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### Environmental field trials and GIS image analysis's in the Tangkiling District along River Rungan in Central Kalimantan, Indonesia

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### Rungan River near Tangkiling





GIS-map location of Tangkiling District, Central Kalimantan

#### Geographic location of the study site



#### Main objective

To evaluate, to zone and to manage areas in the Tangkiling District at the Rungan river for the development and conservation, using Landsat images from Jan / Feb 2003

#### **Specific objectives**

To do an environmental diagnosis for the zone under study, which will allow to select areas of interest based in socio cultural and economic aspects as well as ecological aspects

To formulate and prioritize strategies for the management of the selected areas

To define the guidelines to implement the strategies.

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Tangkiling: Sei Gohong with Rungan River, Hills and Rungan Sari, 1996





#### Peat Swamp Forest and Peatland



Peatland along the road to Kasongan





#### Landsat images + Study area

Landsat images under analysis

- Landsat ETM images 118-61, 118-62,
- acquired on 14. Jan and 15. Feb 2003,
- detailed analysis of the region around the Tangkiling granite hills and the black water river Rungan North of Palangkaraya

#### Landsat images under analysis for Study area

Ground truthing were done in this study area 2004, with

classification based on socio cultural and economic aspects as well as ecological aspects

#### **Production of:**

1. Map-size of 26 km by 42 km in the Tangkiling district and

with water bodies incl river, 70% logged PSF, 10% PSF regrowth, 0% forest (converted into grassland and scrubs), burnd scars 2002, heath forest, sand and roads

2. Map-size of 12 km by 18 km around the Tangkiling hills itself

with PSF, agriculture, scrub and grasslands, riparian gallery, regrowth, secondary forest, traditional home gardens, burnt areas 2002, settlement/housing, sand, water bodies etc.

3. Map-size of 2.4 km by 3.1 km around Rungan Sari – Sei Gohong

#### Zoning areas under analysis

- Zoning maps are produced for development and conservation areas:

- Conservation of large preservation and restoration areas, such as high steep slopes, PSF, woodlands, green corridors, etc.
- Conservation of small vegetation areas
- Conservation of the vegetation along the river as a green corridor and water protection

## KALTENGCONSULTANTS Tangkiling: Rungan River + PSF

### The Rungan River





## **KALTENG**CONSULTANTS Tangkiling: Sei Gohong with Rungan River



View from Tangkiling Granite Hills into the plane peatland with the Rungan basin with PSF Dr. Boehm et al. 23. Sept 2005

## KALTENGCONSULTANTS Landsat-Classification at Rungan/Tangkiling

Land Vegetation Cover Classes Rungan area - Tangkiling district



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#### Tangkiling District – Black water river



Dr. Boehm et al. 23. Sept 2005

Deforestation



### LANDSAT TM 30 June 1991 18km x 24km RGB=542

River Rungan, tall and medium Peat Swamp Forest (PSF) and heath forest (karangas)

Tangkiling with road to Tumbang Jutuh / Tumbang Telaken / Takaras





#### Land cover classes in Kecamatan Bukit Batu



#### 26 km x 42 km with grid

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#### Results: Land use classes + Legend



LEGEND

Trans Kalimantan road Secondary rivers Logging roads Borderl ine Tangkiling hills area Land cover classification River Water bodies 70% PSF (logged) 10% Forest (regrowth) 0% forest (regrowth) 0% forest Converted into grasslands nd scrub by clear cutting Burnt scars from 2002 Heath forest Sand

Total area: 95909 Hectares represented by: Water bodies: 0.79% 70% PSF: 61.14% 10% Forest: 12.29% 0% Forest: 12.14% Burnt scars from 2002: 7.62% Heath forest: 4.96% River: 1.06% Landsat image RGB=543 14 of January 2003, with the help of 15 February 2003

Elaborated by: Dr. Viktor Boehm, Sara Ramírez and Daniela Bustillo June 2005



## **KALTENG**CONSULTANTS Tangkiling: Sei Gohong with Rungan River



## **KALTENG**CONSULTANTS Tangkiling: Sei Gohong with Rungan River



Rungan River with Sei Gohong village and surrounded PSF Dr. Boehm et al. 23. Sept 2005

#### LANDSAT TM 14 Jan 2003 **Tangkiling - Central Kalimantan**



Dr. Boehm et al. 23. Sept 2005

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12 km x 18 km with grid

### Tangkiling - Central Kalimantan



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#### Legend to Map

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### Results: Land use classes + Legend



Land cover class.	Area (ha)	%
Water bodies	401.31	4.32
Burnt scars 2002	459.81	4.95
70% Forest PSF	3573.91	38.44
Riparian vegetation	382.12	4.11
0% Forest: grass	531.72	5.72
Quarry (granite)	42.87	0.46
Human settle-ments	155.56	1.67
10% Forest PSF	1098.59	11.82
Home gardens	137.88	1.48
5% forest: scrub	1573.82	16.93
Agriculture	485.52	5.22
Hills	199.74	2.15
River	253.89	2.73

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### Transmigration-Km38 on Peat



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### LANDSAT TM 14 Jan 2003 Zoning – Tangkiling – Sei Gohong



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#### Rungan Sari Development



Rungan Sari development inside secondary PSF and the Kalimantan highway to Sampit



#### LANDSAT TM 14 Jan 2003 Rungan Sari – Sei Gohong



Dr. Boehm et al. 23. Sept 2005

Approx. 2.4 km x 3.1 km with grid

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#### Secondary PSF



Secondary PSF with scrubs in the foreground and remaining PSF in the rear Dr. Boehm et al. 23. Sept 2005

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#### Alang-Alang on peatland



Alang-Alang growing on opened peatland - very sensitive for fire Dr. Boehm et al. 23. Sept 2005

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#### LANDSAT TM 14 Jan 2003 Zoning – Rungan Sari – Sei Gohong



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Approx. 2.3 km x 3.0 km with grid

### LANDSAT TM 30 June 1991 approx. 28km x 35km, RGB=543

River Rungan, tall and medium Peat Swamp Forest (PSF) with logging roads Tangkiling with road to Tumbang Jutuh / Tumbang Telaken / Takaras



### LANDSAT TM 14 January 2003 approx. 29km x 35km, RGB=543

River Rungan, tall and medium Peat Swamp Forest (PSF) with logging roads Tangkiling with road to Tumbang Jutuh / Tumbang Telaken / Takaras





### Tangkiling locals producing maps + child



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### Tangkiling peatland + peat water





### Tangkiling hills



Synthesis of the main problematic situations in the region identified by the local communities

Table shows the problems of conversion of PSF into agriculture land, which occurs since 1980.

The main problems resulting of the land use changes are:

Deforestation by legal or il-legal logging

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- Fires caused by opened canopies and dry debris's
- Loss of fishing resources caused by changing black water rivers through sediments into yellow/brown water which changes the biosphere
- Lack of technical assistance and self- management process
- Food insecurity and Difficult access to markets for agricultural products
- There is little information about the interconnection of ecosystem, biodiversity and natural resources availability
- Poor social health care, sanity conditions and water supplies
- Poor institutional effectiveness
- High rate of unemployment, caused poverty
- KKN (Korrupsi, Kolusia dan Nepotism, indo.) and
- Local investments are low

### **Conversion of logged PSF**



### Tangkiling granite braking





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### Tangkiling hills + locals



### Tangkiling agriculture + rubber







### Tangkiling peatland + fruits





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### Tangkiling peatland + mushrooms



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### Tangkiling peatland + mushrooms



### Tangkiling peatland + plants



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### Tangkiling peatland + leaves



#### **Proposed Action Plan**

PROGRAMME	PROJECTS	GOAL	TERM	POSSIBLE SOURCE OF FUNDING
Alternative for         the disminution         of       the presure         on       natural         resources.         Rehabilitation of         degraded lands         Consolidation of	The improvement and	Long	Agreements for international cooperation.     The United Nations Children's Fund - UNICEF under the	
	Rehabilitation of degraded lands Consolidation of	establishment of more and better productive practices will lead to the well being of people and conservation of natural resources.	Long	<ul> <li>programme "Indonesian family nutrition improvement programme"</li> <li>Tropical forest research (Tropenbos International), (Indonesian programme)</li> </ul>
	wide vegetation corridors along major water courses.		Long	
Knowledge	Inventary and characterization of biodiversity.	To know the components of biodiversity, the conservation needs and the potentials and opportunities for biodiversity utilization.	Middle	<ul> <li>WWF (World Wildlife Fund) Indonesia</li> <li>Global Enviromental Facilities</li> </ul>
	To recovery and To know and to promot traditional traditional pactices in th knowledge and management of the natura practices. resources.	Middle	(GEF)  • Private investment	
	Establishment of geographic information systems	Monitory of the land uses and environmental changes, this is an importan tool for planning.	Middle	Cooperation projects with Centre for International Cooperation in Management of Tropical Petlands
Use/utilization Use/utilization Use/utilization Use/utilization Promotion of better practices for food production. To develop the economic potential of biodiversity. Establishment of systems for cleaning residual waters. Training and education	Improvement of the nutritional level of population.	Long	(CIMTROP) and Towards Sustainable Livehood in Central Kalimantan (TSLiCK)	
	To develop the economic potential of biodiversity.	Local communities organized and achieving enterprises initiatives.	Long	<ul> <li>Opening spaces for students from Indonesia and around the world, to come to the area to make their thesis in related topics with their own financial assistance.</li> <li>KUK – Kalimantan Unggul Kanca</li> </ul>
	Establishment of systems for cleaning residual waters.	To improve water quality.	Long	
	<ul> <li>Training local communities in academic, echnical and enterprise areas with the puroposeof encourage them to work in their own benefit.</li> <li>To develop communicative programmes and didactics materials about conservation themes.</li> </ul>	Middle	<ul> <li>KTD – Kalimantan Tourism Development</li> </ul>	

### Summary

#### 1. Conservation strategy

• A synthesis of the main problematic situation identified by communities located around Tangkiling / Rungan Sari and by the environmental diagnosis made, allowed to formulate a strategy for natural resources management in Tangkiling and Rungan Sari area:

**Principle:** The strategy addresses the conservation of the relevant elements of the landscape and the management of the available natural resources, leading to a rehabilitation of degraded lands, conservation of forest remnants and improvement of the local community's economy.

#### Potential institutions involved, e.g.:

- World Subud Association
- LPKB (TSLiCK Project)
- Communities
- Government
- Palangkaraya University
   and
- EU and World Bank

### Summary

#### 2. Main points of the strategy

The combination of social and technological elements, as well as research, education and institutional cooperation is bound to lead to the conservation of the selected landscape. The main points of the strategy are described below:

**A.** Environmental zoning for land rehabilitation, management, and proper use of the available land.

**B.** Monitoring, research and a geographical information system - data base (GIS) is required in aspects such as: Rehabilitation of degraded lands, agro-forestry, agriculture and biodiversity.

C. Education and conscientiousness:

- Technical formation

- Business formation

- Academic formation with environmental emphasis

- Communication programmes for spreading knowledge of the local ecosystem, biodiversity, fire problem awareness and fire prevention

- Ecotourism

**D.** Institutional cooperation

- Participation and coordination of the local, national and international institutions both govern-mental and non governmental

- Communitarian organization, participation and self-management



### Tangkiling sun set



## KALTENGCONSULTANTS Tangkiling area: LANDSAT TM 8 July 1994



#### TM channel: RGB = 542 near Infrared and visible

TM channel: RGB = 321 visible spectrum

#### NDVI + TM + AVHRR-channels

NDVI is a vegetation index expressed by the conbination of Red reflectance and Near Infrared reflectance, see below

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#### Land cover in Tangkiling area

12 km x 18 km with grid



