159.8	12	625	153	1.04
<b>Total</b>	<b>9851.3</b>	<b>19432.7</b>	<b>4252.3</b>	<b>33536.3</b>	<b>18184.63</b>	<b>13791</b>	<b>17626</b>	<b>1.90</b>
	29%	58%	13%	100%				

Source: Statistik Perkebunan 2007, Dinas Perkebunan Propinsi Kalimantan Tengah

### Fisheries

Fishing is an important source of protein and income in the traditional tree crop farming systems (rubber and oil palm). Fish is collected directly from the rivers or is caught using “beje” (see also fisheries report). Beje is a pond system found in areas that are regularly flooded (river floodplains and swamps). Bejes are usually manmade but also natural depressions are also used. In the dry season when water retreats after flooding, fish is trapped in the beje and collected. Dimensions of beje vary but are normally 10 by 30 m and 1,5 – 2 m deep. Research indicates that about 5 – 12 different fish species can be caught using a beje (see Table 9).

### Farming Systems and Livelihoods

The agriculture sub-sector is the leading sub-sector for two-thirds of the villages in the EMRP area with plantations (agro-forestry) being the most important for 20% of villages (Table A11.4). Agro-forestry (*kebun rakyat*) is important in Pulang Pisau and Kapuas, while forestry and fisheries are key sub-sectors for villages in the north of the area in Palangka Raya and Barito Selatan. Generally the people of the EMRP area have mixed livelihoods strategies that vary with location in the area (see Box: Livelihoods in the EMRP Area).

**Table A11.4:** Lead Sub-sectors and Local Livelihoods in the EMRP Area.

District	No of Villages with Lead Sub-Sector:						Total
	Agriculture	Forestry	Inland fisheries	Marine fisheries	Plantation	Livestock	
Barito Sltm	1	7	6	-	3	-	17
Kapuas	112	3	0	1	17	2	135
Palangka Raya	1	0	6	0	0	0	7
Pulang Pisau	34	0	1	2	22	2	61
<b>Total (% of Total)</b>	<b>148 (67%)</b>	<b>10 (5%)</b>	<b>13 (6%)</b>	<b>3 (1%)</b>	<b>42 (19%)</b>	<b>4 (2%)</b>	<b>220 (100%)</b>

Source: PODES 2005

All farming systems have a mixed on- and off-farm portfolio. According to a household survey by CKPP, most farmers (56.5%) do not sell their produce and only 22% of farmers sell more than half of their produce.<sup>7</sup> Of those that sell their produce, roughly two-thirds consider that they generate a profit while the remaining one-third consider that they do not make any profit. Most of farmers are subsistence farmers and to augment their livelihoods they work off-farm and harvest forest products such as rattan, gelam wood/poles and fish. Average reported incomes were in the region of Rp 2-4 million per year, which makes the majority of farmers in the area classified as low income (Masyarakat Berpendapatan Rendah/MBR).

#### BOX: Livelihoods in the EMRP Area

A livelihood survey undertaken by CARE in December 2007 compared the livelihood standards with the Millennium Development Goals standard which put the poverty line (*garis miksini*) at 1 USD/capita or ca. Rp. 1,350,000 Rupiah per month per family. Livelihood standards are also compared to the UMR (Upah Minimum Regional or Regional Minimum Income), which at the time of the survey was Rp. 765,868/month/family.

In Barito Selatan incomes are relatively high compared to the other regions. Subsistence products are mainly rice and fish. The off-farm sector dominates in terms of income source with on-farm cash income mostly derived from rubber and rice, while off-farm incomes are dominated by fisheries, labour (transport, workshops, plantation work, gold mining, rattan cleaning) and non-timber forest products. Access to land is relatively high (4.6 ha per household) but generally only 1 ha (22%) of this land is actually in use, which means there is in fact potential for extension.

In Mentangai the incomes are relatively low. Rubber provides regular incomes but paddy is also an important cash crop in the area. In Mentangai off and on-farm income are in balance. Off-farm activities include labour work, NTFPs and the lesser important TFP (Timber Forest Products) labour work (collecting logs). In Mentangai land access is lower (2.9 ha/households), with 1.9 ha or 66% being utilized, mainly for rubber production.

Sebangau has the lowest incomes with activities that are mostly focused on off-farm income generation, especially labour (chainsaw labourer, harvesting logs). Fisheries are an important additional source of income. The on-farm activities are cultivation of paddy as main food crop on not-yet producing rubber tree land (which may cause the relatively low income levels compared to other regions). Land access per household is on average 2.2 ha of which only 0.8 ha or 36% is actually used.

In Timpah the average income is just above the UMR. Off-farm activities are dominant in terms of income generation, especially fisheries and labour work. On-farm activities are mainly focused on rubber and provide only low incomes. The level of land access is only 1.9 ha per family of which 0.6 ha or 31% is actually used, mainly for rubber and with very limited land used for food crops. This makes this village very dependent on food items they can get at the local market.

In the Tumbang Nusa/Gohong area, incomes are relatively high but not on a continuous basis. High incomes are generated by numerous productive rubber trees and a successful rice harvest. Off-farm and on-farm incomes are relatively balanced. Incomes from rubber have tended to decrease, the cause of which is not clear. Fisheries is a major off-farm income as well as labour work. Land access is relatively high, ca. 3.7 ha on average with 1.0 ha or 28% used. In this area the people also apply mixed cropping (paddy and rubber).

Source: CARE Indonesia

<sup>7</sup> CKPP (2008) "Economic Valuation of The Peatland in Central Kalimantan: People Perception in Rehabilitation and Revitalization Ex-Peatland Development in Central Kalimantan", University of Palangka Raya, 2008.

### Extension Services

Currently the extension service is heavily understaffed, on average one extension worker has a working area of about 17,000 ha with about 1,000 farmer households (Table A11.5). Most extension workers active in the EMRP are from outside the area and are not knowledgeable about lowland and peatland agriculture.

**Table A11.5:** Extension workers (PPL) in the EMRP Area in 2005.

District	Area in PLG (ha)	No. of Farming Households	No. of PPL Staff	Area / PPL staff	Households / PPL staff
Palangka Raya	16,324	2,194	0	-	-
Kapuas	626,872	36,186	15	41,791	2,412
Pulang Pisau	633,692	19,993	38	16,676	526
Barito Selatan	197,601	6,404	31	6,374	207
<b>Total</b>	<b>1,462,296</b>	<b>64,777</b>	<b>84</b>	<b>17,408</b>	<b>771</b>

Source: BPS Podes and interviews by EMRP team.

Programs to strengthen the extension services in the area should be part of the implementation of Law No 16/2006 on the Agriculture, Fisheries and Forestry Extension System, and should take note of the special situation of agriculture in swamps. It could also build on existing initiatives such as the World Bank-funded Farmer Empowerment Through Agricultural Technology and Information (FEATI) project.

## ANNEX 12: Plantations and Permits in the EMRP Area

Inpres No 2/2007 allocates 897,000 ha as protection area and 559,900 ha for cultivation divided between forestry cultivation (*kawasan budidaya kehutanan*) (153,000ha) and non-forestry cultivation (*kawasan budidaya non-kehutanan*) (406,900ha).<sup>8</sup>

Collation of data on plantation and other land allocation permits shows that the existing conditions in the area are now very different to the proposed allocation in Inpres 2/2007, especially for oil palm. These data on existing permits are overlaid and analysed in relation to (a) legal provincial spatial plan (RTRWP 2003), (b) the EMRP peat depth map and (c) the proposed spatial plan of Inpres 2/2007.

### A. Data and Analysis

The following data, collected between January and March 2008, were used for the analysis:

**Peat distribution and depth** – Based on the peat depth map produced for the Master Plan (see Annex 3).

**Plantation permits** – Data were collected from the district and provincial Plantations Office (Dinas Perkebunan) and BPN. The most complete dataset appeared to be the data from the district BPN offices, which was used for this analysis. Further verification and clarification of existing permits is recommended given the variation in data held between different offices.

**Mining permits** – Data were obtained from Mining and Energy Office in Kapuas district (Dinas Pertambangan dan Energi Kabupaten Kapuas).

**Transmigration locations** – Data were obtained from the provincial Transmigration Office (Dinas Transmigrasi Propinsi Kalteng).

All data were integrated in a GIS and an analysis of overlap completed.

### B. Results

#### B1. Existing Permits

**Plantations** - Data from BPN Kapuas, Pulang Pisau and Barito Selatan recorded 27 plantation permits in the EMRP area covering 391,048 ha based on the area of the polygons. The data from the provincial plantations agency recorded 23 plantation (oil palm) permits.

**Mining** – Data from Kapuas showed 10 exploration permits (*izin KP explorasi & penyelidikan umum*) covering 122,791 ha based on the area of the polygons.

**Transmigration** – Data from the provincial Transmigration Office showed 224,621 ha allocated for transmigration divided between:

- (i) Existing transmigration settlements (104,484 ha),
- (ii) Proposed transmigration settlement (112,224 ha), and
- (iii) Proposed transmigration settlements with suitability assessments completed (7,913 ha).

---

<sup>8</sup> Lampiran II-2 Inpres 2/2007.



## B2. Comparison with Provincial Spatial Plan (RTRWP 2003)

Results of the overlay with the provincial spatial plan are shown in Table A12.1.

**Table A12.1:** Overlap between Permits and Provincial Spatial Plan (RTRWP 2003)

Sector	Conservation (KGT / Other)	KPP	KPPL	Other	Total
Plantations	125,652 / 13,463	215,006	3,206	33,720	391,048
Mining	- / 2,397	61,881	1,661	56,852	122,791
Transmigration	13,047 / 42,896	125,789	5,781	37,109	224,621

Other Conservation: KEAH (Kawasan Ekosistem Air Hitam), KFF (Kawasan Flora dan Fauna), KH (Kawasan Hidrologi), KM (Kawasan Mangrove). KGT = Kawasan Gambut Tebal; KPP = Kawasan Pengembangan Produksi; KPPL = Kawasan Permukiman Dan Penggunaan Lainnya.

Lain: DS, HP, HPT, HTI, KHR, T1

Plantations vs. Provincial Spatial Plan – Ten permits overlap with the deep peat area (Kawasan Gambut Tebal<sup>9</sup>) covering ±125,000 ha. Two other licenses have part of their area in the Flora and Fauna Conservation Area (Kawasan Flora & Fauna) covering ±12,900 ha.

Mining vs. Provincial Spatial Plan – Five permits overlap with the 'handil rakyat' area (Kawasan Handil Rakyat) covering 38,245ha and two permits overlap with the Flora and Fauna Conservation Area (Kawasan Flora & Fauna) covering 2,390ha. No mining permits are found in the deep peat area (Kawasa Gambut Tebal).

Transmigration vs. Provincial Spatial Plan – 13,047ha of transmigration locations overlap with deep peat area (Kawasan Gambut Tebal) with most of this (±12,400 ha) being proposed transmigration.

## B3. Overlay Permits with Peat Distribution and Depth

The results of the overlay of the permits and various land allocations with the peat distribution and depth map is shown in Table A12.2

**Table A12.2:** Overlap between Permits and Peat Depth.

Sector	PEAT DEPTH / THICKNESS					
	>3m	2-3	1-2	0.5-1	<0.5 / mineral	No data
Plantations	119,564	34,947	45,291	60,336	128,584	2,326
Mining	-	-	182	19,319	101,462	1,828
Transmigration	16,414	16,784	24,542	38,461	127,642	778

Plantations vs. Peat Depth – Fourteen permits have part of their area in deep peat (>3m) covering 119,563. These fourteen permits cover a total 260,138 ha of peat more than 0.5m deep.

Mining vs. Peat Depth – There are no mining permits in the deeper peat areas.

<sup>9</sup> Note that the deep peat area (kawasan gambut tebal) is intended to cover the deep peat for conservation; however, data on peat depth used for the 2003 spatial plan was incomplete, so these figures do not accurately reflect the area of deep peat on which various permits overlap.

Transmigration vs. Peat Depth – There is 16,414ha of deep peat (>3m) in the transmigration areas, with most of this (±14,000ha) being found in proposed new areas.

#### **B4. Overlay of Permits with Proposed Spatial Allocation in Inpres 2/2007**

Results of the overlay between existing permits and planned developments with the land allocation of Inpres 2/2007 are shown in Table A12.3.

**Table A12.3:** Overlap between Permits and Inpres 2/2007

Sector	Kawasan Lindung (termasuk KGT)	Kawasan Budidaya Kehutanan	Kawasan Budidaya Non Kehutanan	Total
Plantations	197,611 (127,999)	95,069	98,368	391,048
Mining	32,985 (-)	-	89,806	122,791
Transmigration	82,607 (15,002)	11,426	130,588	224,621

**Plantations** – All plantation permits overlap to some extent with the protection areas (kawasan lindung) proposed in Inpres 2/2007. Sixteen plantations overlap with the the proposed deep peat area of Inpres 2/2007.

**Mining** - All mining permits except one overlap with the proposed protection areas in Inpres 2/2007. None overlap with the proposed deep peat area (Kawasan Gambut Tebal).

**Transmigration** – Almost 40 % of the total transmigration area overlaps with the protection areas (kawasan lindung) proposed in Inpres 2/2007 including 15,000ha in the proposed deep peat area (Kawasan Gambut Tebal).

#### **C. Summary**

The analysis above shows that there are serious overlaps of permits and proposed locations for plantations – especially oil palm – and transmigration with the deep peat that are not in line with the objectives of Inpres 2/2007. Further, oil palm in Block B will lead to the loss of about 25,000ha of existing forest cover. The drainage required by oil palm and the potential direct loss of forest from the establishment of these plantations is contrary to the aims of Inpres 2/2007. Urgent action needs to be taken to review and, where appropriate, revise and/or revoke plantation licenses in these areas.

Immediate action is required to ensure that planned transmigration in and near peat domes is cancelled (i.e. proposed locations in Blocks B and C) and that current permits on deep and moderately deep peat (>1m) are reviewed, revised and their boundaries moved away from these deeper peat areas. A summary of the plantation permits and their overlap with the peat areas is shown in Table A12.4.

**Table A12.4: Plantation Permits and Peat Depth in the EMRP Area.** Yellow shading indicates the permit overlaps with the deep peat area.

No	NAMA PERUSAHAAN PERKEBUNAN	Komoditi	Status	Sumber	Kegiatan Lapangan	Ketebalan Gambut (m)						Grand Total (ha)	Map.nr.
						> 3	0,5 - 1	1 - 2	2 - 3	Tanah Mineral	No Data		
1	PT. Rejeki Alam Semesta	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Penanaman	16,999		498	2,047			19,544	1
2	PT. Suryamas Cipta Perkasa 1	Sawit	Kadastral,Proses HGU	BPN Ppisau 130308	Mulai Penanaman	4,475	5,136	6,605	5,610	1,391		23,217	16
3	PT. Menteng Kencana Mas	Sawit	Proses Kadastral	BPN Ppisau 130308	Mulai Penanaman	3,884	2,729		171	12,763		19,547	20
4	PT. Graha Inti Jaya	Sawit	Kadastral,Proses HGU	BPN Kapuas 130308	Mulai Penanaman	3,827	2,485	2,793	1,910	3,709		14,725	2
5	PT. Globalindo Agung Lestari 1	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Pembibitan	1,332	11,545	4,526	2,062	10,026		29,491	6
6	PT. Bangun Cipta Mitra Perkasa	Sawit	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	23,753		468	2,619			26,840	15
7	PT. Suryamas Cipta Perkasa 2	Sawit	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	19,394	132	704	1,533			21,763	26
8	PT. Menara Tunggal Perkasa	Sawit	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	15,425		1,205	5,368			21,998	19
9	PT. Prima Unggul Perkasa	Sawit	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	13,802	107	5,651	6,784			26,344	18
10	PT. Karya Luhur Sejati 2	Sawit	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	8,005	818	1,539	1,829			12,191	27
11	PT. Handil Hambie	Karet	Arahan Lokasi	BPN Ppisau 130308	Belum ada kegiatan	4,873		704	1,970			7,547	22
12	PT. Globalindo Agung Lestari 2	Sawit	Arahan Lokasi/ IUP	SK 44 Bupati Barsei 050207	Belum ada kegiatan	3,744	524	605	454	396		5,722	28
13	PT. Karya Luhur Sejati 1b	Sawit	Kadastral,Proses HGU	BPN Ppisau 130308	Belum ada kegiatan	37	2,618	1,927	579	2,634		7,795	25
14	PT. Sangkowong Sinta	Karet	Ijin Lokasi	BPN Ppisau 130308	Belum ada kegiatan	12	886	2,537	1,641			5,075	21
15	PT. Fajarmas Indah Plantations	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Penanaman		642			11,190		11,833	5
16	PT. Sepalar Yasa Kartika	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Penanaman		8,138	135		6,285		14,559	4
17	PT. Dian Agro Mandiri	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Pembibitan		1,949			15,867		17,816	3
18	PT. Hijau Pertiwi Indah Plantations	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Pembibitan		2,044			13,005		15,050	8
19	PT. Kahayan Agro Lestari	Sawit	Ijin Lokasi	BPN Kapuas 130308	Mulai Pembibitan		41			115	1,346	1,502	9
20	KSU Warga Jaya	Karet	Ijin Lokasi	BPN Kapuas 130308	Belum ada kegiatan		869			1,347		2,216	10
21	PT. Bahaur Era Sawit Tama	Sawit	Kadastral,Proses HGU	BPN Ppisau 130308	Belum ada kegiatan		6,548	8,483	372	6,706		22,109	24
22	PT. Berkah Alam Fajarmas	Sawit	Kadastral,Proses HGU	BPN Ppisau 130308	Belum ada kegiatan		8,641	6,642		5,306		20,589	23
23	PT. Free El Green Power	Sawit	Ijin Lokasi	BPN Kapuas 130308	Belum ada kegiatan		77			1,067	980	2,124	11
24	PT. Indosiam Agro Makmur	Ubikayu	Ijin Lokasi	BPN Kapuas 130308	Belum ada kegiatan		2,148			7,533		9,681	12
25	PT. JAMIN	Padi	Ijin Lokasi	BPN Kapuas 130308	Belum ada kegiatan		273			2,282		2,554	13
(13)	PT. Karya Luhur Sejati 1a	Sawit	Kadastral,Proses HGU	BPN Ppisau 130308	Belum ada kegiatan					5,831		5,831	25
26	PT. Padi Kuning Mas	Padi	Ijin Lokasi	BPN Kapuas 130308	Belum ada kegiatan					13,179		13,179	7
27	PT. Sakti Mait Jaya Langit	Sawit	Arahan Lokasi	Disbun Propinsi	Belum ada kegiatan		1,987	270		7,950		10,207	14
Grand Total						119,564	60,336	45,291	34,947	128,584	2,326	391,048	

Baris yang di block kuning menunjukkan bahwa areal perusahaan berada diatas Gambut tebal > 3m  
Kolom dengan block merah merupakan kawasan konservasi

### **ANNEX 13: Challenges for Agricultural Revitalisation**

The mineral soils in the EMRP in particular have agricultural potential, but investments are required to improve on the current, mainly subsistence level, agricultural, land and water management practices in the existing villages and transmigration schemes.

Currently about 110,000 ha is planted with rice, with average yields ranging from 1.5 to 2.5 tons per hectare. Some farmers, using high yielding varieties and appropriate inputs achieve production levels of up to 3.5 tons per hectare. In experimental plots such as in Dadahup, yields of 5 tons per hectare are reported. The current biophysical conditions in the rice producing areas (Block A and D) are marginally suitable for rice production. Most of the EMRP area in its current condition is not suitable for rice, and only with high investments in land and water management could parts be converted to rice producing areas, although these would most likely be marginal. Doubling the rice area through extensification does not seem a feasible strategy, however increasing yields in existing rice producing areas through revitalisation and intensification is a more appropriate route. Most farmers grow rice for home consumption, for resource poor subsistence farmers increased productivity is directly related to securing an important part of their livelihood. Every kilogram of rice that does not have to be bought can be invested elsewhere, such as in education of children.

Strategies aiming at increasing rice yields will also have to address issues related to the less successful farming communities located inland near the peat. In the tidal areas of blocks D and A, new land with high potential could be reclaimed for agriculture as part of the overall revitalisation program.

The relative high labour requirements and low returns from rice production are also responsible for the current trend away from rice toward more rewarding crops like rubber. Especially in areas (e.g. block C) where fire was utilised for land preparation the ban on fire accelerated this process. Increasing demand for cash crops and associated increasing prices are currently an important driver of expansion of major agricultural commodities (e.g. rubber, coffee, sugar, soy and oil palm). Demand is expected to continue to increase over the coming years, increasing pressure on land, labour and financial resources.

In general smallholders follow a risk reducing strategy via on and off farm diversification. The idea is that when smallholders depend on a single activity or a limited number of crops they are more vulnerable and susceptible to shocks. Godoy and Feaw (1991), however, report that smallholder's 'safety first principle' of reducing risk through agricultural diversification can be undermined by price incentives.<sup>10</sup> If profitability of a crop over a long period is higher than alternative activities farmers will take the risk and switch to monocropping. Reduced labour requirements is another important incentive. This can in fact provide off-farm diversification and contribute to a risk reducing strategy.

In the EMRP, farmers are already specialising on-farm towards cash crops with relative low labour requirements (e.g. vegetables, fruit trees, rubber) and seek off-farm diversification to secure income. Food crops (i.e. rice) are grown mainly for home consumption and only if revenues from food crops are high enough will farmers be able to invest in food crop production. Subsistence farmers in the EMRP are constrained by the lack of resources (land and finance) to make the transition to cash crops.

---

<sup>10</sup> Godoy RA and Feaw TC (1991) Agricultural diversification. among smallholder rattan cultivators in Central. Kalimantan, Indonesia. *Agrofor Syst* 13: 27–40; see also Penot E. 1991. Diversification of perennial crops to offset market uncertainties: the case of traditional rubber farming systems in West-Kalimantan. (Smallholder Rubber Agroforestry Project, CIRAD – ICRAF)

Crucial for most food and cash crops in the EMRP is the high acidity, which hampers nutrient uptake by crops. As a result, yields are low mainly because of poor soil fertility. Strategies aiming at reducing the acidity are urgently needed requiring a proper functioning water management system. Lime is also needed to compensate for the acidity, and the currently recommended dosage is up to 2000 kg/ha/yr. However, most smallholder farmers do not have enough financial resources to purchase this input. Lime is found in Kalimantan but it is apparently cheaper to ship the lime from Java. Besides lime, nitrogen (N) and phosphorous (P) fertilisers are needed, all of which are beyond the financial scope of most smallholders.

In large parts of the project area, the root cause of poverty and inefficiency are linked to the poor biophysical conditions and the failure to manage the land and water properly. Large infrastructural works for water management are beyond the scope of the individual farmer but require large-scale interventions from either the private sector or government (see land and water management). Also improvements in the rural infrastructure, a crucial factor for market access, are beyond the scope of the farmer.

Even if water management at the regional scale is effective, improving the skills of the farmer remains a key issue. Current practices are based on local experiences but the exchange of knowledge between farmers about successes and failures between farmers is limited. Also the link between research and farmers is limited, and farmer field schools linked to science networks - including the extension services - could be developed. This should also involve a reorientation of field research away from experimental plots to on-farm research, in order to increase the impact of research.

Common issues in smallholder agriculture for the area are:

- Low yields related to poor biophysical conditions and low inputs.
- Small farm sizes with limited farm diversification and poor specialization.
- The absence of adequate local capacity for agricultural product processing.
- Poor access to markets.
- Limited skills of the farmers.

## ANNEX 14: Challenges for Land and Water Management

The reclamation and agricultural development of (tidal) lowlands in Indonesia has shown successes and failures, which are described extensively elsewhere.<sup>11</sup> The lessons learned, especially the success stories, must be taken into account. It must be understood that the reclamation of tidal lands takes time, and that interventions need to be adapted to actual changing conditions and developments.

Drainage management is key to the sustainable development of the EMRP area. However, drainage will bring about irreversible changes in land and water systems. Whether such changes are acceptable depends on development objectives in relation to current and future bio-physical conditions.

Drainage of peat lands will unavoidably result in subsidence and loss of peat. With the lowering of the surface the land often becomes unsuitable for gravity drainage. To a certain extent the same holds when draining (unripe) mineral soils. Also here the (future) topographical relation with the hydrology of the rivers will determine whether gravity drainage remains possible in the long run. Climate change is expected to result in longer dry seasons, adding to drought problems facing degraded peat areas, and a sea level rise that will effect tidal river water levels, hampering future drainage and increasing flooding risks. A long term view is required on the suitability of drainage interventions, and potential drainability and flooding.

Drainage of peat lands and (potential) acid-sulphate soils also involves the leaching of acids and toxins (especially iron and aluminium compounds), which is known to affect downstream agriculture and fisheries.<sup>12</sup> Drainage of areas bordering on peat lands will affect the water tables of the peat domes and further add to peatland degradation, which is why peat domes should be managed at the hydrological landscape scale. It is therefore important to physically separate development from conservation areas.

Uncultivated land in and around agricultural areas is a source of acidity, fires and pests in the EMRP, affecting agricultural development. Water management systems are only partly functional in these uncultivated lands, limiting the effectiveness of the overall infrastructure. Consideration must be given to revitalise the undeveloped scheme areas (lahan tidur) to minimize impact on existing agriculture.

An essential feature of land and water management in (tidal) lowlands is the capability of the water management infrastructure to maintain a proper soil and water quality through controlled drainage, flushing and leaching. In Indonesia, acidity is normally not a main constraint, but poor water management and stagnant water conditions are. Land and water management development in (tidal) lowlands is characterised by dynamic processes, for which a long-term commitment and 'adaptive' management approach is essential. Current designs and water management practices in the EMRP area are either not complete, or not adapted to principles of controlled drainage, leaching and flushing.

The Banjarese were very selective in the development of their water management systems along the tidal rivers. The handil canals perpendicular to the river in the tidal

---

<sup>11</sup> See (1) Ministry of Public Works DGWRD – Final Completion Report, Telang and Saleh Agricultural Development Project, Drainage Development Component, Integrated Irrigation Sector Project (IISP), Asian Development Bank, Euroconsult, PT BIEC, TIA, 1997; (2) Ministry of Public Works DGWRD (1998-2000) – Framework For Future Swamp Development in Indonesia. Euroconsult. Final Report, ISDP (Integrated Swamps Development Project). Jakarta; (3) Ministry of Public Works DGWRD – Final Completion Report, Integrated Swamps Development Project (ISDP), World Bank, Euroconsult, Indec Ltd, TIA, Necon, BWK 2001; (4) World Bank (2001) – Implementation Completion Report (ICR), Integrated Swamps Development Project, Indonesia, World Bank, April 2001; (5) Houterman, J, Mestika Djoeahir, Robiyanto Susanto, and F. v. Steenberg - Water Resources Management During Transition and Reform in Indonesia, Toward an Integrated Perspective on Agricultural Drainage, Euroconsult, World Bank, ARD, Washington, 2004

<sup>12</sup> 'Downstream' refers to various scales, e.g. peat dome vs bordering areas, higher mineral soils vs lower mineral areas, peat/mineral areas draining into rivers, acid transport further downstream in the rivers.

zone precisely follow the boundary of the tidal propagation into the swamp interior, i.e. allowing for the drainage of tree crops during low-tide, and tidal irrigation during high spring tide. Basically the water management in these areas does not need to be changed drastically. This is to a lesser extent the case with the more upstream Dayak handil areas that have a more complex hydrology and morphology.

The transmigrants in the EMRP are settled in the swamp interior, where land and water management conditions and options are less favorable. Only in a small part of the swamp interior will tidally fed irrigation be possible, not in continuous blocks, but along minor depressions, adding to the micro-diversity of bio-physical conditions. Soil and water quality management in the transmigration schemes is thus largely dependent on rainfall and controlled drainage. The existing hydraulic infrastructure and water management practices are inadequate to create optimal land and water management conditions for agricultural development.

Main system improvements will require re-designs on the basis of accurate topographical, hydrological and land suitability assessments. The upgrading should focus on flood control and drainage management, water circulation, leaching and flushing, and will entail reducing the length and density of canals by adding new canals, the double-connection of dead-ended canals, and water control structures. Transmigrant farmers often opt for a mix of (wetland) rice, dry land crops and tree crops to adapt to the environment. The main canal systems should provide sufficient flexibility to grow a variety of crops, based on in-situ conditions, which may vary from field-to-field and over time and socio-economic considerations. The upgrading of the existing hydraulic infrastructure of the transmigration schemes is a pre-condition for on-farm land and water management development.

Development of the land and water management at tertiary and on-farm level requires a different and long-term approach, dealing with micro-variations of soil and water conditions and potentials, and the limited capacity of farmers and government institutions. Land and water management development must be site-specific and is closely linked to agricultural and socio-economic developments. An important aspect is mechanized land preparation, as this is important to further develop the soils, but is also needed to reduce labour requirements. Mechanization is only possible when the soil has reached a certain level of ripening, for which drainage is required.

Although the broad outline of land and water management interventions is clear, it will be essential to closely monitor and study the effects of land and water management improvements, and adapt proposed measures as needed.

Until major technical and social constraints in the existing transmigration schemes are resolved, new development and transmigration should be discouraged.

Basic challenges to land and water management development include:

- Land reclamation being a long term and dynamic process.
- Interventions and designs must take future drainage and flooding into account.
- Separation of conservation and development areas.
- Undeveloped lands (lahan tidur) in and around agricultural blocks.
- Lack of hydrological and topographical information.
- Major re-design of macro-infrastructure in transmigration schemes.
- Long-term support to on-farm development and mechanization.
- Study, monitoring, trials and demonstrations.
- Flexible and adaptive management, and strengthening of institutions.

## ANNEX 15: Challenges for Fisheries

Ecosystems important for the survival and growth of aquatic species are strongly affected by land use practices and human activities in the EMRP area. Human interventions such as agriculture development, logging, mining and conversion of mangroves to aquaculture ponds have led to the disappearance of certain fish species, changes in species composition and has impacted fisheries and aquaculture production. These changes and impacts include the following:

- Canal construction during the Mega Rice Project has disrupted not only the hydrology of the area (strongly impacting the effectiveness of traditional fisheries systems such as the *beje* fisheries), but has also reduced the water quality (pH) jeopardising the survival, growth and natural productivity of fish species. The low pH also causes slow growth and high mortality rates of fish species farmed in freshwater ponds and in cages located in or near agricultural development areas.
- Development of structures such as dams and gates in drainage canals of agricultural schemes limit the seasonal movement and migration of fish species from peat swamp areas to rivers and back, which are important for feeding and breeding.
- Logging and forest fires have greatly reduced the vegetation cover causing erosion and sedimentation. Sedimentation changes the water flow pattern, decreases the success of fish spawning and changes the structure of the aquatic plant community and insect population. This in turn leads to a loss of food supply and reduces the habitat used for cover.
- Mining activities have a similar effect on water turbidity as logging activities, cause deterioration of the water quality and accumulation of mercury in the food web, which can impact human health.
- Conversion of mangrove to aquaculture ponds for culture of shrimp species and milkfish directly translates into loss of biodiversity and impacts on coastal and marine fisheries that depend on mangroves for reproduction, growth and shelter.

Aquaculture practices are often unproductive due to the inappropriate selection of sites with unsuitable environmental conditions (low pH), lack of technical know-how and experience in pond and water management, high costs of input supplies and limited access to credit facilities, inadequate marketing opportunities, poor infrastructure and the lack of technical support from the relevant government offices. Illegal fishing activities such as electro-fishing create social conflicts, are damaging to the health of the ecosystem because of their non-selective effects, and affects the long-term sustainability of the fisheries resources.

Opportunities in the fisheries sector in the future include: (a) freshwater aquaculture, (b) cage culture, (c) *beje* fisheries and (d) ornamental fish. However, a clear long term integrated framework for fisheries and aquaculture in the EMRP area does not exist and the institutional arrangements for management of the fisheries resources and the conservation of critical fish habitats are inadequate. Capacity and knowledge on integrated sustainable management approaches is lacking and existing policies and strategic plans are all sector based and sometimes conflicting. The role and responsibility of the Department of Fisheries in capacity development (knowledge transfer and skill development) in support of newly introduced fisheries and aquaculture technologies is lacking and extension services are weak. Demonstration, research and extension are often not relevant to the fish farmers' needs and situation. Monitoring systems are not in place and experiences are weakly documented, making it difficult to draw lessons learned, internalise them and integrate them in new project designs.



## **ANNEX 16: Challenges for Socio-economic Development and Livelihoods**

To develop strategies and concrete policy and support options for local livelihood development in the EMRP area, the sustainable livelihoods framework is used.<sup>13</sup> This framework emphasizes that livelihoods and well-being are not just based on financial income or consumption, but also on human, physical, social, and natural capital or assets, and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its assets, both now and in the future, while not undermining the natural resource base<sup>14</sup>.

A further distinction on the basis of socio-economic considerations has to be made in the EMRP between conditions in (i) Dayak communities, mostly along the upstream semi- to non-tidal stretches of the rivers, (ii) the Banjarese settlements, mostly along the downstream tidal stretches of the rivers, (iii) the more recent Government sponsored large-scale reclamation, mainly in the swamp interior or bordering on deep peat areas, and (iv) private sector plantations, often on deep peat. Each socio-economic entity has a different ethnic and cultural background, which translates into different land and water management, land use and farming systems, as well as other socio-economic and income generating activities. Indigenous (Dayak) communities have been under pressure since the spontaneous reclamation of the tidal zone in the early 20<sup>th</sup> century. Large-scale transmigration had an even more intrusive impact on the natural resources and unresolved land titling issues remain.

### **Main Livelihood Problems and Key Drivers**

The people living in Dayak, Banjar and older transmigration (USG) villages have many livelihood assets, including: *adat* laws, institutions as well as leadership; mutual help and social cohesion; traditional knowledge of the peat land and forest environment (adapted agricultural practices, plant varieties, tree farming, non timber forest products and water management); and diversified farming systems and household livelihood strategies.

But they also face many constraints to sustainable livelihood, including: low capital base and poor access to credits, soil fertility problems, as well as agricultural pests and diseases; inappropriate water infrastructure or its insufficient maintenance; declining availability of non timber forest products and quality of the environment in general; seasonal floods and fires; weak village government; poorly defined or disputed tenure and access rights to land and other natural resources; burning restrictions that are increasing soil fertility problems and pests; poor market access, as well as exploitation by middlemen; and lack of health services, and schooling and skill development opportunities.

Analysis of the outcomes of the village workshops and sub-district consultations revealed the following interrelated key drivers behind current livelihood problems in EMRP area:

1. Locally weak external institutional relationships, including lack of representation of local people and their agricultural or natural resource based and non-farm enterprises in policies and decision making;

---

<sup>13</sup> Three-day workshops have been organized in six villages that were selected according to socio-economic and bio-physical criteria to ensure representation of the diversity of village communities, variety in hydrological systems and land use patterns in the EMRP area. The outcomes provided insights into the livelihood assets of local people, the problems they face, and their solutions for addressing these problems. Selected villages are: Katungjung, Manggala Permai and Rantau Jaya (North-west Block A) and Pilang (North Block C), and Gandang and Behaur Hilir (South block C).

<sup>14</sup> Chambers, R. and Conway, G.D. (1992) Sustainable rural livelihoods: Practical concepts for the 21<sup>st</sup> century. Discussion paper 296. Brighton, UK: Institute of Development Studies.

2. Poor supportive infrastructure and services, including lack of financial institutions and business development services;
3. Lack of producers' groups, associations, and cooperatives and business associations for improved market access, value chain addition and marketing; and
4. Lack of adequate or secure land and forest tenure and management rights for individuals and community groups.

The implications are clear: in order to improve local livelihoods and reduce poverty, social, institutional and economic isolation and lack of power all need to be tackled. These issues are difficult for local people to address on their own and require multi-faceted policy and investment support and coordinated action by several groups or communities<sup>15</sup>.

### ***Institutional Issues and Socio-economic Development***

Not unlike villages in other parts of Indonesia, village government in almost all villages has many weaknesses. In various cases the village head is absent or enjoys very limited trust among the villagers or traditional leaders. Due to a lack of external support, capacity building and funds, the role of village heads for the village and its development is problematic in many villages. It is difficult for village heads under the current conditions to bear responsibility for village institutions that are officially supposed to function in each village. Even though the government has established special institutions and programs such as PMD and PNPM to provide development planning and community empowerment support to these village institutions, this support is only rarely provided and has a limited impact on the quality of village government.

In transmigration villages, which do not have a definitive administrative status yet (as long as they are not handed over to the Ministry of Home Affairs), the situation is even more problematic. The village heads are selected each year, which leads to a lack of continuation in policies and program implementation as well as institutional development. Also, due to limited capacity, village administration is usually not well-maintained. In traditional villages, most of which can be found in the peat areas, conflicts are occurring between the village administration and traditional leaders and problems regarding land tenure and village boundaries frequently occur.

In the traditional villages, traditional institutions and leaders can in principle provide the mechanisms for reducing or mediating conflicts, although they can also have an adverse effect. Religious groups can have a bridging function to overcome differences between their followers. However, these institutions have, in practice, not proven to be effective legal and institutional enforcement bodies.

In many villages, both transmigrant and traditional, community organisations such as women groups, youth groups and others do not function effectively. This is partly caused by the top-down way of establishing these community organisations and the traditional attitude of village authorities towards their establishment. Government provides very limited support to these groups and usually only in the initial stage of development. Where formed, the village council is often mainly represented by members of the local elite, and do not represent the majority within the community, especially vulnerable groups. Sometimes the villagers themselves underestimate the importance of community groups such as the fire fighting teams.

Linkages between government and village level community organisations as well as district and sub-district government institutions are extremely weak, both with regard

---

<sup>15</sup> World Bank (2006) Sustaining economic growth, rural livelihoods, and environmental benefits: Strategic options for forest assistance in Indonesia, The World Bank Office, Jakarta, Indonesia, December 2006.

to routine relations as well as program implementation, including social programs (BLT, RASKIN). The provision of farming tools is not well organized (tools ending up unused or with local elites), identification of beneficiaries is not performed well, extension services are not running well and have limited funding, limited skills among extension workers and weak management of the interventions.<sup>16</sup>

The annual planning process (*Musrenbang*), which is supposed to be highly participatory, looks good on paper but in practice is implemented in a very marginal way at the community level, often only involving the village head and the village secretary and/or a limited number of community members in the decision-making and planning processes. The limited information and involvement of community members results in a lack of sense of ownership and responsibility towards village program planning and implementation. Opportunities exist for improving this through more public forums at the village and sub-district, for example, and through the multi-stakeholder Local Government Agency Forums (Forum SKPD) that enable civil society groups to provide input into public service delivery and development. Independent committees are to be established at the local government level, including education boards and school and public health committees, to encourage greater cooperation with regional governments in these vital sectors. These committees can play an important oversight role.

**Community Empowerment in Central Kalimantan - Mamangun dan Mahaga Lewu**

The Governor of Central Kalimantan Province has initiated a five year poverty eradication program called Program *Mamangun dan Mahaga Lewu* (PM2L) – Program for Development and Maintenance of Villages (2006-2010). The program aims at developing less developed villages in the whole of Central Kalimantan province through a specific program. The program has identified the following problems in the area: (1) Low capacity of human resources of village institutions; (2) Mechanism of development planning (*Musrenbangdes*) is not functioning effectively; and (3) There is no synergy in the integration of all development resources. To overcome these challenges the program offers the following strategy: (a) To incorporate all related development resources in the community empowerment endeavour, in an integrated way; (b) Capacity building of institutions and human resources at village level; and (c) Involvement of community from the phase of development planning, implementation and monitoring, to the sustainability of programs.

In response to these issues, the Governor of Central Kalimantan has launched an integrated community development program in the province (see Box: Community Empowerment in Central Kalimantan). Initially working in one village per sub-district, the program aims to create model villages with the capacity to undertake their own sustainable development using available resources. There is a clear opportunity to support the expansion of this program to more villages in the EMRP area through the rehabilitation and revitalization programs planned for the area.

<sup>16</sup> Field extension workers (*penyuluh pertanian lapangan, PPL*) are assigned to a number of villages, and visit each village once every two weeks. They work with groups of contact farmers (*kontak tani*) in each village, discussing relevant topics for the time of year. These contact farmers in turn are expected to disseminate their knowledge to other farmers in their village.

## ANNEX 17: Scenario Development

Scenarios are a useful approach to consider possible futures when dealing with complex and uncertain situations such as the EMRP area. The EMRP area is presently at an important point in its history where decisions made now will have long-term consequences for the area and its people. In order to assist decision-makers, the Master Plan presents three scenarios to highlight the consequences of “what might happen in the future” under different conditions and management strategies. These results are therefore presented as a means of stimulating discussion on the future of the EMRP area and issues that need to be considered amongst stakeholders. This Annex outlines the development of scenarios for the EMRP area and describes the scenarios in more detail.

### Box: Drivers of Change and Scenario Development

The Millenium Ecosystem Assessment distinguishes direct and indirect drivers of change in ecosystems. A direct driver of change unequivocally influences ecosystem processes, whereas an indirect driver operates more diffusely by altering one or more direct drivers. Categories of indirect drivers of change are demographic, economic, sociopolitical, scientific and technological, and cultural and religious. Important direct drivers include climate change, plant nutrient use, land conversion leading to habitat change, and invasive species and diseases.

Within the EMRP area, indirect drivers therefore include factors such as population change; trends in agricultural markets including commodity prices and REDD; trade policy and subsidies; governance and the role of the state; and the impact of scientific and technological innovation on production and other ecosystem services. Significant direct drivers include climate change, land conversion to new crops (especially oil palm) and fire.

### Scenario Development

The future of the EMRP will be dependent on a number of “drivers of change” that together will determine the condition and nature of the area in the future. A driver of change is any factor that creates change in the system and can influence the system directly or indirectly. The Millenium Ecosystem Assessment, for example, identified a series of drivers of change and emphasized that the interaction between these is critical to understanding how change occurs (see Box: Drivers of Change and Scenario Development). For example, the conversion of farmland may be a not be a major problem on its own but when combined with high population growth and climate change that may reduce future yields, the problem of farmland conversion can be seen to have even greater significance.

Central to the development of future scenarios in the EMRP area is defining alternative land use scenarios. Two alternative future directions for the EMRP area as seen in Inpres 2/2007 and, in contrast, through the existing plantation permits issued by district government in the area. A third land use scenario considered here is one of no change, in other words leaving the area in its present situation without significant development of any kind.

The Master Plan therefore defines three future scenarios:

1. No Change - Canals remain as they are, without blocking, resulting in continued overdrainage. No concessions are implemented i.e. no drainage is added. Population increases by natural growth without transmigration and market conditions, science and government services remain stable. REDD is not developed as an option. Major fires occur once every 10 years.
2. Plantation Development - Large parts of Block C and Block B peatlands and Block D are converted to oil palm concessions (see Figures 2.17 and 2.18). Outside of concessions, there is no peatland rehabilitation and conditions

remain overdrained as they are now. Population increases by natural growth with some immigration to work in the plantation sector. Market conditions, science and government services remain stable. REDD is not developed as an option. Major fires occur once every 10 years outside of plantations and once every 20 years inside plantations.

3. Peatland Rehabilitation and Agricultural Revitalisation – Peatlands are rehabilitated, forest cover begins to be reestablished on deep peat and water levels are raised to the point where subsidence will gradually stop altogether. Limited development in shallow peat and areas bordering the peat led by mostly smallholders and private sector of suitable (i.e. limited drainage) tree crop plantations. Population increases by natural growth and REDD / carbon finance is successfully developed as an option. Agricultural services improve with agricultural development based on development of specific commodities (rice, oil palm, fruit etc.) through a mix of agricultural strategies (intensification, extensification, diversification) led by farmers and the private sector.

### Scenario Assessment

Each scenario is assessed in terms of the consequences for (a) ecosystem goods and services, (b) regional development and (c) poverty alleviation.

#### 1. Ecosystem Goods and Services

The evaluation of the different land use mosaics is done using the concept of ecosystem goods and services. The following categories of ecosystem goods and services are being used:

- **Provisioning** - Food production (e.g. crops, fisheries), feed production, fuel production, water supply, genetic resources and biodiversity, raw materials, mobility;
- **Regulating** - Flood control, climate control, fire control, pest & disease control;
- **Supporting** - Nutrient cycling and carbon sequestration;
- **Cultural** - Spiritual, recreational and aesthetic values.

**Table A17.1:** Estimation of the Quantity of Ecosystem Goods & Services

Ecosystem	Sub-type / condition	Ecosystem Goods & Services*			
		Provisioning	Regulating	Supporting	Cultural
Mangrove	Natural	++	++	++	+
	Converted ( <i>tambak</i> )	-	--	-	-
Peat swamps	Natural forests	++	++	++	+
	Degraded forests	-	-	-	-
	Rehabilitated forests	+	+	+	0
Freshwater swamps	Natural forests	++	+	+	+
	<i>Melaleuca</i> forest	+	0	0	-
Riparian habitat	Riparian forest	++	+	+	+
	Degraded	0	0	0	-
Rivers, lakes & streams	Pristine black-water streams	+	+	+	0
	Degraded black water streams	-	-	-	-
	Rivers	+	+	+	+

**Note:** '++' = high positive value; '+' = positive value; '0' = no value; '-' = negative value; '--' = high negative value.

Two approaches are taken. First, a semi-quantitative approach is used to allow for inclusion of non-monetary values of different land uses and strategies (Table A17.1). The goods and service concept is based on the notion that specific types of land use provide services which are important for development and need to be linked to policy and planning processes. However because not all services can be expressed in

monetary terms, e.g. biodiversity and wellbeing, it is difficult to directly use the concept in development planning.

Second, the three different scenarios have been evaluated for their impact on the future morphology, peat depth, flooding regime and drainability of the area using the Peatland Scenario Assessment Tool (PSAT) developed in the Habitat platform in this project (see Box: Subsidence Modeling and the Peatland Scenario Assessment Tool). The long-term impacts of each of these scenarios have been evaluated with and without the effects of fires, and over 25 and 50 years.<sup>17</sup> The results presented are tentative and based on the limited information currently available on the relation between drainage, subsidence and greenhouse gas emissions. However, the PSAT results provide useful information to compare the potential impact of the different scenarios based on current knowledge.

#### **Subsidence Modeling and the Peatland Scenario Assessment Tool**

The Master Plan team has developed a 3-D modeling tool operating on the WL Delft Hydraulics HABITAT platform to help understand long-term drainage impacts in the EMRP peatlands. This tool predicts CO<sub>2</sub> emissions and peat subsidence and the effect of this on drainability and flood patterns. Some key parameters for the subsidence modeling include:

- An equation describing the shape of the 'subsidence profile' away from canals has been fitted on the average of 40 transect elevation measurements over 1km, perpendicular to canals. In the current situation subsidence near canals is about 0.08m/y at the start of subsidence, and subsidence at 1km away from canals 0,04 m/year. These values are based on the averages of the 40 transects, which are based in block A, B and C (and thus in areas, which have been drained already for 10 years).
- Subsidence slows down in time, as the peat matures; after 25 years it is 005 m/y near canals and 0.02 m/y at 1km distance.
- Assuming water levels will be reasonably controlled in plantations, subsidence is assumed to occur at half the rate there than in the current situation.
- Where fires occur, they are assumed to occur once every 10 years, once every 20 years in plantations, and to burn away 0.5m of peat.

In the Master Plan Main Synthesis report, scenario outcomes on flooding and peat conservation / carbon emissions are presented as two priority issues.

### *2. Regional Development*

Estimates of production, total revenues and likely government revenues are described for each scenario. The overall impact of the development scenario on regional development is assessed.

### *3. Poverty Alleviation*

The possible impacts on employment and poverty alleviation are qualitatively assessed and presented.

<sup>17</sup> The different existing management strategies have been discussed during a workshop "Development scenarios in the ERMP area, how to solve land claim conflicts" held at Bappeda office in Palangka Raya on June 6, 2008.

## ANNEX 18: Villages in the EMRP Area

Implementation of Inpres 2/2007 will directly affect all persons living in the EMRP area. In addition, villages near the boundary of the area should also be considered as target villages for Inpres 2/2007, which will increase the potential for success of rehabilitation and revitalization programs. These additional villages include:

- Villages along the Sebangau River bordering Block C of the EMRP area in Palangka Raya (1 village) and Pulang Pisau (4 villages);
- Villages bordering the western part of Block E in Pulang Pisau (4 villages);
- Villages to the east of the Kapuas River and the eastern boundary of the EMRP to the provincial boundary with South Kalimantan (31 villages).

The proposed target villages and population for rehabilitation and revitalization programs is shown in Table A18.1 and forms the basis for the analysis of the regional economy and socio-economic conditions.

**Table A18.1:** Proposed Target Population for Inpres 2/2007.

District/City	# Sub-districts	# Villages	Population	Households
Palangka Raya	2	9	15,749	3,986
Kapuas	10	139	300,110	74,493
Barito Selatan	3	18	34,691	8,852
Pulang Pisau	7	61	106,587	26,903
<b>Total</b>	<b>22</b>	<b>227</b>	<b>457,137</b>	<b>114,234</b>

Source: PODES 2005.

### Definition of Target Villages

The villages in and surrounding the EMRP area were initially listed using a number of sources including BPS PODES (Potensi Desa) 2005, list of villages in the EMRP area held by Bappeda Central Kalimantan, maps of the EMRP area and verification by district government. The following steps were taken:

1. List the villages in the EMRP area using the information from PODES 2005 and Bappeda Central Kalimantan.
2. Crosscheck with maps and GIS data whether villages are located in the EMRP area and surrounding areas indicated above.
3. Discuss and revise the result of step (2) above with informed persons at provincial level.
4. Verification and final revision based on visits and meetings to the district governments of Kapuas, Pulang Pisau, Palangka Raya, and Barito Selatan.

### List of Villages

Based on the above, Table A18.2 shows the proposed target villages for Inpres 2/2007. It is recommended that this is further verified and checked with regional governments.

**Table A18.2:** Proposed Target Villages for Inpres 2/2007.

No.	District	Sub-District	Village Inside EMRP Boundary	Village Surrounding EMRP Area
1	Kapuas	Kapuas Kuala	Batanjung	
2	Kapuas	Kapuas Kuala		Cemara Labat
3	Kapuas	Kapuas Kuala		Palampai
4	Kapuas	Kapuas Kuala		Sungai Teras
5	Kapuas	Kapuas Kuala		Lupak Dalam
6	Kapuas	Kapuas Kuala		Tamban Baru Selatan
7	Kapuas	Kapuas Kuala	Tamban Baru	
8	Kapuas	Kapuas Kuala		Tamban Baru Tengah
9	Kapuas	Kapuas Kuala		Bandar Raya
10	Kapuas	Kapuas Kuala		Warna Sari
11	Kapuas	Kapuas Kuala		Tumban Lupak

Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

No.	District	Sub-District	Village Inside EMRP Boundary	Village Surrounding EMRP Area
12	Kapuas	Kapuas Kuala		Taman Baru Mekar
13	Kapuas	Kapuas Kuala	Sidorejo	
14	Kapuas	Kapuas Kuala	Lupak Timur	
15	Kapuas	Kapuas Timur		Anjir Serapat Timur
16	Kapuas	Kapuas Timur		Anjir Serapat Tengah
17	Kapuas	Kapuas Timur		Anjir Serapat Barat
18	Kapuas	Kapuas Timur		Anjir Serapat Baru
19	Kapuas	Kapuas Timur		Anjir Mambulau Timur
20	Kapuas	Kapuas Timur		Anjir Mambulau Tengah
21	Kapuas	Kapuas Timur		Anjir Mambulau Barat
22	Kapuas	Selat	Terusan Raya	
23	Kapuas	Selat	Terusan Mulya	
24	Kapuas	Selat	Terusan Karya	
25	Kapuas	Selat	Terusan Makmur	
26	Kapuas	Selat		Tamban Luar
27	Kapuas	Selat		Handel Jangkit
28	Kapuas	Selat		Pulau Kupang
29	Kapuas	Selat		Sei Lunjuk
30	Kapuas	Selat	Pulau Mambulau	
31	Kapuas	Selat	Murung Keramat	
32	Kapuas	Selat	Selat Hilir	
33	Kapuas	Selat	Selat Tengah	
34	Kapuas	Selat	Selat Hulu	
35	Kapuas	Selat	Selat Dalam	
36	Kapuas	Selat	Pulau Telo	
37	Kapuas	Basarang	Pangkalan Rekan	
38	Kapuas	Basarang	Basarang	
39	Kapuas	Basarang	Maluen	
40	Kapuas	Basarang	Basungkai	
41	Kapuas	Basarang	Lunuk Ramba	
42	Kapuas	Basarang	Batuah	
43	Kapuas	Basarang	Tambun Raya	
44	Kapuas	Basarang	Pangkalan Sari	
45	Kapuas	Basarang	Bungai Jaya	
46	Kapuas	Basarang	Basarang Jaya	
47	Kapuas	Basarang	Panarung	
48	Kapuas	Basarang	Tarung Manuah	
49	Kapuas	Basarang	Batu Nindan	
50	Kapuas	Kapuas Hilir		Hampatung (K)
51	Kapuas	Kapuas Hilir		Dahirang (K)
52	Kapuas	Kapuas Hilir		Barimba (K)
53	Kapuas	Kapuas Hilir		Sei Pasah
54	Kapuas	Kapuas Hilir		Bakungin
55	Kapuas	Kapuas Hilir		Sei Asem
56	Kapuas	Pulau Petak	Teluk Palinget	
57	Kapuas	Pulau Petak		Narahan
58	Kapuas	Pulau Petak	Bunga Mawar	
59	Kapuas	Pulau Petak		Palangkai
60	Kapuas	Pulau Petak	Sei Tatas	
61	Kapuas	Pulau Petak		Handiwung
62	Kapuas	Pulau Petak		Anjir Palambang
63	Kapuas	Kapuas Murung	Palingkau Baru (K)	
64	Kapuas	Kapuas Murung	Upt Palingkau Sp1	
65	Kapuas	Kapuas Murung	Palingkau Lama (K)	
66	Kapuas	Kapuas Murung	Upt Palingkau Sp2	
67	Kapuas	Kapuas Murung	Upt Palingkau Sp3	
68	Kapuas	Kapuas Murung	Tajepan	
69	Kapuas	Kapuas Murung	Mampai	
70	Kapuas	Kapuas Murung	Muara Dadahup	



Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

No.	District	Sub-District	Village Inside EMRP Boundary	Village Surrounding EMRP Area
71	Kapuas	Kapuas Murung	Dadahup	
72	Kapuas	Kapuas Murung	Upt Dadahup A1 (Ds. Bina Jaya)	
73	Kapuas	Kapuas Murung	Upt Dadahup A2	
74	Kapuas	Kapuas Murung	Upt Dadahup A4 (Ds. Harapan Baru)	
75	Kapuas	Kapuas Murung	Upt Dadahup A5 (Ds. Bentuk Jaya)	
76	Kapuas	Kapuas Murung	Upt Dadahup A6	
77	Kapuas	Kapuas Murung	Upt Dadahup B1	
78	Kapuas	Kapuas Murung	Upt Dadahup B2 (Ds. Sumber Agung)	
79	Kapuas	Kapuas Murung	Upt Dadahup B3	
80	Kapuas	Kapuas Murung	Upt Dadahup B4	
81	Kapuas	Kapuas Murung	Upt Dadahup F2	
82	Kapuas	Kapuas Murung	Upt Dadahup F5	
83	Kapuas	Kapuas Murung	Upt Dadahup G1	
84	Kapuas	Kapuas Murung	Upt Dadahup G2	
85	Kapuas	Kapuas Murung	Upt Dadahup G3	
86	Kapuas	Kapuas Murung	Upt Dadahup G4	
87	Kapuas	Kapuas Murung	Upt Dadahup G5	
88	Kapuas	Kapuas Murung	Belawang	
89	Kapuas	Kapuas Murung	Upt Dadahup A8	
90	Kapuas	Kapuas Murung	Upt Dadahup A9	
91	Kapuas	Kapuas Murung	Palangkau Lama	
92	Kapuas	Kapuas Murung	Upt Dadahup A7	
93	Kapuas	Kapuas Murung	Palangkau Baru	
94	Kapuas	Kapuas Murung	Upt Dadahup C1	
95	Kapuas	Kapuas Murung	Upt Dadahup C2	
96	Kapuas	Kapuas Murung	Upt Dadahup C3	
97	Kapuas	Kapuas Murung	Upt Dadahup C4	
98	Kapuas	Kapuas Murung	Tambak Bajai	
99	Kapuas	Kapuas Barat	Upt Lamunti C 5	
100	Kapuas	Kapuas Barat	Sei Kayu	
101	Kapuas	Kapuas Barat	Saka Mangkahai	
102	Kapuas	Kapuas Barat	Mandomai (K)	
103	Kapuas	Kapuas Barat	Anjir Kalampan	
104	Kapuas	Kapuas Barat	Pantai	
105	Kapuas	Kapuas Barat	Saka Tamiang	
106	Kapuas	Kapuas Barat	Penda Ketapi	
107	Kapuas	Kapuas Barat	Teluk Hiri	
108	Kapuas	Kapuas Barat	Sei Dusun	
109	Kapuas	Timpah	Petak Puti	
110	Kapuas	Timpah	Aruk	
111	Kapuas	Timpah	Lawang Kajang	
112	Kapuas	Mantangai	Manusup	
113	Kapuas	Mantangai	Upt Lamunti A 1	
114	Kapuas	Mantangai	Upt Lamunti C 1	
115	Kapuas	Mantangai	Upt Lamunti C 3	
116	Kapuas	Mantangai	Sei Kapar	
117	Kapuas	Mantangai	Tarantang	
118	Kapuas	Mantangai	Lamunti	
119	Kapuas	Mantangai	Upt Lamunti A 2	
120	Kapuas	Mantangai	Upt Lamunti B 1	
121	Kapuas	Mantangai	Upt Lamunti C 2	
122	Kapuas	Mantangai	Upt Lamunti C 4	
123	Kapuas	Mantangai	Pulau Kaladan	
124	Kapuas	Mantangai	Upt Lamunti A 3	
125	Kapuas	Mantangai	Upt Lamunti A 4	
126	Kapuas	Mantangai	Upt Lamunti B 2	
127	Kapuas	Mantangai	Upt Lamunti B 3	
128	Kapuas	Mantangai	Upt Lamunti B 4	
129	Kapuas	Mantangai	Mantangai Hilir	

Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

No.	District	Sub-District	Village Inside EMRP Boundary	Village Surrounding EMRP Area
130	Kapuas	Matangai	Upt Lamunti A 5	
131	Kapuas	Matangai	Upt Lamunti B 5	
132	Kapuas	Matangai	Matangai Tengah	
133	Kapuas	Matangai	Matangai Hulu	
134	Kapuas	Matangai	Kalumpang	
135	Kapuas	Matangai	Sei Ahas	
136	Kapuas	Matangai	Katunjung	
137	Kapuas	Matangai	Lahei Mangkutup	
138	Kapuas	Matangai	Tumbang Muroi	
139	Kapuas	Matangai	Danau Rawah	
140	Barito Selatan	Jenamas	Tabatan Jaya	
141	Barito Selatan	Jenamas	Tampulang	
142	Barito Selatan	Jenamas	Rantau Bahuang	
143	Barito Selatan	Jenamas	Rantau Kujang	
144	Barito Selatan	Jenamas	Rangga Ilung	
145	Barito Selatan	Karau Kuala	Taliuk	
146	Barito Selatan	Karau Kuala	Babai	
147	Barito Selatan	Karau Kuala	Teluk Betung	
148	Barito Selatan	Karau Kuala	Selat Baru	
149	Barito Selatan	Karau Kuala	Bangkuang	
150	Barito Selatan	Karau Kuala	Teluk Sampudau	
151	Barito Selatan	Dusun Hilir	Teluk Timbau	
152	Barito Selatan	Dusun Hilir	Batilap	
153	Barito Selatan	Dusun Hilir	Batampang	
154	Barito Selatan	Dusun Hilir	Sungai Jaya	
155	Barito Selatan	Dusun Hilir	Mahajandau	
156	Barito Selatan	Dusun Hilir	Mengkatip	
157	Barito Selatan	Dusun Hilir	Kalanis	
158	Pulang Pisau	Kahayan Kuala	Cematan	
159	Pulang Pisau	Kahayan Kuala	Papuyu Iii Sei Pudak	
160	Pulang Pisau	Kahayan Kuala	Kiapak	
161	Pulang Pisau	Kahayan Kuala	Papuyu li / Barunai	
162	Pulang Pisau	Kahayan Kuala	Papuyu I / Pasanan	
163	Pulang Pisau	Kahayan Kuala	Sei Rungun	
164	Pulang Pisau	Kahayan Kuala	Bahaur Hilir	
165	Pulang Pisau	Kahayan Kuala	Bahaur Tengah	
166	Pulang Pisau	Kahayan Kuala	Bahaur Hulu	
167	Pulang Pisau	Pandih Batu	Dandang	
168	Pulang Pisau	Pandih Batu	Talio	
169	Pulang Pisau	Pandih Batu	Gadabung	
170	Pulang Pisau	Pandih Batu	Belanti Siam	
171	Pulang Pisau	Pandih Batu	Pangkoh Hilir	
172	Pulang Pisau	Pandih Batu	Talio Muara	
173	Pulang Pisau	Pandih Batu	Talio Hulu	
174	Pulang Pisau	Pandih Batu	Pangkoh Sari	
175	Pulang Pisau	Pandih Batu	Kantan Muara	
176	Pulang Pisau	Pandih Batu	Pangkoh Hulu	
177	Pulang Pisau	Pandih Batu	Sanggung	
178	Pulang Pisau	Pandih Batu	Pantik	
179	Pulang Pisau	Pandih Batu	Mulia Sari	
180	Pulang Pisau	Pandih Batu	Kantan Dalam	
181	Pulang Pisau	Maliku	Gandang	
182	Pulang Pisau	Maliku	Garantung	
183	Pulang Pisau	Maliku	Maliku Baru	
184	Pulang Pisau	Maliku	Badirih	
185	Pulang Pisau	Maliku	Tahai Jaya	

Master Plan for the Rehabilitation and Revitalisation of the EMRP Area

No.	District	Sub-District	Village Inside EMRP Boundary	Village Surrounding EMRP Area
186	Pulang Pisau	Maliku	Tahai Baru	
187	Pulang Pisau	Maliku	Kanamit	
188	Pulang Pisau	Maliku	Purwodadi *)	
189	Pulang Pisau	Maliku	Wonoagung	
190	Pulang Pisau	Maliku	Kanamit Barat	
191	Pulang Pisau	Maliku	Sei Baru Tewu	
192	Pulang Pisau	Maliku	Sidodadi	
193	Pulang Pisau	Maliku	Kanamit Jaya	
194	Pulang Pisau	Kahayan Hilir	Buntoi	
195	Pulang Pisau	Kahayan Hilir	Mintin	
196	Pulang Pisau	Kahayan Hilir	Mantaren li	
197	Pulang Pisau	Kahayan Hilir	Mantaren I	
198	Pulang Pisau	Kahayan Hilir	Pulang Pisau	
199	Pulang Pisau	Kahayan Hilir	Anjir Pulang Pisau	
200	Pulang Pisau	Kahayan Hilir	Gohong	
201	Pulang Pisau	Kahayan Hilir	Upt Anjir Pulang Pisau	
202	Pulang Pisau	Kahayan Tengah	Sigi	
203	Pulang Pisau	Kahayan Tengah		Bukit Rawi
204	Pulang Pisau	Kahayan Tengah		Tuwung
205	Pulang Pisau	Kahayan Tengah		Petuk Liti
206	Pulang Pisau	Kahayan Tengah		Bukit Liti
207	Pulang Pisau	Sebangau Kuala		Sebangau Jaya
208	Pulang Pisau	Sebangau Kuala		Sebangau Permai
209	Pulang Pisau	Sebangau Kuala		Mekar Jaya
210	Pulang Pisau	Sebangau Kuala		Sebangau Mulia
211	Pulang Pisau	Sebangau Kuala	Paduran Sebagau	
212	Pulang Pisau	Jabiren Raya	Garong	
213	Pulang Pisau	Jabiren Raya	Henda	
214	Pulang Pisau	Jabiren Raya	Simpur	
215	Pulang Pisau	Jabiren Raya	Saka Kajang	
216	Pulang Pisau	Jabiren Raya	Jabiren	
217	Pulang Pisau	Jabiren Raya	Pilang	
218	Pulang Pisau	Jabiren Raya	Tumbang Nusa	
219	Palangka Raya	Sebangau		Kereng Bangkirai
220	Palangka Raya	Sebangau	Sabaru	
221	Palangka Raya	Sebangau	Kalampangan	
222	Palangka Raya	Sebangau	Kameloh Baru	
223	Palangka Raya	Sebangau	Berng Bengkel	
224	Palangka Raya	Sebangau	Danau Tundai	
225	Palangka Raya	Sebangau	Tanjung Pinang	
226	Palangka Raya	Sebangau	Pahandut Seberang	
227	Palangka Raya	Pahandut	Tumbang Ruang	

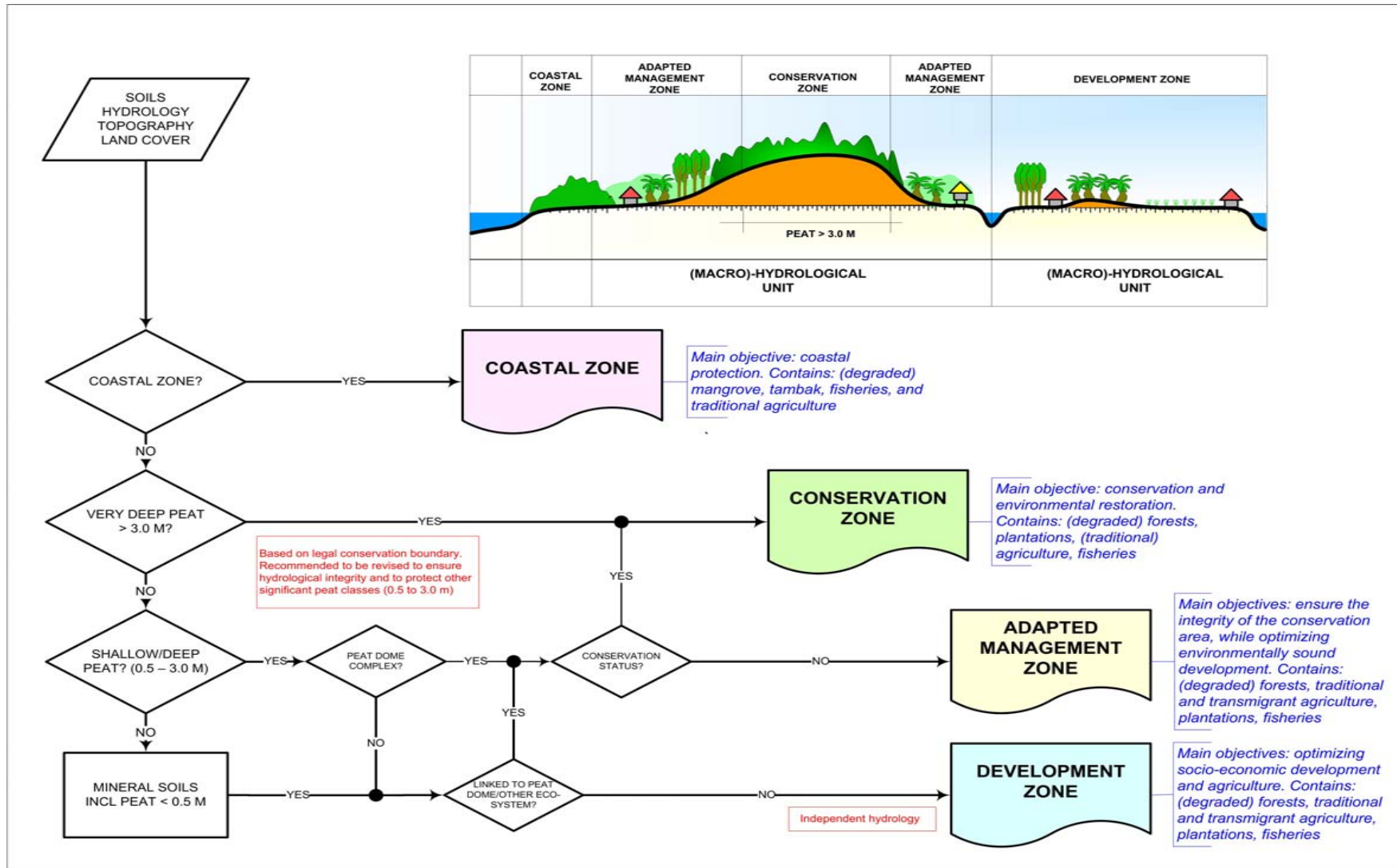
## ANNEX 19: Management Zones

A basic element of the Master Plan is the separation of conservation and development on the basis of ecosystem and hydrological characteristics, i.e. a macro-zoning in independent hydrological units, to ensure that drainage associated with lowland agriculture will not affect sensitive peat and other valuable eco-systems. These macro-zones are characterised by overriding policy objectives, i.e. conservation, coastal zone management, or agricultural development. Table A19.1 and Figure A19.1 provides further details on the definition of the Management Zones and Units.

**Table A19.1:** Rationale for the Management Zones

Step I: Management Zones		Step II: Integrated Management Units	
<b>Peat Land Protection &amp; Conservation Zone</b>	Deep peat areas, (degraded) forests and areas of bio-diversity value	Hydrological independent units (landscape unit-delta) comprising of conservation and adaptive management areas, e.g. the peat dome & buffer zone	<i>Policy objective:</i> Eco-system conservation and rehabilitation
<b>Adaptive Management / Limited Use Buffer Zone</b>	Areas between conservation zone & hydrological boundary with development zones, land use restrictions		<i>Integrated approach:</i> Conservation and restoration measures, restrictions on plantation development and operations, livelihood strategies for indigenous communities and transmigration settlers involving minimal drainage
<b>Development Zone</b>	Zone where drainage has no impact on conservation areas, no deep peat, mainly mineral soils, no land use restrictions	Hydrological independent units (landscape unit-delta) with different physical, socio-economic and cultural characteristics	<i>Policy objective:</i> Development and optimization of agricultural production systems <i>Integrated approach:</i> Optimizing land and water management at delta level, small-holder agriculture and private sector plantations, livelihood strategies for indigenous communities and transmigration settlers
<b>Coastal Zone</b>	Coastal zone, (degraded) mangrove and tambak, land use restrictions	Separate management unit based on overriding policy objectives	<i>Policy objective:</i> restoration of protection functions, mitigation of climate change impact <i>Integrated approach:</i> Restoration and protection of mangrove forests, restrictions on aquaculture ( <i>tambak</i> ) development and operations, livelihood strategies for local communities

Figure A19.1: Decision Tree and Schematic Diagram of the Macro-zoning in the EMRP Area.



## ANNEX 20: Proposed Management Units of the EMRP Area

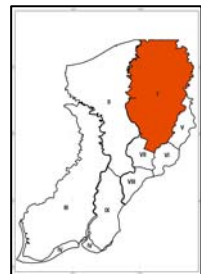
Within the macro-zones, separate integrated management units are distinguished, based on bio-physical and socio-cultural characteristics and unique relations between land utilisation types. The management units are the smallest unit for integrated lowland management. Nine management units are recognized in the EMRP area.

### A. Protection and Limited Development Buffer Zones

In the conservation and adaptive management zones (management unit I-III), the management priority is to conserve and rehabilitate remaining peat swamp forest, and to conserve carbon resources and other functions of the peatland landscape. The sequence of proposed intervention steps is the same for each management unit in conservation zones (see section 4.3), however the actual priority in each unit may differ depending on local conditions.

#### Management Unit I - Deep peat Block A North and Block E East

<i>Area:</i>	361,000ha
<i>Master Plan Zones:</i>	Protection and limited development zones
<i>Districts:</i>	Barito Selatan and Kapuas
<i>Sub-districts:</i>	Karau Kuala, Dusun Hilir, Mantangai, Timpah



This area is defined by the hydrological landscape associated with the deep peat areas between the Kapuas, Mengkatip and Barito Rivers in the north-eastern part of the EMRP area. Central to the unit is the deep peat area stretching from the uplands in the northern part of Block E southwards into the lowlands in Block A, with shallow to medium deep peat and mineral soils along the rivers. The peat overlies thick quartz sand formations, referred to as Giant Podsol. The rivers are mainly non-tidal and flooding occurs in the floodplains, especially along the Mengkatip and Barito. The Mantangai River finds its origin in the peat areas of Block E. The survival of the peat dome depends very much on conserving the integrity of the entire unit. Adaptive management and 'wise use' of peat lands is required for the regeneration of the area.

**Fire Management** - Fire prevention and management capacity is needed across the unit, especially to the south of the SPI canal where the density of fires has been highest in long dry seasons. This will require a comprehensive approach involving local communities, regional government and the Department of Forestry.

**Peatland Rehabilitation** - In Block A, some dense forest parts remain, but overall severe deforestation and fire damage has occurred here, linked to the PLG drainage infrastructure. The peat area is crossed by the main PLG SPI canal, with a dense network of lower order canals in Block A. Wetlands International is engaged in restoring the hydrology in part of this area. At Mantangai a bridge is under construction that would connect the improved road system of Lamunti with the upstream villages, passing along the deep peat area. Construction of this infrastructure needs to be aligned with the overall goal of peatland rehabilitation.

The SPI canal between Kapuas and Mantangai Rivers and Mantangai and Barito Rivers should be fully blocked to prevent further subsidence and limit logging access. Secondary canals should be blocked, but a detailed design study is required first to ensure long-term effectiveness. The effectiveness and condition of existing canal blockings should be evaluated thoroughly. Effective canal blockings should be restored and strengthened to make sure they will stay effective in the long term.

Reforestation should be undertaken through encouragement of natural succession and tree planting. On community land this should be done through a community-led reforestation program, but in more remote parts of the area either large-scale forest rehabilitation or natural succession will be required. The potential for large-scale forest rehabilitation needs to be

examined with a focus on management arrangements. The degraded area to the south of the SPI has much potential for the development of carbon emission reduction projects, which should also include community-based principles in community areas.

AusAID through the Kalimantan Forests and Climate Partnership proposes to work in part of this management unit and it is proposed that AusAID takes a whole of unit approach to their intervention in this area.

**Agricultural Development, Community Empowerment and Livelihoods Development -**

There are traditional Dayak/ mixed settlements located along the rivers. Agriculture (hill rice, rubber, vegetables and fruits), fisheries and harvesting non-timber forest products are their main sources of livelihood. The public consultations in Karau Kuala, Dusun Hilir, Mantangai and Timpah identified a range of interventions that are needed in this area.

Specific recommendations on access and domestic water supply include:

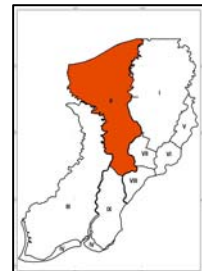
- Reconsider the need for a road north of Mantangai and how to avoid negative impacts of such a road on conservation of the peat lands.
- To compensate for the lack of road access, improve public water transport facilities to existing villages along the Kapuas river.
- Support community development of water supply, sanitation and other small-scale infrastructure works depending on livelihood strategies.
- Rehabilitation or improvement of the hydraulic infrastructure (handils) in the limited development buffer zone should be combined with improvement of access to agricultural fields by shaping and compacting embankments to become trafficable for (motor)bikes and carts.

**Key Information Gaps**

- Precise extent and depth of peat to the north of the SPI canal
- Large-scale restoration techniques
- Hydrological separation of cultivation and peat areas
- Detailed topography and land suitability at the village level
- Alternative mechanisms for dispute settlement between GoI and local communities
- Market information for locally produced commodities and new development opportunities
- Prospects on microfinance for small holder forest plantations and SMEs

**Management Unit II - Deep peat Block B North and Block E West**

<i>Area:</i>	355,500ha
<i>Master Plan Zones:</i>	Protection and limited development zones
<i>Districts:</i>	Pulang Pisau and Kapuas
<i>Sub-districts:</i>	Kahayan Tengah, Sebangau, Pandahut, Mantangai, Jabiren Raya, Kahayan Hilir, Kapuas Barat



This area is defined by the hydrological landscape unit associated with the deep peat area between the Kahayan and Kapuas Rivers in the north-western part of the EMRP. Administratively the area falls under the jurisdiction of Palangka Raya, Pulang Pisau and Kapuas districts.

**Fire Management** - Fire prevention and management capacity is needed especially along the SPI canal and the ther PLG canals to the south of SPI and in the north along the Mangkutip River (tributary of the Kapuas River) where the density of fires has been highest in long dry seasons. This will require a comprehensive approach involving local communities, regional government and the Department of Forestry.

**Peatland Rehabilitation** - Central to the unit is the deep peat dome stretching from the northern part of Block E into the northern part of Block B, with shallow to medium peat and mineral soils near the river. The survival of the deep peat dome depends very much on the integrated and adaptive management of the area as a single unit. Forests have been logged,

but dense forest is still to be found in Block E and Block B. Deforestation and associated fires occurring especially along the PLG canals. The area is crossed by the main PLG SPI canal, with several lower order canals in the peat areas of Block B.

The most urgent intervention in this Unit, which is largely covered by forest but being heavily logged at present, are to (i) stop illegal logging and to close logging canals, and (ii) to prevent development of oil palm plantations in Block B. If these concessions are implemented fully, very little forest or peat can be conserved in Block B. In the Block B part of the unit, the priority is to prevent further fires, which have reduced forest cover greatly in recent years.

The SPI canal between Kahayan and Kapuas Rivers should be fully blocked to prevent further subsidence and limit logging access. Primary and secondary canals in Block B should be blocked but a detailed design study is required first to ensure long-term effectiveness.

**Agricultural Development, Community Empowerment and Livelihoods Development -**

Traditional Dayak / mixed settlements are located along the rivers with livelihoods based on mixed agriculture, fisheries and some forestry. In the South of Block B, the area borders on the Anjir Kalampan, taken as the hydrological boundary of the peat dome. Here, as well as along the Kahayan River, smaller transmigration units are located in the adaptive management zone. Under the Inpres 2 2007, new transmigration is planned along the Kahayan River which is not recommended for development. Plantation licenses overlap with the designated conservation and adaptive management zones, and at least one plantation is active in the deep peat zone (see above).

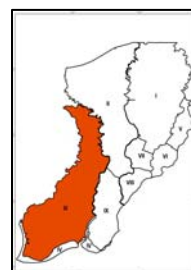
Due to the deep peat area with only narrow strips of other soils along the rivers, the impact of drainage on the deep peat, and the rights of indigenous Dayak communities, the carrying capacity of the zone is minimal and hence not suitable for intensive development and transmigration. Declining availability of non-timber forest products (including wildlife and fish resources) and social and land issues are perceived major problems among Dayak communities. Soil fertility problems and low levels of agricultural production, processing and commercialization, poor market access, as well as supportive infrastructure and services are important livelihood constraints for local people.

Specific recommendations on access and domestic water supply include:

- Improve car access to villages north of the Anjir Kelampan.
- Gradually plan improved road access to villages along the Kapuas River in the south of the Management Unit.
- To compensate for the lack of road access to remote villages, improve public water transport facilities.
- Gradually expand the PDAM operated water supply systems in the south of the unit to include adjacent villages where water supply is problematic.
- Support community development of water supply, sanitation and other small-scale infrastructure works.
- Rehabilitation or improvement of the hydraulic infrastructure (handils) in the limited development buffer zone should be combined with improvement of on-farm access by shaping and compacting embankments to become trafficable for (motor)bikes and carts.

**Management Unit III - Peat and Surrounding Area of Block C**

Area:	409,000ha
Master Plan Zones:	Protection and limited development zones
Districts:	Pulang Pisau and Palangka Raya
Sub-districts:	Sebangau, Jabiren Raya, Kahayan Hilir, Maluku, Pandih Batu, Kahayan Kuala, Sebangau Kuala



This area consists of the hydrological landscape unit associated with the deep peat area south of Palangka Raya between the Sebangau and Kahayan Rivers in the western part of the EMRP.



**Fire Management** - This is one of the most fire-affected areas in the EMRP. Fires are found across the EMRP area, especially north of the Garong canal in Jabiren Raya outside of the forest area and along the canals in the rest of the area. The south of unit has had many fires along the canals, in areas with location permits for plantations and along the road running from the Kahayan to the west. A series effort of fire prevention and management targeting these areas is required.

**Peatland Rehabilitation** - Central to the unit is the deep peat dome stretching from near Palangka Raya in the North to near the coast, with shallow to medium peat and mineral soils near the rivers and coastline. The survival of the deep peat dome depends very much on the integrated and adaptive management of the area as a single unit. The Block C area has an important function as buffer between the eastern development areas and the Sebangau National Park. Further development of Block C would unavoidably have a negative impact on conditions in Sebangau.

Most of the area is severely de-forested and extremely fire-prone and the area is the most developed of the three peat zones. Small patches of dense forest remain along the western side of the block and the area is crossed by the main PLG canal network. CIMTROP is active in the northern part with canal blocking and re-greening activities. Around the largest forest block in the north and the smaller remnants of forest further to the south, prevention of fires and forest conservation should be the priority. A rapid assessment of remaining conservation values in those remnants may be needed first to allow prioritization. Management of this conservation / protection area should focus on fire prevention and rehabilitation in degraded areas rather than conservation, hence the status of KPHL.

Out of the three peatland Management Units, Block C is least affected by drainage as only primary canals were implemented here. Canal blockings may be helpful to prevent further degradation in the long term especially in some more densely drained and inhabited areas, especially around the CIMTROP area in the north and around the Pangkoh scheme in the southeastern part. In much of the area, canal blockings may have limited impact on short-term groundwater depths because of the large distances between canals, peat characteristics as well as the already low gradients of the peat surface here. The very low population density and lack of dam protection options here should also be considered as a possible limitation on the long-term effectiveness of wooden dams.

The unit is not suitable for transmigration and the proposed transmigration areas along the Sebangau River should not be developed. Permits for oil palm plantations cover a large part of the south of the unit (Figure 2.17 and 2.18). Those with most of their area on the deep peat should be cancelled, while those with part of their area on the southern part of the peat area should be reviewed and revised in light of Inpres 2/2007 and information on the extent of the peat in this area.

#### **Agricultural Development, Community Empowerment and Livelihoods Development**

The area for agricultural development in the unit can be best divided into four sub-areas, each of which presents different conditions and challenges:

Palangka Raya-north of the Maluku/Pangkoh Area – Traditional Dayak / mixed settlements are located along the Kahayan River in the northern part of block C with livelihoods based on mixed agriculture (hill rice, rubber, vegetables and fruits), fisheries and some forestry (gelam etc.) and harvesting non-timber forest products. Local rubber is planted and some villages are extending the drainage infrastructure into the peat areas. Due to the deep peat area with only narrow strips of other soils along the rivers, and the presence and rights of indigenous Dayak settlements, the unit is not suitable for large-scale development and transmigration. Agricultural, community empowerment and livelihoods support specific to the needs of these communities is needed.

Transmigration Villages in the Maluku/Pangkoh Area – In the tidal downstream area along the Kahayan river, older transmigration settlements (Maliku, Pangkoh) from the 1980s are located cutting into the deep peat areas. A review and redesign of the land and water management in these schemes is required.

South and West of the Maluku/Pangkoh Area –Downstream of these transmigration schemes, traditional Banjar / mixed settlements are found along the river with large handil canal

systems. Rice and coconut farming is common here and further inland the area consist of very low lying swamp, patches of forest, shrub and grassland. Salinity intrusion is a constraint in the near-coastal zone for double (wetland rice) cropping. The area can potentially be developed using approaches adapted to the area and crops that have limited drainage requirements. Inpres 2/2007 proposes timber plantation, which could be feasible. Further bio-physical, social and economic assessments are required in this area to determine the most suitable land use.

Transmigration Villages to the west of the Sebangau River - Settlements along the west bank of Sebangau have serious land and water management problems including high acidity due to the water from the peat of Sebangau NP. When crops fail, these communities become dependent on off-farm labour. A comprehensive review of conditions in these settlements is needed.

Improvement of conditions in the existing agricultural areas, including those of the older transmigration settlements need to take into account that improved drainage, being the key to higher agricultural productivity, will have a serious impact on the hydrology of the peat dome.

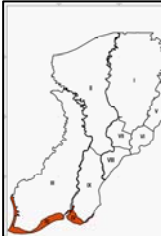
#### Key Information Gaps

- As per management unit I
- Bio-physical, social, economic and land suitability assessments in the south of the unit
- Review of land and water management designs needed in transmigration areas of Maluku, Pandih Batu and comprehensive review of conditions in settlements on west side of Sebangau

### B. Coastal Zone

The coastal zone represent a single management unit to the south of Blocks C and D (management units III and IX).

#### Management Unit IV – Coastal Areas of Blocks C and D

<i>Area:</i>	40,000ha	
<i>Master Plan Zones:</i>	Coastal management zone	
<i>Districts:</i>	Pulang Pisau and Kapuas	
<i>Sub-districts:</i>	Sebangau Kuala, Kahayan Kuala, Kapuas Kuala	

This unit forms the coastal area between the Sebangau, Kahayan Rivers and Kapuas rivers in the southern part of the EMRP. Administratively the area falls under the jurisdiction of the Pulang Pisau and Kapuas districts. The coastal zone is characterized by mangrove and sand ridges, and deep flooded areas beyond the zone due to impeded drainage. Between the Sebangau and Kahayan rivers, the mangrove is degraded and near the Kahayan limited development of tambak has been started. Between the Kahayan and the Kapuas the mangrove is still in good condition. Unfortunately, the Inpres allocates this area for tambaks, which needs to be revised.

**Conservation and Rehabilitation** - Management of the coastal zone should take into account (future) climate change, whereby a sea level rise and intense storms will increase erosion of the coastline. Measures to rehabilitate the degraded coastline and improve the natural protection function of the mangrove should be taken through mangrove conservation and rehabilitation programs.

**Agricultural Development, Community Empowerment and Livelihoods Development** - Soft soils and tidal flooding make road construction especially difficult here. With a very low population density, water transport might remain the best option, with due attention paid to provision of jetties and boat services to the few scattered settlements. Supply of drinking water is notoriously difficult in this zone because of sea water intrusion. Even a groundwater

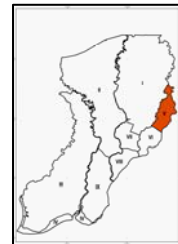
well down to 200 m constructed recently in Bahaur Hilir yielded brackish water in the dry season. This should, however, not necessarily discredit all groundwater resources in the area, as further away from the river, and below sand ridges existing in the area, the situation might be different. Possible fisheries interventions in the area include limited development of (semi-intensive) tambak and mud crab fattening.

### C. Development Zone

The development zone is split into five management units that reflect differences in bio-physical and socio-economic conditions.

#### Management Unit V - Block A: Jenamas

Area:	46,000ha
Master Plan Zones:	Development zone
Districts:	Barito Selatan
Sub-districts:	Jenamas



This zone forms the northern part of the Dadahup-Jenamas ex-PLG transmigration scheme, located between the Mengkatip and Barito rivers in the North-East of the EMRP. Traditional Dayak settlement are located along the rivers. Administratively the area falls under the jurisdiction of Barito Selatan district.

Two UPT were settled during the PLG project (Dadahup D1 and D3 with 160 families remaining in 2006 of the original 691 families). Severe prolonged flooding occurs from the Mengkatip and Barito Rivers, which are semi- to non-tidal here and in the villages along these rivers. Drainability of the area is very limited. A large swamp area along the Barito River, now part of the hydraulic infrastructure, is a traditional swap buffalo (*kerbau rawa*) area. In the south, the scheme borders on the Dadahup ex-PLG transmigration scheme, which is much more populated and shows better prospects, conditional to the provision of flood mitigation measures. The opening up of large areas for transmigration caused tensions in the traditional Dayak communities along the rivers and outstanding land rights issues still need to be addressed in this area.

Flooding makes the area is unsuitable for large-scale development and transmigration.

#### Agricultural Development, Community Empowerment and Livelihoods Development

Development potentials for the area are mainly limited to community forestry, beje fisheries, and kerbau rawa. Barito Selatan district government is currently supporting the expansion of the kerbau rawa activities in the area. Canal embankments are used for sheltering the kerbau rawa. Similarly, further study is required as to what extent the existing and defunct hydraulic infrastructure can play a part in the development of traditional fisheries. This should be done in close coordination with the development of the Dadahup area.

*Agriculture* - This low lying area near the Barito river was allocated as a transmigration area, with the target to produce rice. Conditions are difficult and so far flooding, for upto 6 months, has prohibited successful agriculture. To create favourable conditions for agriculture this area requires large scale investments in water works, e.g. dams and dykes. Soil conditions are not clear but it is likely that the subsoil is acid.

The area is home to the swamp buffalo that is reared by the local people who sell their meat. The low, channeled area, is also exploited for fishery. The area is hardly populated, the people living in the area, however indicated that would like to see flood control measures and improvements in agriculture. Small scale improvements for agriculture will be difficult as flood control requires large infrastructures.

*Improved livelihoods* - Steps towards improving the local livelihoods can concentrate on the improvement of the fishery system and tree crop systems on the higher areas (levees). In its

current state the area is not suited for transmigration. Market research and value chain analysis are required to support agro-forestry and fisheries development. Transforming the area and improving conditions for transmigration and agriculture is costly with a low probability of success.

*Fisheries* - Beje fisheries can be intensified and extensified in Block A, management unit V and the northern part of management unit VI. In unit V production of rubber and other agricultural crops is difficult due to the hydrology of the system. Beje fisheries is a suitable alternative. Not only are the knowledge and skills already available, the local communities are interested to revive the once successful livelihood.

*Rural Infrastructure* - Prolonged, deep flooding makes this area unsuitable for agricultural settlements. Other land use options (fisheries, kerbau rawa, community forestry) have to be considered, together with their infrastructural requirements. Road construction is unlikely to be feasible here.

## Management Unit VI - Dadahup

This area is located between the Mengkatip and Barito Rivers and is one of the

<i>Area:</i>	39,500ha
<i>Master Plan Zones:</i>	Development zone
<i>Districts:</i>	Kapuas
<i>Sub-districts:</i>	Kapuas Murung



ex-PLG  
transmigration

schemes. Originally populated by 6,051 families, roughly half of the original transmigrants left due to initial hardships and better opportunities elsewhere. In 2006, 3,401 transmigrant families were living in the area. Administratively the area falls under the jurisdiction of the Kapuas district.

The hydraulic infrastructure of the schemes was never completed as the PLG project was halted. Since then, the government has intervened with remedial measures and the provision of services to the remaining population. It was reported from other parts of the EMRP, a.o. the Maluku area, that transmigrants who failed in the deep peat areas of Block C, were re-settled in the Dadahup-Lamunti schemes. Similar information was obtained regarding settlers of Banjarese origin.

### Agricultural Development, Community Empowerment and Livelihoods Development

*Land and Water Management* - The area has a certain agricultural potential, but it will require completion of the hydraulic designs, based on accurate hydrological and topographical assessments and modeling, including that of the (potential) drainability. The area is located in the semi-tidal zone, with limited potential for tidal irrigation and drainage.

The Dadahup block has serious flooding problems, which are currently being addressed by Public Works. These floods are predominantly caused by the unfavourable hydrology of the Barito and Mengkatip rivers in combination with the area's relatively low topography. District government reports that a lack of control structures at Kuripan village is a significant part of the problem. The wetter conditions make this area probably more suitable for wetland rice. On-farm water management is hardly developed if at all, but should be preceded by completion of the main infrastructure. The key to the management of soil acidity is controlled intensive drainage, for which water control structures are essential.

*Agriculture* - Agriculture is hampered by the lack of settlers, as large areas remain underdeveloped (lahan tidur), and so is potentially appropriate for the planned transmigration "refill" program. Unused land is a source for pests and acidity, while the gelam-purun stands are also vulnerable to fires. Land issues include cases where transmigrants returning to Java borrowed money from the local Dayak communities in exchange for their land certificate. Not only that, part of the transmigration population consisted of local traditional Dayak settlers,

which largely returned to their villages, but are still formal owners of the land. Before refill with new transmigrants, these land certificate and ownership issues need to be addressed. If not handled appropriately, this can lead to further disputes.

The main crop in Dadahup is rice. Rice yield in some experimental plots can be relatively high (up to 5 ton ha<sup>-1</sup>) but on farm yields are low ranging from 1 - 2 ton per ha. Input (fertilizer, lime) requirements are however high and beyond the financial reach of the farmers in the area. Of the recommended 1500 kg lime per ha, most farmers apply only a fraction.

Flooding occurs regularly and living conditions are poor. Soils are acid but have potential for agriculture. Key issues that need to be addressed are related to soil and water management. For agricultural production to take off inputs, notably, lime and fertilizers are needed. Extension towards farmers is limited and no on-farm research is done. Experiments at the field station do not link to the needs of the local community. The area has agricultural potential but crucial elements are soil and water management. Input requirements will be high so it will be difficult to compete on the rice market. Farmers increasingly cultivate vegetables for income generation. The Department of Agriculture and Horticultural Department of Kapuas district is active in the field of vegetable growing in the area.

*Improved livelihoods* - Priority should be given to make the transmigration works. This implies settlement of land tenure problems, strengthening village government, cooperative development (for instance for collective marketing), and improved basic infrastructure and services (including microcredit and finance). Vegetable farming and agroforestry (e.g. *Lepironia articulate* (Retz.) - purun danau) for handicrafts, and home-based processing of soy beans and cassava are existing options for alternative sources of income. Market research and value chain analysis are required to support agro-forestry (handicraft development) and vegetable farming.

*Rural Infrastructure* - Improving the accessibility is important and is relatively easy in the area as roads have already been constructed on many canal embankments but most of the roads are not passable during the wet season. Due attention should also be paid to on-farm access over the embankments of tertiary canals with proper crossing structures over quaternary or other drains. Improvement of drinking water supply is needed, and the best option might be extension of the PDAM operations already ongoing in part of the area. Government support to groups of families constructing and operating their own water supply systems (groundwater wells) should also be considered.

#### Key Information Gaps

- Topography and flooding
- Soils and land suitability
- Hydraulic design
- Mechanisms for land dispute settlement
- Market information for locally produced commodities and new development opportunities (e.g. tree products)
- Prospects of microfinance for tree farming and enterprise development

### Management Unit VII - Lamunti

Area:	41,500ha
Master Plan Zones:	Development zone
Districts:	Kapuas
Sub-districts:	Kapuas Murung, Mantangai, Kapuas Barat



This area is the other main ex-PLG scheme that was actually populated and is located between the Kapuas, Mantengai and Mengkatip Rivers. Originally populated by 7,852 families, roughly half of the original transmigrants left due to initial hardships and better opportunities

elsewhere. In 2006, 4,274 transmigrant families were living in the area. Administratively the area falls under the jurisdiction of the Kapuas district.

The history of this unit is similar to that of the Dadahup. Conditions differ with a reported higher topography and a somewhat better river hydrology, i.e. more tidal influence. Flooding may occur along the Mengkatip River but not to the same extent as in Dadahup. Drainability will be better, though tidal irrigation is not likely because of the higher topography. The area is considered more suitable for dryland crops including rice (*padi gunung*) and tree crops.

Oil palm licenses cover a large part of the Lamunti scheme. It is reported that PT Globalindo is active with a seed-farm in the Lamunti area and the border with the peat dome.

*Agriculture* - The history of the area is similar to Dadahup (unit VI) but as this area is slightly higher lack of water during the dry season becomes a critical issue. Rice is grown for home consumption but large areas are abandoned. The agricultural research station moved its focus to other crops i.e. vegetables, maize and soya. Additional irrigation, pumped from deep aquifers, is needed. The markets in Kuala Kapuas and Banjarmasin provide an opportunity for vegetable production.

Part of the area is being converted to oil palm, whether these will survive the dry season, without irrigation, is still unclear. The plantation could have a positive effect on the micro climate, and reduce fire risks.

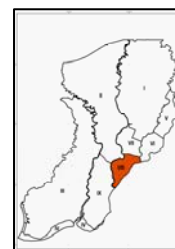
*Rural Infrastructure* - Improving the accessibility is important and is relatively easy in the area as roads have already been constructed on many canal embankments but most of the roads are not passable during the wet season. Due attention should also be paid to on-farm access over the embankments of tertiary canals with proper crossing structures over quaternary or other drains. Improvement of drinking water supply is needed, and the best option might be extension of the PDAM operations already ongoing in part of the area. Government support to groups of families constructing and operating their own water supply systems (groundwater wells) should also be considered.

#### Key Information Gaps

- Topography and flooding
- Soils and land suitability
- Hydraulic design
- Mechanisms for land dispute settlement
- Market information for locally produced commodities and new development opportunities (e.g. tree products)
- Prospects of microfinance for tree farming and enterprise development

### Mangement Unit VIII - Handil Rakyat area

<i>Area:</i>	41,000ha
<i>Master Plan Zones:</i>	Development zone
<i>Districts:</i>	Kapuas
<i>Sub-districts:</i>	Kapuas Murung, Kapuas Barat, Pulau Petak, Kapuas Hilir



The Handil Rakyat area is located at the confluence of the Kapuas and Barito Rivers. Administratively the area falls under the jurisdiction of the Kapuas District. The area is located in the tidal zone. Salinity intrusion may occur in parts of the area. According to a preliminary assessment, the area is not subject to flooding, but there is mostly no tidal irrigation in the dry and wet season.

The area is mainly developed by Banjarese with intensive handil systems along the river. The center of the area is largely undeveloped and there is permit (izin lokasi) for 13,179 ha of rice production here (PT Padi Kuning Mas). In the north-eastern part, bordering on the Lamunti

scheme, the Palingkau PLG transmigration scheme is located. Originally with 1,000 families, 652 families remained in 2006.

Although overall more developed than the other areas, improvement needs are still large and should be addressed on a village by village basis. Special attention should be given to improving access to agricultural fields in the traditional settlements, while drinking water needs are highest in the inland villages, away from the main rivers, and along river reaches with saline water intrusion.

### Management Unit IX - Block D

<i>Area:</i>	125,500ha
<i>Master Plan Zones:</i>	Development zone
<i>Districts:</i>	Pulang Pisau, Kapuas
<i>Sub-districts:</i>	Kahayan Hilir, Maluku, Pandih Batu, Kahayan Kuala, Kapauas Kuala, Selat, Basarang, Kapuas Barat



The area constitutes the entire Block D, located between the Kahayan and Kapuas rivers. Administratively the area falls under the jurisdiction of the Kapuas and Pulang Pisau Districts. The block is located in the Development Management macro-Zone.

The area consists of handil areas along the rivers, and older transmigration sites in the swamp interior and along the anjir canals. Gelam-purun associations in the swamp center are as yet designated as protection area. The block is located in the full tidal zone. It is a fairly low-lying area, especially nearer to the coast. Tidal irrigation is utilized in the traditional Banjar areas and the transmigration areas near Terusan Raya. The main crop here is obviously wetland rice. Salinity intrusion is a serious constraint for double cropping, but also for human consumption and bathing. Other areas are developed for mixed agriculture, including rubber. Oil palm plantations are operational in the Terusan Raya area, with licenses covering other parts. (Tidal) flooding may occur but was not reported. Drainability will depend on the tidal range and the topographical relation. In the areas with tidal irrigation, soil acidity is not a severe problem usually due to leaching opportunities. Where drainage is limited and there is no access to tidal irrigation, acidity may however pose serious problems.

*Land & Water Management* - The design of the transmigration schemes follows the forked kolam system. A dead-ended system that is known to be inadequate for the leaching and flushing needed for the management of acid sulphate soils. Re-designs are required for which proper hydrological and topographical data are required. It is expected that the PLG macro canals in the swamp interior can be used to improve the land and water management.

Even though the soils are mainly mineral, subsidence is likely to occur due to the continuing soil ripening processes. In view of the lower topography, in combination with a predicted sea level rise, future drainability and flood risk will be important criteria for the assessment of the agricultural suitability.

*Agriculture* - The tidal lowlands were taken into production in the 1970s. The rice is dominant near the coast, in the northern part of this unit tree crops dominate. In the northern part rice fields are converted to rubber plots as revenues from rubber are higher and labour requirements are low.

Although the area is suitable for high yielding varieties the majority of farmers grow local rice varieties. Also here high inputs and high labour requirements needed for the high yielding variety and the low returns are the main criteria to stick to the local varieties. Access to markets, mainly Banjarmasin is good.

*Rural Infrastructure* - Infrastructure in the northern part, with older settlements, is clearly better developed than in the southern part. Road access to the southern part is made difficult by frequent tidal flooding and the presence of the Terusan River and numerous canals. In the short term, access to the south could be improved by east-west roads from the settlements to

the Kahayan in the west or the Kapuas in the east, and, after a ferry crossing over the river, connecting to existing roads on the opposite river bank. The existing east-west and north-south PLG canals could in principle serve to improve water management as well as water transport in the area.

Drinking water needs are also more urgent in the south where surface water becomes brackish during part of the year. The potential of using groundwater should be investigated and becomes even more urgent if present plans for new transmigration settlements in the southern part are implemented.

**Key Information Gaps**

- Topography and flooding
- Soils and land suitability
- Hydraulic design
- Market information for locally produced commodities and new development opportunities
- Prospects for microfinance for tree farming and enterprise development
- Drinking water and sanitation



## **ANNEX 21: Fire Prevention and Management in the ERMP Area**

The management of land and forest fires involves the following components: fire information system; fire prevention; fire preparedness; fire suppression and fire impact analysis and follow up. An effective fire management system will require effective fire management institutions and community-based support and capacity to prevent and suppress fires.

The following components for an effective fire management system are required:

- **Fire Information System** - The fire information system provides early warning of fire danger, monitoring of fires in progress, and assessment of impacts of fires. Fire early warning is based on fire threat mapping and fire danger rating. The fire threat map shows where prevention measures are most needed and where fire suppression capacity has to be concentrated. Fire danger rating provides forecasts, preferably daily, of fire hazard, which is important information for both land users as well as for the mobilization of fire suppression teams. Monitoring of fires mostly involves hotspot detection by satellite systems, supported by field monitoring through e.g. patrolling, and is essential for the fire suppression response.
- **Fire Prevention** - Fire prevention in the broad sense ranges from spatial planning and zoning aimed at reducing fire risks, clarification of legal land titles and boundaries, information and education campaigns, introduction and support of viable zero-burning farming and other land use systems, protecting areas or assets at risk with fire breaks, monitoring and patrolling, to awareness campaigning on the enforcement of regulations, decrees and sanctions on the use of fire.
- **Fire Preparedness** - Fire preparedness is about both the capacity of the fire suppression response as well as the readiness to mobilize that capacity. The fire suppression capacity includes clear and tested organization, system and procedures, as well as trained and supplied fire fighting personnel. Furthermore, maintained vehicles, equipment and tools, including for communication, safety and first-aid. Finally, capacity also includes an available budget.
- **Fire Suppression** - 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 village, the government sector fire brigades, the plantation company fire fighters and the allocated army personnel.
- **Fire Impact Analysis** - Fire evaluation and follow up includes the assessment of the fire damage and restoration/rehabilitation needs, as well as investigation and legal action concerning perpetrators of illegal use of fires. The assessment of the impacts of fires is again based on satellite information on burned areas, combined with field observations. The assessment focuses on what was lost and needs to be restored, as well as law enforcement action on illegally started fires.

### ***Fire Management Institutions***

Fire management cannot be handled by a single agency, and therefore has to be a joint effort by several government agencies, institutions and groups (including private sector companies and village community groups). Fire management is still primarily focused on fire suppression and/or the crisis management aspects, much less on a long-term integrated approach to fire prevention for example. Presently, fire anticipation and suppression is handled at the various levels of government through the Disaster Management Board (Badan Koordinasi Nasional Penanggulangan Bencana dan Penanganan Pengungs, or Bakornas PBP). Bakornas is a non-structural co-ordination board and functions only when multisectoral action is needed during a disaster. At provincial level Satkorlak PBP is established (Satuan Koordinasi

Pelaksana PBP or Implementation Coordination Unit PBP, at District level Satlak PBP (Satuan Pelaksana PBP or Implementation Unit PBP and Satuan Tugas PBP (Satgas - Task Force PBP) at operational level.

The main agents involved in this structure are the Forestry and Environment Departments. The former is responsible for Prevention and Suppression, while the latter is responsible for Monitoring and Evaluation.

The Department of Forestry established an internal division of tasks to coordinate its fire suppression responsibility, *Pusdalkarhutnas* at central level and *Pusdalkarhutla* and *Satlakdalkarhutla* at Provincial and District levels; these are active during the dry season only, when fires occur. An actual fire suppression capacity, including simple standard operating procedures (SOP) in the fields of prevention, suppression, equipment maintenance and law enforcement, was developed by the creation of Forest Fire Brigades (*Manggala Agni*) under the responsibility of the Ministry's Directorate for Fire Control and Prevention, managed on regional level by its Natural Resource Conservation Agencies (BKSDA).

The Department of Environment and its provincial and district agencies have developed mechanisms to handle their fire monitoring and evaluation tasks. However, the Forestry Department has developed similar capacity for fire monitoring, and an overlap in efforts and outputs has been evident, creating inefficiencies, confusion with regard to responsibilities, and competition between these departments.

The Bakornas approach has been fairly ineffective and inefficient due to its approach of only reacting to fires when they start to occur, and because of many unresolved issues of mandates, organization, bureaucracy, budgeting, procedures and capacity.

In 2007 a new Law on Disaster Management has been issued (No. 24/2007). The Presidential Regulation No. 8/2008 based on that law replaces the Bakornas PBP with Badan Nasional Penanggulangan Bencana. This new National Disaster Management Board at national level is of Ministerial level and will have representative offices in each Province and District (Badan Penanggulangan Bencana Daerah). These will replace the Satkorlak and Satlak structures.

The significant difference is that the 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. Its new mandate and role also moves it away from only reacting to disasters, instead also having the task to monitor and address causes of potential disasters, such as fire threat. It is hoped this new BPBD will improve the fire information and fire prevention components of fire management, as well as intensify fire suppression capacity.

### ***Community-based Fire Management***

Fire management in Indonesia will only be really effective if the village government and communities are involved and supported. It is at this level, the level of the land user, that fires are started and subdued. For fire prevention purpose, 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, land use systems and environmental management. For the purpose of fire suppression, the villages, which are often closest to the fires, are of crucial importance for involving in a coordinated approach of fire management.

***Strengthening the Forest and Land Fire Management in the EMRP Area***

The development and status of forest and land fire management in Central Kalimantan has followed and reflects the overall development of forest and land fire management in Indonesia, experiencing the same problems with the complexity and scale of the fire issue and the lack of an effective organization of fire management. The latter is similarly due to weaknesses in regulations, insufficient capacity across the involved agencies, lack of clear guidelines and standard operating procedures, sectoral politicking, over-emphasis on reactive fire suppression, and the lack of integrating the rural communities into the solution.

The Bakornas approach has only been operational at provincial level (Satkorlak), and has been fairly ineffective due to reasons already mentioned earlier. Fire suppression capacity at the provincial and district forest agencies (Pusdalkarhutla / Satlakdalkarhutla) is virtually non-existent. Manggala Agni forest fire brigades have been developed and have been in operation. Their effectiveness has been limited due to the inaccessibility of the remote areas where fires often rage.

The BPPLHD (Environment Agency) at province level has developed fire information system capacity, monitoring and reporting on fire early warning, including fire threat mapping and fire danger rating.

A number of regional regulations and governor decrees have been issued on Forest and Land Fire Prevention and Control, among others establishing the Environmental Information Center under the coordination of the BPPLHD that concerns itself with fire information, and has made significant progress with assistance from Care International in cooperation with IRI to handle early warning of fires. Other regulations established a Command Post for Forest and Land Fire Prevention and Control, and issued technical guidelines and manuals on forest fire prevention and control.

In the Districts / Municipality, only Palangka Raya Municipality and Pulang Pisau District have a regulation and draft regulation respectively on Prevention and Suppression of Fire in Palangka Raya Municipality, without any specific mention of the institutional setup.

Community based fire management capacity has been developed by CIMTROP/Unpar through the TSA (Tim Serbu Api) concept with 20-30 person teams active since 2006 in Kalampangan and other areas (TSA Kalteng). Care International has developed the RPK (Regu Pengendali Kebakaran) concept, with 25 such teams established in Districts Kapuas and Pulang Pisau since 2003, each team having 20-30 members. Both approaches involve fire prevention and fire suppression. Local governments have shown interest to support these approaches, and so far a TSA-K has been established in Palangka Raya Municipality, and a RPK in Districts Kapuas and Pulang Pisau. These teams however have been operating on their own, and are not yet integrated with the fire management approach and capacity coordinated by the Posko (Coordination Command Post) that was established by Governor Decree in 2007 (based on a 2003 Provincial Government Regulation on Control of Forest and Land Fires Central Kalimantan Province).

Controversy still exists between the outlawing of use of fire, which follows present laws, regulations and decrees on one hand and controlled burning on the other hand, which is a long-established traditional farming technique. Further development of viable alternatives to burning for land clearance in the EMRP area is required.

The following actions are recommended to improve the management of fire in Central Kalimantan:

- 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 involved agencies, institutions and groups to handle their respective tasks in fire management is needed and should be reflected in government sector programming and budgeting;
- Fire management should be planned for and engaged at long, medium and short-term, and integrated with other relevant government planning and programming;
- Laws, regulations, decrees concerning fire management issues should be consistent, synchronous and harmonious across all levels of government;
- The recommendations from the Palangka Raya Declaration (see Box: Palangka Raya Declaration) should be implemented, in so far they are still in compliance with the new regulations;
- The various community based fire management approaches and efforts should be integrated and harmonized into one standard successful approach and system. The resulting community based fire management approach should then be legally and procedurally established by a Decree of the Governor and Regional Government Regulation (Perda), integrated within the overall fire management organization and approach, and capacity development programs and operational budget should be intensified.

**Box: The Palangka Raya Declaration on Forest and Land Fires**

A National Seminar on Prevention, Suppression and Legal Action against Perpetrators of Forest and Land Fires was organized in Central Kalimantan in December 2006, and produced the Palangka Raya Declaration and an Action Plan. The Action Plan describes a number of activities, including: (a) awareness campaigns, (b) zero-burning for plantation companies to be confirmed with AMDAL, (c) developing local knowledge in land preparation, (d) drafting regulations on the utilization of idle lands, (e) establishing of a Technical Implementation Unit (UPTD, part of the Forest Service) for Forest and Land Fire Control at Province and District levels, (f) establishment and support of Community Fire Control Groups, (g) development of an Early Warning System, (h) rewarding villages that are "fire-free", (i) establishment of water-wells, water-points in areas of high fire threat, (j) canal blocking, (k) provide operational budget from APBN, APBD to support activities, (l) get agreements with private enterprises that they will prevent and control fires in their respective working area, (m) provide aircraft for patrol, (n) activate Command Post, (o) intensify routine patrols and ground truthing, (p) intensify law enforcement efforts and (q) increase fire suppression capacity.

## ANNEX 22: Spatial Planning in the EMRP Area

Spatial planning in the EMRP area is a key issue for the long-term management of the area. Two main areas are highlighted in this Annex: the need to revise the current draft spatial plan for the EMRP area and the need to ensure community rights are protected.

### Provincial Spatial Plan and Inpres 2/2007

The current legal provincial spatial plan was produced in 2003 (Perda No 8 /2003, see Figure A22.1, left). Since 2007, the revised draft provincial spatial plan (RTRWP) has been undergoing a process of harmonisation (*paduserasi*) with the state forest boundary as determined by the Department of Forestry, which is scheduled for completion by the end of 2008. Within the draft RTRWP, the proposed spatial plan of Inpres 2/2007 is used with one change: part of the deep peat area in the west of Block B has been reclassified as KPP to accommodate an oil palm concession (Figure A22.1, right).

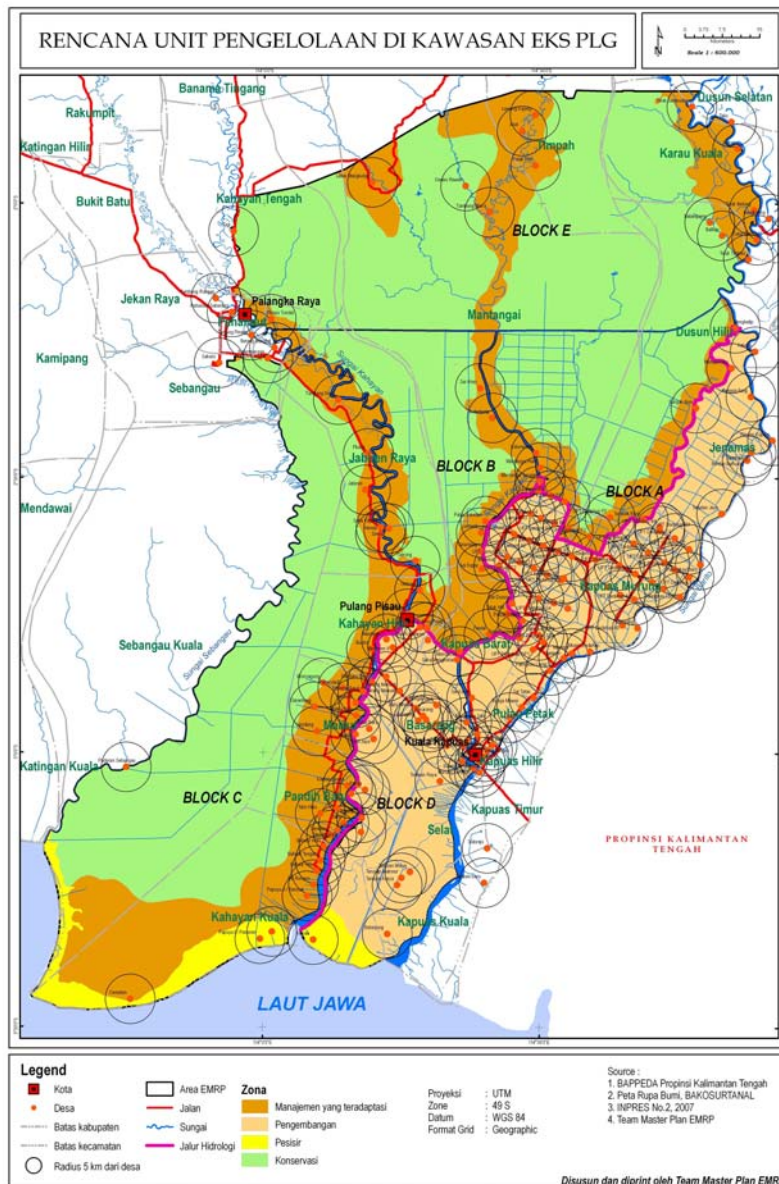
The Master Plan strongly recommends that the draft provincial spatial plan currently undergoing *paduserasi* and the proposed spatial plan in Inpres 2/2007 are modified based on this study. The following changes are recommended:

- The Master Plan Management Zones present a proposed concept for spatial utilisation (*pemanfaatan ruang*) that defines protection areas (*kawasan lindung*) and areas for development (limited development and development) within the framework of conservation, rehabilitation and revitalization of the EMRP area: it is recommended that this basic concept is used for all spatial plans and spatial planning in the region.
- The Master Plan proposes that the area by the rivers (including Kapuas River in Block E) is not defined as protection area as much of this area is inhabited and cultivated by local Dayak communities. This principle is in line with the concept of spatial planning in Central Kalimantan.
- In the protection (*kawasan lindung*), the division between deep peat conservation (*konservasi gambut tebal*) and hydrological conservation (*konservasi hidrologi*) is artificial and much of the hydrological conservation area is deep peat. It is proposed that this distinction is removed - all deep peat should be classified for deep peat conservation.
- The Flora and Fauna Areas (*kawasan flora dan fauna*) do not match with the area of highest biodiversity value (see Master Plan Technical Report on Biodiversity). With the protection zone proposed in the Master Plan, revised areas for the conservation of flora and fauna need to be delineated.
- The area proposed as for Black Water Ecosystem Conservation (*konservasi air hitam*) in block C is now heavily degraded and does not have biodiversity value. This area, known as Danau Manyun, is in a slightly different location to the Inpres map and should be simply part of the deep peat area.
- The category of *Melaleuca cajuputi* forest and rushes (*hutan gelam / purun*) is not appropriate as a protection category. *Melaleuca cajuputi* (paper bark tree) is a pioneer species that naturally regenerates in disturbed (especially fire affected) areas and is widely used for poles and pilings in construction. Its presence is not a suitable indicator for the need for protection and it is recommended to (a) remove this category from the maps and (b) remove the proposed protected areas of *hutan gelam / purun* in blocks A and D.
- For the cultivation area (*kawasan budidaya*), the present map does not effectively show the distribution of farm systems in the area - an alternative farm systems map as presented in the Master Plan could be used (see Figure 7).

- The area proposed for *tambak* in the *kawasan budidaya* currently has a land cover of healthy mangrove. This should be conserved and any *tambak* developed be targeted to a limited area to the west of the Kahayan estuary.
- Minor readjustments to the boundary of the protection zone are proposed in the south of Block C based on new data regarding peat depth and land cover.

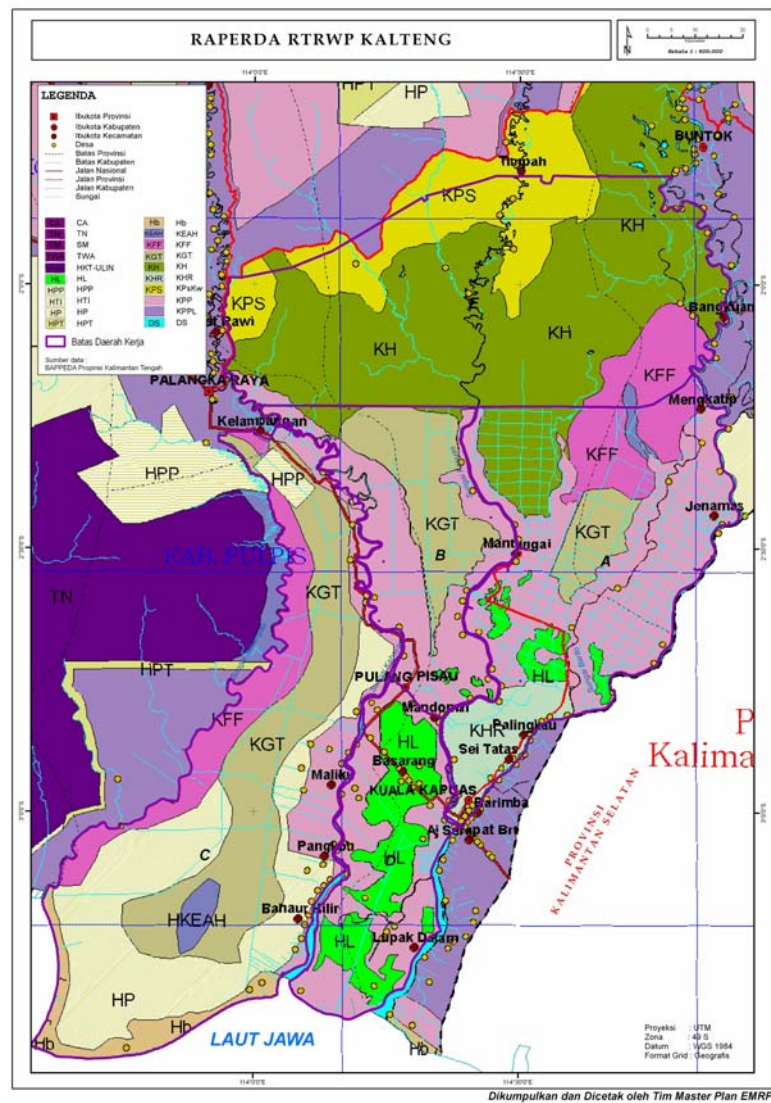
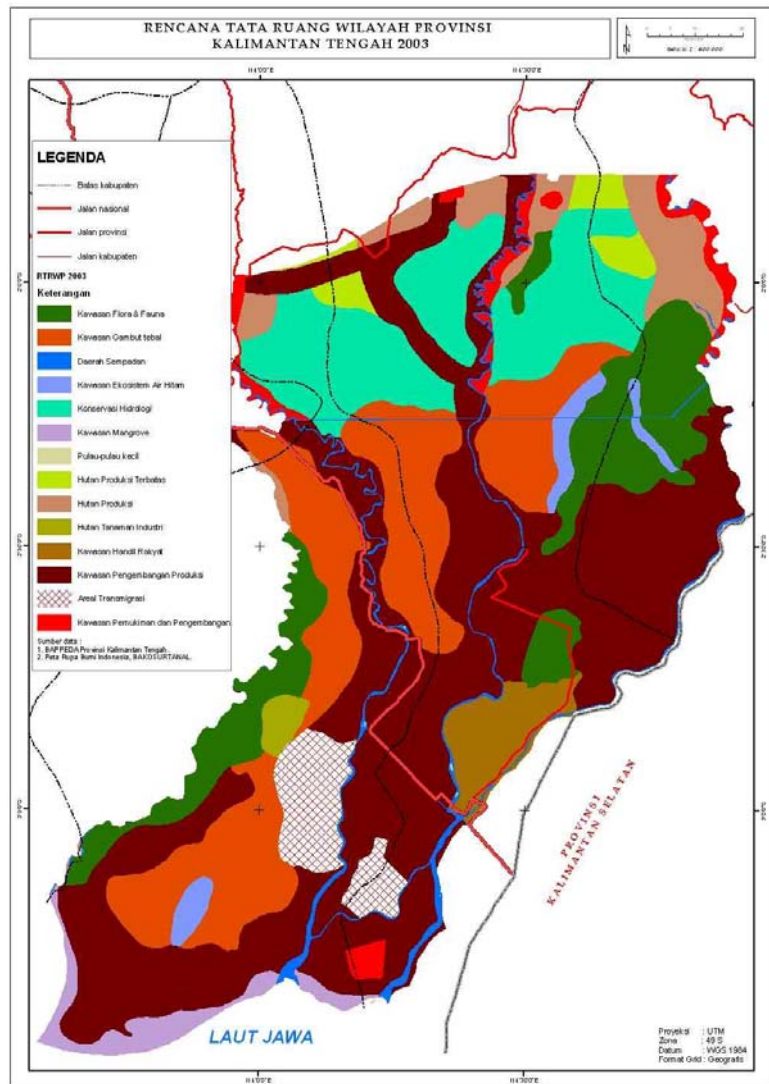
### Community Rights, Forest Boundaries and Spatial Management

In Central Kalimantan, an area approximately 5km around a traditional village is considered to be community land. Figure A22.2 shows the potential extent of community land in the EMRP area. In this figure, a circle has been drawn 5km around the centre of each village to provide an indication of where community land may be found. Identifying this land is important for (a) ensuring community rights to land are recognised and (b) preventing future conflicts over land. For these reasons, the Master Plan proposes community-based participatory mapping and resource planning is conducted to (a) define community claims and rights to land and (b) assist communities with planning sustainable land use in their villages.



**Figure A22.2:** Map of the Management Zones in the EMRP Area showing potential community land marked by circles with a 5km radius around each village.

Figure A22.1: Provincial Spatial Plan of 2003 (RTRWP 2003, left) and revised draft Provincial Spatial Plan of 2007 (right) for the EMRP area.



## **ANNEX 23: Partnership, Secretariat and Technical Facility**

The Master Plan proposes the establishment of: (1) a Partnership for the Rehabilitation and Revitalisation of the EMRP area, (2) a full-time secretariat for the implementation of Inpres 2/2007 and (3) a Technical Facility. This Annex describes these in more detail.

### **Partnership for the Rehabilitation and Revitalisation of the EMRP Area**

The Rehabilitation and Revitalisation of the EMRP area will involve a range of actors including GOI, donors, NGOs and the private sector. In order to ensure that all parties involved in this effort work in a cooperative and integrated manner, it is proposed to establish a Partnership for the Rehabilitation and Revitalisation of the EMRP Area under the leadership of the Governor of Central Kalimantan. The Governor, as the head of the province, is the person appointed by the President to be responsible for the implementation of Inpres 2/2007, which provides the Partnership potential to integrate donors, NGO and private sector responses with the GOI responses under Inpres 2/2007.

The purpose of the Partnership is to bring together all actors working in the EMRP area under one umbrella to create a unified response from GOI and others. A formal partnership agreement will need to be made that defines the responsibilities of partners in the partnership. It is envisaged that this would include:

- Commitment to the four principles of the Master Plan (adaptive management, integrated approach, landscape scale approach, community based approach);
- Commitment to joint planning, review and evaluation in line with GOI planning timelines;
- Commitment to sharing data and knowledge for the enhancement of responses in the area;
- Commitment to joint evaluation, learning and adaptation of responses based on evidence and understanding as it evolves;
- Commitment to production of a unified annual report on the progress with Rehabilitation and Revitalisation of the EMR area;
- Commitment of time to engage with the partnership and resources, where possible, to meet priority needs as jointly identified by the Partnership.

### **Secretariat for Inpres 2/2007 and the Partnership**

The current institutional framework for the implementation of Inpres 2/2007 defines the Head of Bappeda, Central Kalimantan as the Head of the Secretariat for the Implementation Team of Inpres 2/2007.<sup>18</sup> The implementation of Inpres 2/2007 combined with the management of the Partnership will require effective management and administrative support. It is proposed that this will be provided through a full-time secretariat to be established within the provincial Bappeda in Palangka Raya to provide support to the Head of Bappeda, Central Kalimantan. Given the temporary nature of Inpres 2/2007, it could be desirable for the secretariat to be staffed by non-structural professional staff as well as structural staff from Bappeda. The main tasks to be undertaken by the secretariat are envisaged as follows:

- Support the development of detailed plans and projects for the rehabilitation and revitalization of the EMRP area based on the six programs outlined in the Master Plan;
- Support the development of a coordinated, integrated response through working with (a) the main sectoral agencies, (b) the Working Groups in Jakarta, (c) the

---

<sup>18</sup> Decree of the Governor of Central Kalimantan No. 188.44/144/2007 on the Organisation and Roles for the Implementation Team of Inpres 2/2007.



four districts in the EMRP area, and (d) donor, private sector and NGOs to ensure a coordinated and integrated planning, implementation and evaluation of Inpres 2/2007;

- Establish and manage an information centre on the EMRP area including spatial data and related programs including progress reports;
- Evaluate and control the implementation of projects implemented by the Partnership for the Rehabilitation and Revitalisation including the resolution of problems;
- Complaints
- Support the Head of Bappeda as Secretary of the Implementation Team and the Partnership for the Rehabilitation and Revitalisation of the EMRP area;
- Draft annual reports of progress with the Rehabilitation and Revitalisation of the EMRP area;
- Support communication of major outcomes, progress and policies to a wider audience.

### **Technical Facility**

The rehabilitation and revitalization of the EMRP area has many technical challenges as discussed in this Master Plan. A range of basic and applied research questions need to be addressed, a technical program of work need to be implemented to increase the knowledge base for implementation, and a long-term monitoring system needs to be established. To support the implementation of Inpres 2/2007, it is therefore proposed to establish a Technical Facility alongside the full-time secretariat. This Technical Facility should draw on local, national and international expertise to ensure that the best mix of resources is deployed for the task. The University of Palangka Raya has a key role to play in this.

The level of knowledge, experience, professionalism and availability of experts required will be difficult to organize by any individual project implementing organization and could take disproportionate resources. There is a real risk that the lack of available capacity will lead to a lack of technical expertise being applied to intervention planning and to monitoring and assessment of intervention effects. Moreover, this problem could be further enhanced if projects would compete for scarce resources and capacity. The Master Plan therefore suggests that the technical support required can only be achieved by a high degree of human resource and knowledge sharing through the establishment of a single Technical Facility to support the various projects in executing technical and scientific tasks, in detailed planning and design of interventions and in the process of evaluation and learning about the impact of various interventions.

The main tasks envisaged for the Technical Facility include:

- Support technical agencies and projects involved in implementation of Inpres 2/2007 with planning, detailed design and other technical issues and act as a focal point for technical and research issues in the rehabilitation and revitalization of the EMRP area;
- Provide support to the secretariat for the management of technical information on the EMRP area;
- Oversee implementation of an agreed long-term monitoring framework for projects in the EMRP area, including supervision of field surveys, setting up monitoring systems, maintenance of a central database for data quality control and sharing, development of standards and guidelines, and supervision of evaluations of intervention effects;

- Support the development of an adaptive management approach through organizing joint evaluations, learning and creation of “knowledge products” through a multi-stakeholder approach;
- Produce technical reports on progress with the rehabilitation and revitalization of the EMRP area for use by those working in the Partnership;
- Promote and support the implementation of basic and applied research required as part of the implementation of Inpres 2/2007;
- Provide support to capacity building programmes by (a) providing applied courses on aspects of peatland management, (b) make sure there is ‘on the job training’ for all staff involved, and (c) actively involve relevant Government research organizations in the work (e.g. Puslitbang, Puslitanak, Bakosurtanal, LAPAN).

## **ANNEX 24: Long-Term Monitoring System**

Successful rehabilitation projects in the PLG will require well-planned intervention management at a large scale, and accurate monitoring of its impact. Results of impact monitoring will be used to steer further planning and implementation of intervention according to the approach of adaptive management. Both intervention planning and impact monitoring will require data collection at a large scale and to a high quality standard.

Monitoring is the systematic measurement of variables and processes over time based on the assumption that there is a specific reason for the collection of data. In the EMRP this should be to ensure that standards specified in the Master Plan are being met. Recording, mapping, surveys and sampling all provide a basis for monitoring over time. According to Spellerberg (2005) there are five reasons to justify ecological monitoring:

1. Ecosystem processes have not been well researched and basic ecological knowledge is required.
2. Management requires a baseline that only ecological monitoring can provide.
3. Anthropogenic influences have long-term effects and therefore long-term monitoring is required.
4. Data obtained from long-term studies form the basis for early detection of deviation from the management regime.
5. The impact of losses of and damage to habitats need to be evaluated.

Consequently, it will be necessary to develop appropriate methodologies and determine appropriate indicators of ecological and hydrological change that can be benchmarked. These should be as simple as possible and the objectives should be defined clearly.

Ecological monitoring can also consider the past by examining records and other information. Remote sensing is a valuable tool in this respect since it can be used to examine land cover, land use and land use change over at least the previous 30 years or so in the case of the EMRP and determine the changes that have taken place. Historical based monitoring or retrospective studies are important in order to establish the baseline for the monitoring programme. What happens in the future can also be monitored more or less constantly by the increasingly sophisticated satellite and aeroplane based sensors that are being developed.

It is important to define the framework within which monitoring will be carried out including the rationale for why, identification of where, determination of methods and the frequency at which measurements and assessments will be made.

A programme of monitoring has to be resourced and financed over a timescale that still has to be determined. There will need to be compromises between what is ideal and reality constrained by resources. The size and complexity of the EMRP are major constraints in themselves. The monitoring programme should fit within the four major Management Zones and be formulated to address the priority objectives of each.

In devising a monitoring programme for the EMRP it is essential to take into account existing systems and procedures and not to “re-invent the wheel”. Since the EMRP area consists mostly of wetland landscapes of which peatland is a major constituent

it seems logical to incorporate information and approaches that have been developed by the Ramsar Convention on Wetlands over many years.<sup>19</sup>

### **Data requirements**

Three types of information are required for responsible management of the PLG area:

1. Detailed spatial data on the PLG area that are required for basic planning, such as: where are the deep peatlands and the boundaries of peatlands, where is intact forest left, where is what type of agriculture successful, and so on.
2. Monitoring of the current status of the system that would support management interventions (especially water & fire management): fires, flooding, forest loss, forest regeneration, and so on.
3. Monitoring of hydrological, ecological and other biophysical research parameters that help understand the current state of the system, assess the impact of implemented interventions and predict its future state under different management scenarios, i.e. that provide a scientific basis to support the planning process: groundwater depths in relation to water management, subsidence rates in relation to peat types and management conditions, forest regeneration in relation to environmental conditions, and so on.
4. Monitoring changes resulting from specific interventions, i.e. tracking inputs, outputs, processes, and/or outcomes (impacts). Also intended and/or unintended consequences may be monitored.

An EMRP Secretariat will need to be established at the provincial level to co-ordinate and, where necessary, fund data collection by different organizations, develop shared protocols and manuals, store and quality control data, and provide them to interested parties. Ideally, the secretariat would also provide training and supervision to the separate data collection programmes

The Master Plan will present a separate technical report defining a long-term monitoring framework to be implemented as part of the adaptive management approach for the long-term management of the EMRP area.

---

<sup>19</sup> Ramsar Convention of Wetlands of International Importance, especially for Waterbirds.

## ANNEX 25: Capacity Building

Capacity building of government agencies is not a component of Inpres 2/2007, however there is both limited technical capacity relating to peatland and lowland management as well as demand for capacity building support in Central Kalimantan.

Capacity building can be defined as: *“the process by which individuals, organizations, institutions and societies develop abilities (individually and collectively) to perform functions, solve problems, and set and achieve objectives”*.<sup>20</sup> Two distinctions should be made between:

**Capacity:** *The overall ability of the individual or group to actually perform the responsibilities. It depends not only on the capabilities of the people, but also on the overall size of the task, resources which are needed to perform them and the framework within which they are discharged.*

**Capability:** *The knowledge, skills and attitudes of the individuals, separately or as a group, and their competence to undertake the responsibilities assigned to them.*

The Master Plan viewed ‘capacity’ in terms of the following aspects: (a) organizational structure, (b) leadership, (c) human resources, (d) financial management, (e) infrastructure - facilities, (f) program management, (g) process management and (h) linkages between organizations. Two main activities were conducted during the preparation of this Master Plan report: (1) a training management capacity assessment of selected government training institutes (Public Works, Forestry, Agriculture and Provincial Government) and (2) a ‘Participatory Organizational Diagnosis’ of the most relevant government agencies at district, provincial and national UPT-level. The purpose of this was to match capacity building needs with current training capacities in Indonesia in order to develop a capacity building strategy linked to the rehabilitation and revitalisation of the EMRP area and its long-term management.

### ***Training Management Capacity Assessment of Government Training Institutes***

At the moment, no clear system for capacity building (especially training / education) of government staff is, in general, in place yet. The current practices related to effective training of government staff at various levels are considered as not yet sufficiently well-planned, systematic and structured, and often do not fulfill the needs of the target-groups / agencies nor achieve the training outcomes as expected.

Each department (such as Forestry, Agriculture, Public Works, etc.) has its own training institutes at national and at regional level throughout the country. Before decentralization, all training activities for sectoral staff were conducted through these training institutes. However, since mid 1995 there has been a trend for many Directorate Generals, technical agencies at provincial and district level to budget funds and manage their own training activities. As a result, staff training is managed and conducted by the technical agency itself rather than a specialized training institute. The role of the training institutes has been reduced as a result of this.

The generalized picture of weaknesses (especially for the regional training institutes) is as follows:

- No technical training institute is established in Central Kalimantan; government staff of Central Kalimantan have to travel to South Kalimantan (PW, Agriculture) or East Kalimantan (Forestry), or to training institutes on other islands.

---

<sup>20</sup> From: Presentation “Towards a Master Plan for Capacity Building in the Indonesian Water Sector. Project Description and Preliminary Findings”; citing Lopes and Theisohn, 1997).

- Limited involvement of regional training institutes in training planning (including training needs assessment and course design). Overall supervision of the quality of training management seems to be inadequate.
- Considerable challenges exist – for example: technical standards for training materials are often lacking; existing training materials are not well-structured and/or formatted; technically qualified trainers / resource persons are not available locally; resource persons lack adequate training skills; duration given for the training is too short in relation to the stated objectives and aspired quality levels; funds for ToT are lacking, etc.
- There is a lack of training staff qualified in technical areas for swamp, peat and lowland conditions (e.g the national Public Works Education and Training Institute has only three trainers to service the country on lowland/swamp irrigation). There is also a lack of existing suitable training modules for the swamp, peat and lowland conditions such as found in EMRP area.
- There is a lack of funds for assessing impact of training on the job performance of the former participants and monitoring of the trainees' progress is weak.

## **2. Organizational Diagnosis of Government Agencies**

### ***Current Personnel***

The quantity and quality of the available human resources within the agencies at all levels in Central Kalimantan (district, provincial, and technical implementation units - 'UPTs') is one of the main concerns at the moment and in the near future. In general, a large amount of staff at the three government levels is presently in the high age category (45–55 years of age) and will retire within 10 years, and/or has a relatively low educational background (senior high school or less).

### ***Organizational Diagnosis***

The organizational diagnosis resulted in a large variety of problems and constraints, causes and impacts, faced by each of the organizations, covering all categories (organizational structure, leadership, human resources, infrastructure-facilities, financial management, program management, process management, linkages between organizations). Consequently also a large variety of current and envisaged organizational needs (non-performance related needs as well as performance-related needs) were expressed, a reflection of which is found in the strategies proposed (see *below*).

## **3. Strategy for Capacity Building of Government Agencies in Central Kalimantan**

The strategy distinguishes performance-related and non-performance-related capacity building needs. Performance-related interventions are those that aim to increase the capabilities (skills, knowledge and competencies) of individuals and groups. Non-performance related interventions focus on improving organizational capacity.

### ***Performance-related Capacity Building Strategy***

It is recommended that related to **performance-related** needs, the capacity building activities during implementation of Inpres 2/2007 should not be limited to 'classical training-courses' only, but should involve a wide range and mixture of interventions, the choice of which will depend on and should be adjusted to the needs of each 'technical area'. Additionally it should not be limited to the 'training-event' only, but should be given follow-up through provision of 'after-care'.

In general it is expected that the capacity building activities related to performance-related needs, will consist of a mixture of:

- standard training interventions
- customized training interventions
- on-the-job training
- training 'after-care', e.g. through practical, 'problem solving' workshops for the training-alumni on a regular basis
- coaching, and managerial and technical guidance
- Workshops
- extension for community (groups)
- information-dissemination
- short-courses (in-country and/or abroad)
- degree / diploma courses (in certain cases, for limited number of persons; in-country and/or abroad)
- networks for information exchange.

The type of 'training/education'-intervention(s) should also be determined by the kind of target-group involved (such as policy-makers / top-level management, middle management, operation / field level).

The recommended approach is to create qualified and capable training service providers and trainers, who will be able to provide quality training services as required to the government staff at provincial, district, sub-district and village level, and training for community (groups) as required. Given the actual and future involvement of the Ministries of Forestry, Agriculture, Public Works, and Home Affairs / the Provincial Government in the rehabilitation and revitalization of the EMRP area, the most relevant training institutes of these Ministries are expected to play an important role as training service providers, especially for training of government staff of national-level, provincial and district agencies.

To develop and utilize existing human resources in Central Kalimantan, it will be important for the selected training institutes to develop and apply a systematic approach towards training, which entails training planning, preparation, implementation, and evaluation, each of which is called a sub-system. In the application of a systematic approach, these four sub-systems constitute a training cycle. In order to be able to function well, each of the sub-systems needs to be supported by supporting facilities such as administrative and financial services, logistics, and human resource development data system. The assurance that there will be a continuous quality improvement process constitutes an important characteristic from the training cycle and system approach towards training. In the system approach for training, the planning, preparation, implementation, and evaluation of training will be conducted in such a way that the attention will always be focussed on training results, in accordance with work-requirements. In other words, everything will be directed to help staff to obtain knowledge and skills needed to improve work-performance.

### ***Non-Performance-related Capacity Building Strategy***

Related to **non-performance** related problems and needs, a large variety of organizational development strategies for their own organization were formulated by the representatives of the government agencies at various levels in the organizational diagnosis covering each of the eight categories (Table A25.1).

**Table A25.1:** Strategies for Organizational Development Proposed by Government Agencies.

<p><b>Leadership:</b></p> <ul style="list-style-type: none"> <li>• Improvement of managerial system</li> <li>• Develop and apply control mechanisms (close supervision)</li> <li>• Leadership and managerial training/education</li> <li>• Recruitment of leaders through fit&amp;proper test</li> <li>• Competent leadership caderization system</li> <li>• ESQ Training</li> </ul>	<p><b>Financial Management:</b></p> <ul style="list-style-type: none"> <li>• Budget proposal should be supported by data</li> <li>• Develop performance-based budgeting</li> <li>• Develop on-line performance-based financial management system between agencies</li> <li>• Initiate cooperation /partnership with other parties more intensively</li> <li>• Increase financial training and education</li> <li>• Prepare financial staff from recruitment, and training and education</li> <li>• Intensive dialogue with legislative</li> <li>• Increase managerial capability &amp; improve financial system</li> </ul>
<p><b>Organizational Structure:</b></p> <ul style="list-style-type: none"> <li>• Analysis of appropriate needs of organizational structure</li> <li>• Socialization &amp; consultation to obtain same perception on organizational structure and work-procedures</li> <li>• Application of job-analysis</li> </ul>	<p><b>Infrastructure - Facilities:</b></p> <ul style="list-style-type: none"> <li>• Improvement of lobby ability</li> <li>• Identification of facility – infrastructure needs</li> <li>• Manual for supervision of infrastructure and facilities maintenance</li> <li>• Participatory preparation of priority-based 'RKBU'</li> <li>• Improve information exchange cooperation in accordance with needs</li> <li>• Develop partnerships with private sector</li> </ul>
<p><b>Human Resources:</b></p> <ul style="list-style-type: none"> <li>• Analysis of staff needs and recruitment</li> <li>• Analysis of staff development needs (training and education)</li> <li>• Guidance to improve professional human resource quality consistently</li> <li>• Develop a staff management system</li> <li>• Develop performance-based incentive system</li> <li>• Develop cooperation with other parties for staff development</li> </ul>	<p><b>Process Management:</b></p> <ul style="list-style-type: none"> <li>• Formulate a written agreement on communication mechanisms between areas / Sub-Dinas</li> <li>• Develop a training program on reporting</li> <li>• Evaluate together work-procedures regularly</li> <li>• Increase two-way communication between Sub-Dinas</li> <li>• Development of on-line reporting system internally and between agencies</li> </ul>
<p><b>Linkages between Organizations:</b></p> <ul style="list-style-type: none"> <li>• Increase communication with related parties</li> <li>• Agree on (inter-agency) role-sharing between related parties and stick to commitments made</li> <li>• Coordinate programs / activities with related parties</li> <li>• Develop regulations required &amp; enforce its implementation</li> </ul>	



**ANNEX 26: Estimation of Financing Needs**

The Master Plan team has been requested to complete an initial costing of the program of work contained in the Master Plan, which is presented in this Annex. It must be emphasized that the Master Plan team does not consider this an accurate estimation of finance required. Instead, this should be seen as an initial costing aimed at establishing an approximate figure of the finance required and which can be used as a starting point for further detailed costing in the future. The following tables present indicative estimates of finance required (rounded to the nearest IDR 5 billion) for each of the main programs and actions in Table 11 of the Master Plan.

**PROGRAM 1: FIRE MANAGEMENT**

Activity	Type of Activity	Cost Estimate (IDR billion)
Strengthen policies, institutions and operations	Routine government	5
Capacity building	Routine government	5
Integrated planning and budgeting	Routine government	5
Up scaling village based fire brigades in close collaboration with local Gol, including monitoring impact assessment	Routine government	20
Expansion of non-community based capacity	Routine government	20
Maintain information campaign	Routine government	5
Maintain monitoring capability	Routine government	5
<b>TOTAL</b>		<b>65</b>

**PROGRAM 2: SPATIAL MANAGEMENT AND INFRASTRUCTURE**

Activity	Type of Activity	Cost Estimate (IDR billion)
Revision of maps of Inpres 2 and RTRWP	Routine government	-
Review of status of area (kawasan khusus. Kawasan strategis)	Consulting services	5
Conduct detailed spatial planning	Consulting services	5
Revision of district spatial plans	Consulting services	5
Program for standardization of spatial data management in Central Kalimantan	Consulting services	20
Program for the control of spatial plans and land management (based on UU26/2007)	Consulting services	20
Program to improve spatial data on topography, relevant bio-physical, characteristics and integrated land suitability in priority areas	Consulting services	20
Production of a macroinfrastructure investment strategy	Consulting services	5
Major infrastructure improvements		
- Roads	Civil works	800*
- Bridges	Civil works	50*
- River transport	Civil works	50*
<b>TOTAL</b>		<b>980</b>

\* Cost estimates marked with \* are based on Inpres 2/2007 financing plans

**PROGRAM 3: SUSTAINABLE PEATLAND MANAGEMENT AND CONSERVATION**

Activity	Type of Activity	Cost Estimate (IDR billion)
Guideline for integrated peatland rehabilitation	Routine government	5
Detailed planning of peatland rehabilitation	Consulting services	5
<b>A. Hydrological Rehabilitation</b>		
Development of hydrological rehabilitation plans	Consulting services	5
Establishment of hydrological monitoring (part of LT monitoring system)	Consulting services	10
Blocking canals and introduction of water control structures in management units I-III	Civil works	100
Review of water management in peatland areas	Routine government	10
<b>B. Forest Rehabilitation</b>		
Applied research on regeneration and succession	Various	20
Species selection trials	Various	20
Development of silvicultural treatments	Various	20
Piloting community-based forest management, reforestation and smallholder forest plantations schemes	Various	100
Reforestation of up to 500,000ha	Various	1,000
Establishment of multi-stakeholder platform	Routine government	10
<b>C. Conservation and Environmental Management</b>		
Delination of conservation areas	Routine government	10
Action against conservation threats	Routine government	50
Collaborative management of conservation and protection areas (by FMU)	Routine government	15
Review of EIA's in area	Routine government	5
Strengthening of EIA procedures for peatland	Consulting services	10
<b>D. Boundary Establishment and Forest Management</b>		
Review Kepmen 166/Menhut/VII/1996	Routine government	-
Review, revise and revoke plantation licenses	Routine government	5
Forest resource suvey, inventory and mapping	Routine government	20
Community-based participatory land mapping and consultations on boundaries	Various	5
Issue Ministerial Decree on forest boundaries	Routine government	-
Establishment of boundaries on the ground	Routine government	20
Establishment of FMU's / KPH	Routine government	5
Detailed zoning and development of management plans for FMUs/KPH	Various	15
Pilots for carbon finance and strengthening of institutions	Various	50
<b>TOTAL</b>		<b>1,515</b>

**PROGRAM 4: AGRICULTURAL REVITALISATION**

Activity	Type of Activity	Cost Estimate (IDR billion)
Detailed planning of programs	Routine government	5
Integrated land suitability assessments	Various	20
<b>A. Strengthening Agricultural Farm Systems</b>		
Program for agricultural infrastructure and facilities	Various	250
Strengthen the extension services	Various	20
Reclamation of new land in suitable areas (say 20,000ha)	Various	200
Program to support access to finance for farmers	Various	150
Program to support access to markets for farmers	Various	50
Provision of quality agricultural inputs	Various	100
Local village-based land suitability and pest control assessments	Various	10
Conduct on-farm studies, establish on-farm demonstration plots and facilitate visits to productive farms by local farmers.	Various	20
Piloting and upscaling of techniques for land clearance without burning that can be applied by farmers	Various	20
<b>B. Land and Water Mangement</b>		
Review and redesign of water management infrastructure in management units VI-XII and transmigration areas in management units II-III	Consulting services	25
Rehabilitation of existing water management infrastructure in development zone	Civil works	500
Strengthen on-farm water management practices and institutions	Various	50
Assessment of flood control options on Barito and other rivers	Various	5
Implementation of flood control measures	Civil works	200
Monitoring, review and maintenance of water management infrastructure and practices	Various	5
<b>C. Fisheries</b>		
Cage aquaculture program	Various	20
Pond aquaculture program	Various	20
Ornamental fish program	Various	5
Traditional fish capture (beje) program	Various	5
Institutional strengthening program for fisheries sector	Routine government	10
<b>D. Agro-processing</b>		
Development of cooperatives, small enterprises and processing areas for adding value to products	Routine government	20
<b>TOTAL</b>		<b>1,710</b>

**PROGRAM 5: COMMUNITY EMPOWERMENT AND SOCIO-ECONOMIC DEVELOPMENT**

Activity	Type of Activity	Cost Estimate (IDR billion)
Detailed planning	Routine government	5
<b>A. Community Empowerment</b>		
Recruitment, placement and support of village facilitators	Various	50
Pubic information campaign	Routine government	5
Resolution of land tenure and land claim issues	Routine government	10
Program for strengthening village institutions and governance	Routine government	50
Community development planning, including provision of technical support and training, monitoring and impact assessments	Consulting services	50
<b>B. Basic Services and Infrastructure</b>		
Program for improving access to quality health services	Routine government	50
Program for improving access to quality education services	Routine government	50
Provision and upgrading of rural and village infrastructure where possible through community-based programs	Civil works	825
Improve local access to drinking water and sanitation, including provision of technical support and training, monitoring and impact assessments	Civil works	50
Access to electricity in villages	Civil works	50
<b>C. Socio-economic Development</b>		
Piloting, through market analysis, value chain development and promotion of value chain addition for 'best bet' agricultural activities	Consulting services	135
Formation of producer groups, associations etc	Various	40
SME development and agro-processing centres	Various	25
NTPP commercnailisatin	Various	10
Piloting of Payment for Ecosystem Services approaches (inc. REDD)	Various	50
<b>D. Transmigration</b>		
Review of food crops based transmigration	Consulting services	5
Implementation of transmigration refill program in Lamunti, Dadahup and Palingkau	Various	350
New transmigration to limited number of new sites	Various	500
<b>TOTAL</b>		<b>2,210</b>

**PROGRAM 6: INSTITUTIONAL DEVELOPMENT AND CAPACITY BUILDING**

Activity	Type of Activity	Cost Estimate (IDR billion)
Development of an integrated program through Working Groups and Coordination Teams	Routine government	5
Formation of Partnership, Secretariats and Technical Support Facility	Various	50
Initiate and maintain a long-term monitoring system with data collection and management and reporting as part of annual review process	Consulting services	50
Implement capacity building program as part of Inpres 2/2007	Routine government	50
Review and determine the long-term institutional arrangements for the management of the EMRP area	Routine government	5
<b>TOTAL</b>		<b>160</b>

**Limitations to the use of IRR-based analysis of investments**

A standard project economic feasibility analysis (which results in an EIRR) is useful if: (i) most of the economic costs and benefits of the project can be quantified with a reasonable degree of accuracy, and (ii) the results of the analysis are used to rank similar projects. Subprojects proposed for the rehabilitation of the EMRP area are unlikely to meet these criteria, given that:

- Several important expected economic benefits of EMRP cannot be quantified, such as reduced incidence of forest fires, reduced regional disparities, and improved biodiversity conservation.
- Activities will be proposed for several sectors (such as forestry and watershed management), the EIRRs of which are not readily comparable.

At present, detailed subproject cost information is not available to assess the EIRR of suggested investments in public infrastructure (such as roads or public health facilities). More importantly, the Government of Indonesia does not use such analyses to justify its public investment. Instead, with the issuance of PP38/2007, it has requested technical ministries to prepare minimum service standards (*Standar Pelayanan Minimal* or SPM). Sub-national governments are responsible for meeting such standards, but the central government will have the right to support investments in public infrastructure and services through the deconcentration fund channeling mechanisms (Dana Dekon & Tugas Pembantuan) as long as such standards are not met.

Similarly, the calculation of financial internal rates of return for revenue-generating agricultural activities proposed in the EMRP area is fraught with difficulties because of the high volatility in two major determinants of net financial revenue from such activities: the world market price for agricultural commodities, and – especially in the case of smallholder farming – the unit price of fertilizer.

## ANNEX 27: Carbon Finance

Revenues from reduced carbon emissions may be an important source of finance for sustainable peat land management in the ex PLG area. Market related instruments under the United Nations Framework Convention on Climate Change (UNFCCC) specified in the Kyoto Protocol can generate revenue in areas where the government decides to implement a forest and peat land conservation or protection policy, and makes it possible to share these revenues with the local communities.

The options for alternative finance sources market based instruments related to the Climate Change Framework Convention and the Kyoto Protocol include:

- Reduced Emissions from Deforestation and forest Degradation (REDD)
- Clean Development Mechanism (CDM)
- Selling Emission Reductions at the Voluntary Carbon Market

REDD is a new international scheme of carbon market through reducing emission from deforestation and degradation. Pilot projects will be implemented in the period 2008-20012. Full implementation of this scheme, if it will happen, will only begin after 2012. Peat restoration is not included yet in REDD. In the current discussion within the government of Indonesia, peat land is eligible for REDD if the land is still forested, and remaining forest vegetation will be protected from deforested and degradation. Potential efforts for Carbon credits therefore will focus on stopping land use allocation of forested (peat-) land for other purpose such as oil palm plantation and timber plantation, and protection forest from fire. Pilot projects will have to prove if and how degradation of peat soils and protection of peat soils from wild fires can be included under the REDD scheme. For the development of pilot projects for REDD funding is available from bilateral and multilateral donors.

The Clean Development Mechanism (CDM) is a carbon trading mechanism under the Kyoto Protocol. Industrialized countries with a greenhouse gas reduction commitment (called Annex 1 countries) invest in projects that reduce emissions in developing countries. Afforestation and reforestation activities are eligible for carbon credits under the CDM for areas that were non-forested areas in 1989. The land cover map of 1990 shows that much of the peatland in the EMRP area was covered with forest. Thus the potential of generating carbon credits under the current CDM regulation for afforestation and reforestation is limited at present. However, emissions from degraded peatland may potentially be accepted by the CDM as a eligible emission in its own right: the approval of any methodologies for degraded peatland would be of great significance to the rehabilitation of the EMRP area.

The Voluntary Market seems to have the clear possibilities for generating alternative sources of finance for conservation and restoration activities. In the voluntary market carbon credits are purchased by companies or institutional investors that generate carbon emission reductions against generally recognized but voluntary standards which are not officially approved under the United Nations Framework Convention. However, the size of the Voluntary Market is unlikely to be able to meet the supply of potential carbon emissions reductions from the EMRP area. In 2006, 24 million tons of CO<sub>2</sub> was traded in the voluntary market<sup>21</sup> - this is roughly the same order of magnitude as the potential emission reductions in the EMRP area. In contrast, the primary CDM market is 20-times as large as the Voluntary Market and in 2006 traded 450 million tons of of CO<sub>2</sub>. This underlines the importance of the CDM and potential REDD markets for reducing emissions within the EMRP area.

---

<sup>21</sup> Ecosystem Marketplace & New Carbon Finance (2007) State of the Voluntary Carbon Markets – Picking Up Steam. [http://ecosystemmarketplace.com/documents/acrobat/StateoftheVoluntaryCarbonMarket18July\\_Final.pdf](http://ecosystemmarketplace.com/documents/acrobat/StateoftheVoluntaryCarbonMarket18July_Final.pdf)

***Institutional Options and Distribution of Revenues***

One of the challenges related to carbon finance is channeling the money. Carbon should be treated as a commodity for which each entity that is adding value to the commodity should be paid. Carbon revenues (generated through REDD, CDM or the voluntary market) should be allocated for:

1. Payment to the land owner (e.g. Department of Forestry, communities).
2. Payment to the community living in and/or near to the project site.
3. Local governments (at provincial and district level)
4. The costs of the carbon storage measures (fire prevention, replanting, canal blocking etc.)
5. Supervision, auditing and monitoring (experts from third parties).
6. Organizations (NGO's or others) for facilitating communities.

So far the Government of Indonesia has been working on the selection of pilot site for REDD. Mechanisms to channel the revenues have not been developed yet although an initial draft regulation on REDD has been produced.<sup>22</sup> In order to ensure that the money reach the right person/stakeholder a distribution mechanism needs to be determined – the Australia-Indonesia Kalimantan Forest and Climate Partnership will be working on this in its pilot within the EMRP area. Such a mechanism should include developing a view on the institutional conditions that will have to be met in order to have the mechanism work through effective incentives, determine the organizational structures and define a system for transfer of payments to stakeholders including communities living in and potentially beyond the area. Generation of carbon credits such as REDD involves many parties: the local population, the private sector, NGOs, and government ranging from national to village levels. Each of them has its own role and contribution. The revenues of the reduced emissions relate to provision of rewards and incentives to both the state and local communities for their success in reducing carbon emissions.

---

<sup>22</sup> Draft Decree of the Minister of Forestry on Implementation Procedures for Reducing Emissions from Deforestation and Forest Degradation (REDD).

**ANNEX 28: Consultations and Meetings Held During the Master Planning Process**

During the preparation of the Master Plan, the Master Plan team held and participated in the following formal meetings, workshops and consultations.

No	Date	Meeting	Place
1	7-8 Novmeber 2007	Provincial inception workshop	Bappeda, Kalteng
2	15 November 2007	National Inception meeting	Bappenas
3	3 December 2007	Presentation to the Governor of Central Kalimantan	Goevrnor's office, Kalteng
4	8 December 2008	Presentation to Minister Koenders, Dutch Development Cooperation Minister	KMC, Kalteng
5	January 2008	District consultation meetings	Barito Selatan, Kapuas, Pulang Pisau
6	January – February 2008	Meetings with Inpres 2/2007 working groups I-III	Departments of Forestry, Agriculture and Employment & Transmigration
7	February-March 2008	Community sub-district consultations	19 sub-districts in EMRP area
8	February- April 2008	Working group on dam blocking	Bappeda, Kalteng
9	29 March 2008	Presentation to Australia KFCP Mission	Bappeda, Kalteng
10	10 April 2008	Livelihoods and socio-economic workshop	Bappeda, Kalteng
11	11 April 2008	Forest rehabilitation stakeholder meeting	Bappeda, Kalteng
12	22 April 2008	Presentation to Public Works	Department PU
13	29 April 2008	Organisational diagnosis workshop	Bappeda, Kalteng
14	30 April 2008	Workshop on developing the fire management system for the EMRP area	Bappeda, Kalteng
15	2 May 2008	Working meeting of Working Group III / Inpres No.2 tahun 2007	Bappeda, Kalteng
16	5-7 May 2008	Organisational diagnosis workshop	Bappeda, Kalteng
17	7 May 2008	Public consultation in Kapuas district	Kabupaten Kapuas
18	8 May 2008	Organisational diagnosis workshop	Bappeda, Kalteng
19	10 May 2008	Public consultation in Pulang Pisau district	Kabupaten Pulang Pisau.
20	12 May	Presentation to Supporting Team for Inpres 2/2007	Bappenas
21	13 May 2008	Public consultation in Barito Selatan district	Kabupaten Barito Selatan



*Master Plan for the Rehabilitation and Revitalisation of the EMRP Area*

<b>No</b>	<b>Date</b>	<b>Meeting</b>	<b>Place</b>
22	24, 28 May 2008	Organisational diagnosis workshop II	Bappeda, Kalteng
23	26-27 May 2008	Organisational diagnosis workshop II	Kapuas
24	5 June 2008	Presentation and discussion of scenarios	Bappeda, Kalteng
25	16 July 2008	Carbon finance and payment mechanisms	Bappeda, Kalteng
26	16 July 2008	Presentation to meeting on Draft Perpres for Peat Management	Coordinating Ministry of Social Affairs
27	26 July 2008	Presentation of draft MP	Bappeda, Kalteng
28	28 July 2008	Presentation at national coordination meeting on peatland management	Palangkaraya, Kalteng
29	28 July 2008	Presentation of draft MP to Governor of Central Kalimantan	Governor's office, Central Kalimantan
30	31 July 2008	Presentation of draft MP	Barito Selatan district
31	9 September 2008	Presentation of draft MP	Kapuas district
32	11 September 2008	Presentation of draft MP	Pulang Pisau district
33	14 October 2008	Presentation of draft MP to Working Group III, Inpres 2/2007	Department of Employment and Transmigration
34	17 October 2008	Presentation of draft MP to Working Group II, Inpres 2/2007	Coordination Meeting in Kuala Kapuas
35	18-19 October 2008	Meeting with Norwegian International Forest and Climate Initiative Mission	Pulang Pisau district
36	20 October 2008	Presentation of draft MP to Working Group I, Inpres 2/2007	Hotel Menara Peninsula, Jakarta
37	22 October 2008	Presentation of draft MP to Department of Public Works	Department of Public Works



**Bappenas**  
Secretariat  
Inpres 2/2007

**Bappeda  
Central  
Kalimantan**  
Secretariat Inpres  
2/2007

**Royal  
Netherlands  
Embassy**

**Euroconsult  
Mott MacDonald**

**Deltares | Delft  
Hydraulics**

Jl. Taman Suropati  
No.2,  
Jakarta 10310

Jl. Diponegoro 60,  
Palangka Raya  
73111,  
Kalimantan Tengah

Jl. H.R. Rasuna  
Said Kav. S-3,  
Kuningan  
Jakarta 12950

S. Widjojo Centre, It. 3  
Jl. Sudirman Kav. 71  
Jakarta 12190

P.O. Box 177  
2600 MH Delft  
The Netherlands

[www.bappenas.go.id](http://www.bappenas.go.id)

[www.kalteng.go.id](http://www.kalteng.go.id)

[indonesia.nlembassy.org](http://indonesia.nlembassy.org)

[www.euroconsult.mottmac.com](http://www.euroconsult.mottmac.com)

[www.wldelft.nl](http://www.wldelft.nl)