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Tropical peatland fire: “causes, effects and protection in the case of Central Kalimantan”

Presented on “Workshop on region specific systems and activiyy in overseas research & student exchange promotion office (ORSE-PO)”, Hokkaido University,
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Background.....

- ➡ Fire is a major threat to the peatland and forest exists and more danger compare than illegal logging.
- ➡ Peat fire difficult to stop, taken time, high cost, and **produce many kind of gases** i.e. CO₂, CO and so on.
- ➡ Wild fire is always occurring in Central Kalimantan certainly any reason which related to the local people, and wildfires spread easy everywhere since 1997

Causal factor of fire.....

1. Human behavior

a. Intentionally or accidentally to make fire:

☛ This case was indicated by hotspot always started from human access are road, river, canal, lake, temporary stay in the forest, and human activity i.e. plantation (company/private), mining (company/private),

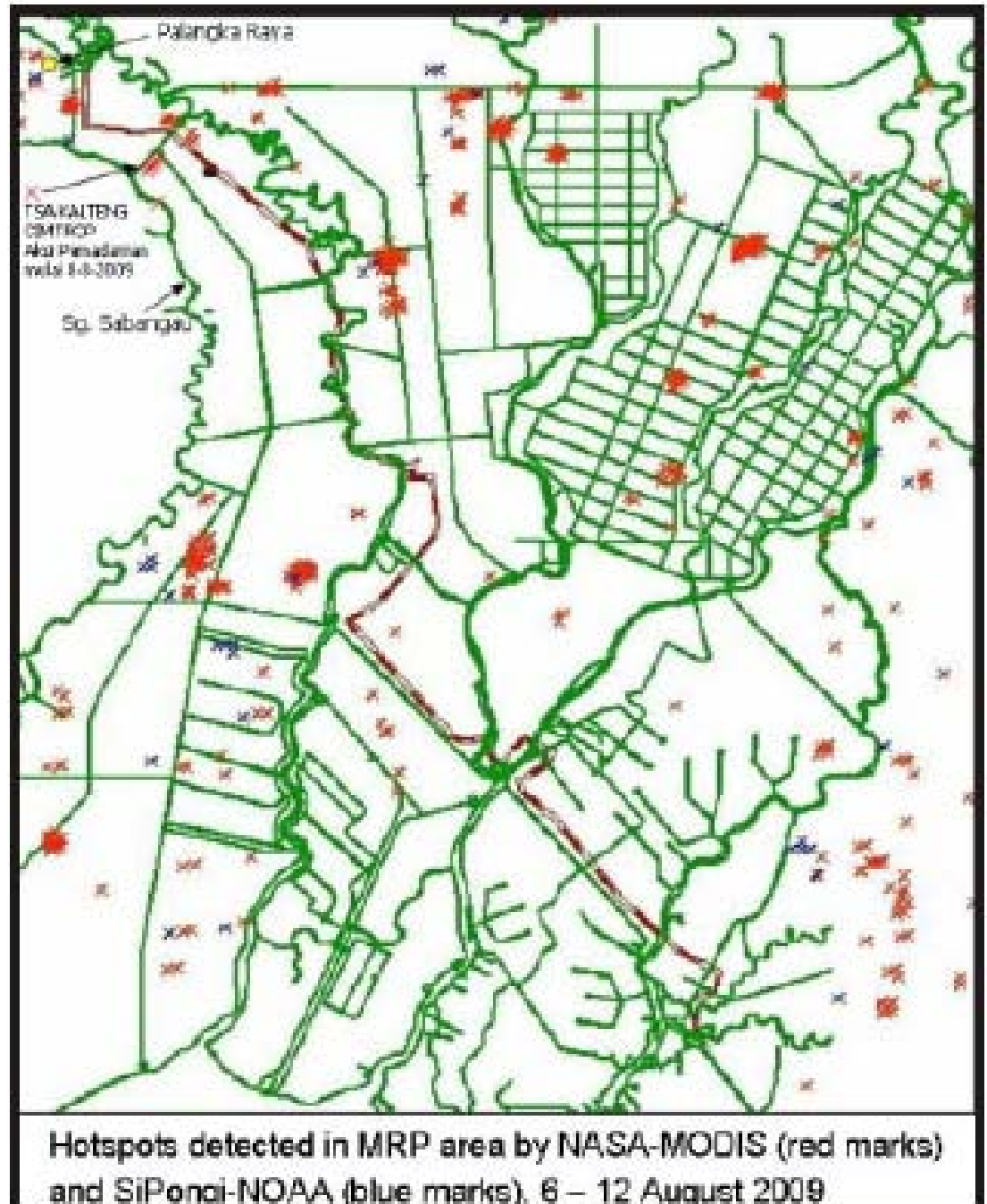
☛ Near the road



Near the canal ☛



Hot spots
appeared near
human access



Why they make fire:

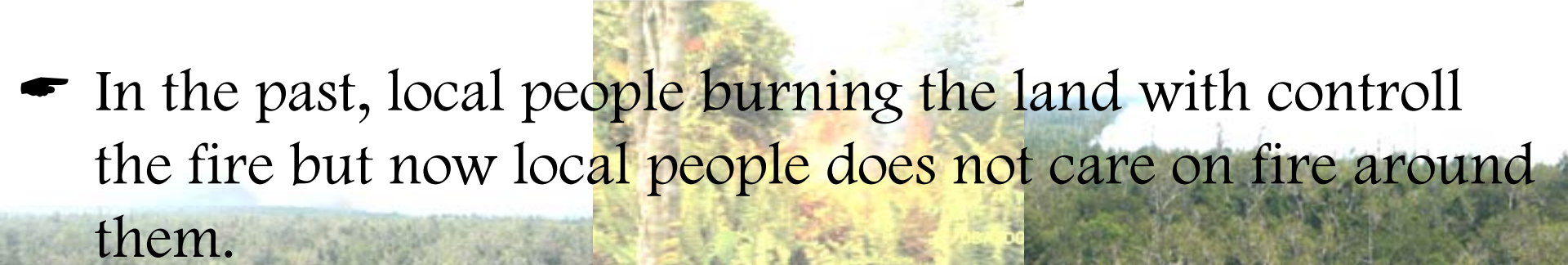
a. Intentionally, e.g.

1. To clearing the land and open new area for agriculture system (new plantation). The burning system is easy and cheap way to clearing the land.
2. They want to get nutrient addition from burning the land, and they can not maintenance of agriculture system without burning the land.

b. Accidentally, e.g.

1. Uncotrolled burning of the land
2. Discard cigarrete butts carelessly





☛ In the past, local people burning the land with controll the fire but now local people does not care on fire around them.

Why?

Their land rights and environments rights based on the traditional law have loss by the Government policy. All of forest and land in Central Kalimantan have divided to the forest company, plantation company and mining company.

☛ Local people has loss their trust to the Government.

Why?

Government more pro to the company compare than to the community.



- ☛ Local people was lack self-confidence.

Indicator :

They have exploit and destroy of natural resources without control (from friendly to be enemies).

Why?

- (1) They do not believe can survive by managing other source of income
- (2) If new comer can exploit natural resources, why they don't?

Causal factor of fire.....

2. Natural condition (dry season).

- ☞ Government program in the past for make irrigation with big canal, therefore peat surface became very dry especially in the dry season and if burned difficult to control and taken time to stop.
- ☞ More danger if Elnino came to this area with strong windy, especially peat fire in 2009

➡ May effect to:

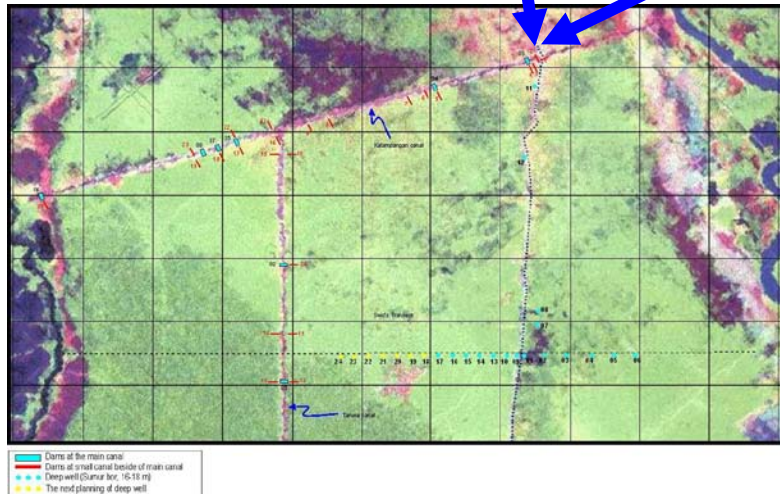


Water is just below irrigation canal bottom surface only two weeks after start of the dry season



dry season 2002

dry season 2005



If rainy season became flooded



Fig . Kalampong Canal-Block C at the Ex-MRP

Effect of fire....

1. Impact on environment:

- a. Reduce absorbing/maintaining the carbon store as forested undrained peatland
- b. Increase climate change effect by releasing greenhouse gases, especially CO₂
- c. Peat layer lost (subsidence)
- d. Change hydrology status, nutrient balance in soil, etc.

Peat layer loss by fire

Typical peat depth lost by fire events:

Kalampangan 2002

- Deep peat : loss 0 – 42.3 cm (Average 22.04 ± 12.09 cm)

Kalampangan 2006

- Deep peat : loss 18 – 60 cm (average: 34.7 ± 14.51 cm)
- Deep peat : loss 16 – 43 cm (average: 31.7 ± 11.11 cm)

Tumbang Nusa 2006

- Deep peat : loss 16 – 55 cm (average: 34.1 ± 13.35 cm)

NLPSPF-Sabangau 2006

- Shallow peat : loss 15 – 24 cm (average; 19.7 ± 3.20 cm)

Vegetation
changed,
hydrology status,
etc.



2. Impact on habitat and biodiversity:

a. Plants :

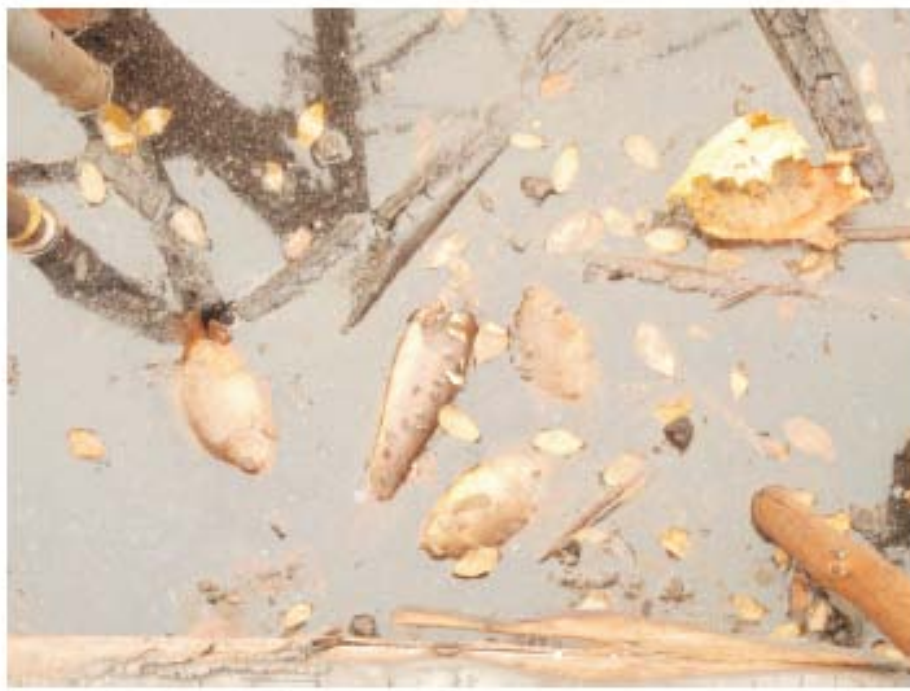
- ~ Vitality and viability of plants & reduced plants growth and reproduction.
- ~ Vegetation will be change.

b. Animals :

Immigrate and die in the fire, feeding in source in limited, e.g. after peat fire happen in Kalamangan zone, the farmer difficult to get local feeding (Sesenduk plant) for their goat. They should go very far places that still remaining Sesenduk plant.

c. Microorganism:

Reduced growth and kind of species of microbes in peat forest area or there several microbes will be lost



Fish died in the canal near
base camp in Kalampangan
zone, October, 1st, 2009



Vegetation changed after peat forest,
July, 2009

3. Impact on health:

Fig. Low visibility in the Palangka Raya area because of dense haze on September 23rd, 2002 ☞



- a. Quality of life (Meneg LH, 1998a)
 - ~ reduce their work : 275,660 people
 - ~ Stopped working : 141,714 people, during forest fire and thick smoke
 - b. Public health in Central Kalimantan. Based on Meneg (1998a), the estimation of health problems in Central Kalimantan caused by forest fires is as follows:
 - Death:** 29 people, **Asthma:** 17,270 people, **Bronchitis:** 3,366 people, **respiratory disease:** 83,772 people.
- In this year (2009), part of fire fighting team of Cimtrop Unpar (TSA members) getting sick and their leg was burned when they try to stop the fire.

4. Impact on National and regional economics

1) National Losses (2002)

~ Dirgantara Air Service (DAS)	Rp. 0.23 billion
~ Merpati Nusantara Airline	Rp. 10.60 billion
~ Mandala Airline	Rp. 2.80 billion
~ Garuda Indonesia Airline	Rp. 76.80 billion
~ Bourag Airline	Rp. 0.95 billion

2) Local economics

- ~ School closed
- ~ people stay at home/limited time for working
- ~ Food supply difficult and prices increasing
- ~ Reduce their income because many agricultural field of farmer was burned especially in this year (2009), e.g. rubber plantation and fruit plantation (banana, rambutan, manggo, durian, etc.)

5. Impact on research:

In this year 2009, all of research facilities in Kalampangan zone (base camp, permanent plot for regrowing of native species (reforestation), small tower in open area, water table and gases equipment) was burned, except high tower.



Fig 48. Small tower (Japanese tower)



Fig 37. Chamber for Gasses measurement (04.10.09)



Fig 46. Japanese tower : Fence of small tower (05.10.09)



Fig 47. All of cable for gasses measurement was burned (Japanese tower, 05.10.09)

Effort for protect and suppress the fire....

1. Government :

- a. Government made fire fighting team (**Manggala Agni team**) to control peat fire.

This method have limitation because:

- ~ their method only spraying water using a pipe and source of water should they bring with big tank in the car. That is why they only suppress fire near the road and can not suppress fire if appear from central of forest (limit in method, acces to central of forest, time, and source of water)
- ~ they never stayed near the hot spot or control the fire until night time

- b. Government make **artificial rain and water bomb**. For example since August 16 until the end of October 2009, our government spent around **Rp 23 miliar (US \$ 2.3 millions)**. We taught this method still have limitation because:
- ~ expensive method
 - ~ Suppressing surface fire only during the day. This was not effective because the unseen fire would come out at night and re-burning at night because peat fire difficult to stop.



2. Community :

- a. Several farmers control fire only near their home and their plantation by simple tool e.g. flushing with a bucket, but a few farmer already used spraying water with a pipe and machine.



b. CIMTROP-Unpar developed several ways to protect peatland fire by:

1. Make fire fighting team or **Tim Serbu Api (TSA) Kalteng** and developed two methods to control peatland fire (TSA's method)
2. Restoration of hydrological status with establishment of DAM along the canal (**Blocking canal system**)
3. Reforestation by **planting of native species and conducted a new system; called Buying Living Tree System (BLTS)-Suwido's method**
4. Education

Why CIMTROP-UNPAR established Fire fighting team (Tim Serbu Api-TSA)?

Cause:

1. wildfires spread easy everywhere since 1997
2. management by Indonesian government has been implemented without involving local communities and is always ineffective and inefficient.

TSA CIMTROP-UNPAR Concepts:

1. Member of team are involving local communities surrounded the fires spread.
2. The TSA always stay near the hotspots and work until the fire has totally stopped
3. The TSA activity is not dependent on water available on the surface (ditch, channel, lake or river), because in the dry season water is limited and not located near the hotspot. The TSA always make deep wells near the hotspots (12 – 24 m depth)
4. The TSA always suppresses the fires by blocking the hotspots by making fire transects and digging deep wells. Therefore, they must carry all equipment to the vicinity of hotspots

TSA decided to worked out fire suppression by themselves using two methods:

1.KATIR

2.BOMTIK.



KATIR Method

☞ Sekat bakar diairi (KATIR), is action for stopping the spreading of fires by making ditch by 30~50 cm deep and then to be filled in with water (especially on peat land).

☞ Where as on dry land “sekat bakar”, is sufficiently by clearing off vegetation/debris by about 1 meter wide.

☞ The digging of the peat layer is meant to facilitate fast horizontally and vertically water absorption to the ground so that fire could not spread through underground peat layer. In this way, fire will not be able to cross over the “sekat bakar” and so that other threaten areas will not be burnt out.

Fire transect 1.8 long at the ex of MRP Block C
(2002)



Fire transect 1.8 long at the ex of MRP Block C
(2002)





Fig. Ex Big Fire 2002 near Tower at Kalampangan Zone

BOMTIK Method



- ☞ BOMTIK: “Bom air plastik”, is water-contained plastic bag used like a bomb is made by using (sugar) plastic bag. One BOMTIK can contain 1.0 – 1.2 liter of water.
- ☞ For boring process, water had been prepared in a galon and as well as in BOMTIK: 150~200 liters. TSA’s experience showed that to reach 12~16 meters took 1.5~2.0 hours.
- ☞ Every person could bring 30~50 BOMTIK safely
- ☞ If every family can produce 10 BOMTIK per day, and if only carried out by only 5,000 families in Palangka Raya, so there will be 50,000~60,000 liters of water could be moved around the fire site everyday.



Gbr 19. Pembuatan Bomtik untuk dibawa pada waktu patroli (29.08.09)



Application of
BOMTIK
method



Gbr 25. Aksi pemadaman mematikan titik api yang kecil (30.08.09)





TSA are assigned task and responsibility according to their group as follows:

- 1). TSAU-1 arranges accommodations and equipment,
 - 2). TSU-2 Observing water sources, and making pipe well and as well as installing water pump machines,
 - 3) TSAU-3 observing and analyzing hot spots,
 - 4). TSA-4 operating pump machine and spraying hot spots.
- Each of the group is provided with at least 1 Handy Talkie (HT), and except for TSAU-4, two persons responsible for every machine; one person holding in the middle of the pipe and one person should standby holding the nozzle.

Prevention and suppression program by TSA KALTENG



Fig 3.3. British Ambassador and members of TSA KALTENG
Suppression Program in 2005 in Palangra Raya (27.09.09)



3br 4,5,6 dan 7. Mengatur strategi dan apel untuk
pengarahan dan rencana pemadaman selanjutnya
24.08.09)



TSA KALTENG Activities (drilling deep well) on fires



Gbr 33. Penampungan air
untuk mereli mesin pompa
(13 Agustus 2009)



(11 Agustus 2009)



Gbr 28,29,30. Sumur bor digali pada malam hari.
Ada hujan pada malam hari (11 Agustus 2009)



Gbr 34,35,36. Sumur bor digali pada malam hari
(13 Agustus 2009)



Fig 13. Kitso's team walking to the Base Camp (25.09.09)



Fig 14. Big fire beside of canal move from north to base camp (25.09.09)



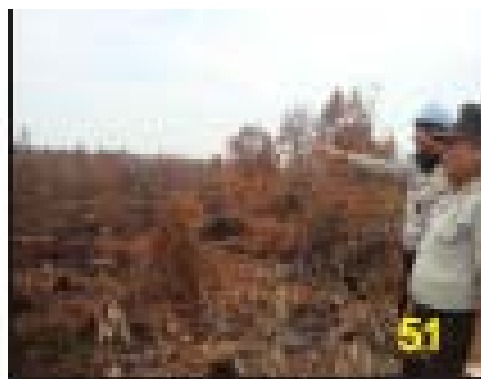
Fig 7 . TSA hard work to stop fire movement to dam 03 and watering land surface and trees (19.09.09)



Fig 10. (20.09.09)



Gbr 9,10,11. Anggota TSA menuju ke lokasi kebakaran membawa alat bor, mesin pompa, dll (8 Agustus 2009)



Gbr 51,52,53. Aparat Polsek Sabangau menyidik sumber api dan penyebab terbakar sepeda motor pada tanggal 8 Agustus 2009.

Ada hujan lebat sekitar 20 menit.

(8 Agustus 2009)

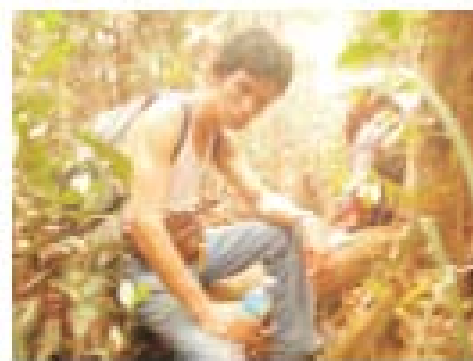


Fig 38. Some of the members of the TSA are sitting on the ground near the high tower. (05.10.09)



Gbr 37. Anggota TSA tidur dibawah tenda darurat. **Tak ada hujan** (14 Agustus 2009)



Fig 45. Part of TSA member resting and take a lunch near high tower. (Taken on 05.10.09)

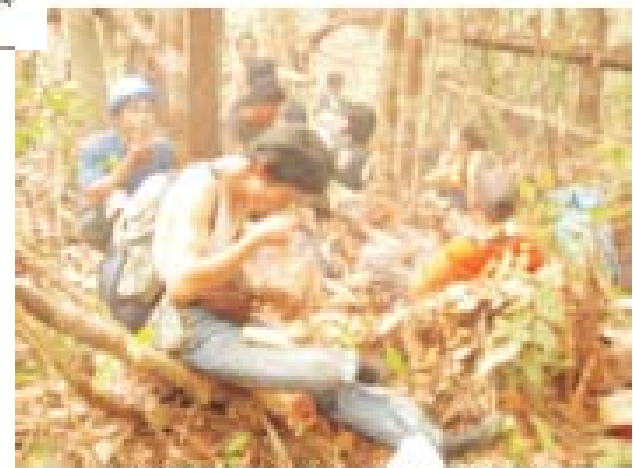


Fig 49. Take a lunch near high tower after walk more than three hours (01.10.09)



Fig. TSA KALTENG Team action

Activities CIMTROP- to conserve the NLPSF and Kalampangan zone by:
Damming of canal as one of priority needs to restore hydrological status

CIMTROP's collection photo

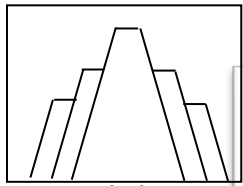


Fig.. The PUTSK and Local Community establishing DAMs

DAM design in peat swamp forest by CIMTROP-UNPAR

1. Terrace of full wall type

a. Without channel of water



Disain

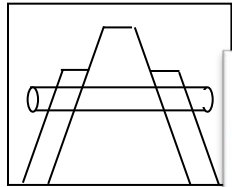


Dam 02



Dam 01

b. With channel of water



Disain

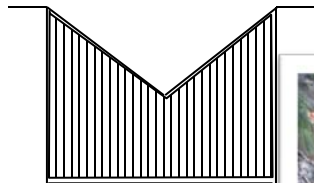


Dam 01



Dam 03

2. V-Vertical type (Swid V-v)



Disain

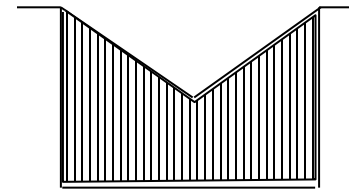


Dam 05

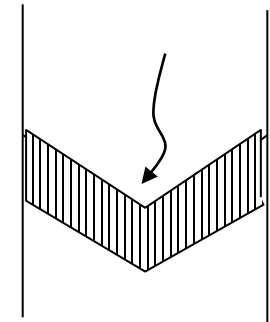


Dam di LAHG

3. V-Vertical-Horizontal type (Swid V-vh)

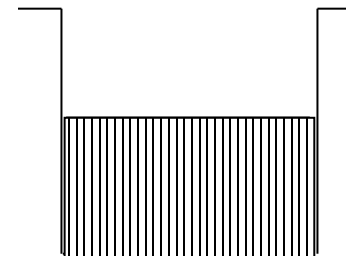


Disain Tampak Depan



Disain Tampak Atas

4. Half of DAM type (Swid-s)



Disain



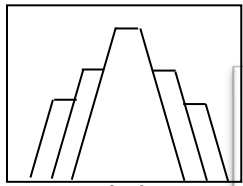
Dam 09

Fig. 4. The development design of DAM by CIMTROP-UNPAR (Limin, 2008)

DAM design in peat swamp forest by CIMTROP-UNPAR

1. Terrace of full wall type

a. Without channel of water



Disain

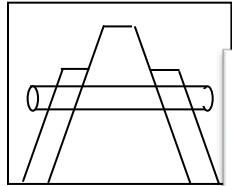


Dam 02



Dam 01

b. With channel of water



Disain

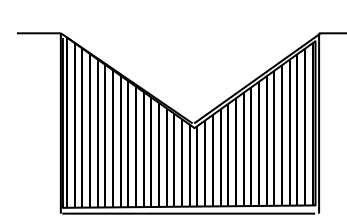


Dam 01

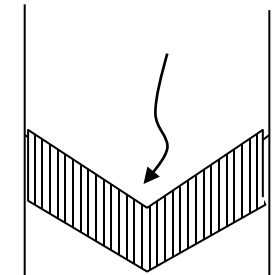


Dam 03

3. V-Vertical-Horizontal type (Swid V-vh)



Disain Tampak Depan



Disain Tampak Atas

4. Half of DAM type (Swid-s)



👉 Blocking canal
can raise the water table

Dam di LARU

Disain

Dam 09

Fig. 4. The development design of DAM by CIMTROP-UNPAR (Limin, 2008)



Fig. 71. Tumih before dam constructed between Dam 4 and Dam 03 at Kalampungan canal (July, 2008)

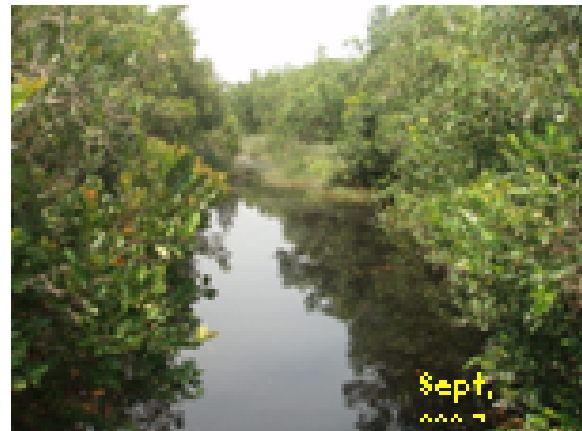


Fig. 72. Tumih after dam constructed between Dam 4 and Dam 03 at Kalampungan canal



Fig. 73. Tumih after dam constructed between Dam 4 and Dam 03 at Kalampungan canal



Fig. 74. Tumih after 2 month dam constructed between Dam 02 and Dam 01 at Tanjung canal



Fig. 75. Tumih after dam constructed between Dam 02 and Dam 01 at Tanjung canal



Fig. 76. Tumih after dam constructed between Dam 12 and Dam 01 at Tanjung canal

CIMTROP-UNPAR established of Buying Living Tree System

- ☞ Therefore, Limin has formulated a new system of reforestation ~ called “**Buying Living Tree System**” (BLTS) ~ which will give benefit: an increase of responsibility and awareness of the importance of conservation for local people in the villages

Source: Limin, 2008

1



Kahui (*Shorea balangeran*),
2 years after planting

5



2



Selection of seed trees
(Jelutung's seeds)

3



4



Planting and maintenance in the
experiment site

Nursery of Kahui (*Shorea balangeran*)
(165 days - seedling)

Fig.. Activity of BLTS team at post command TSA Kalteng Kalamangan

4. Education

Education for increasing awareness and knowledge on peat swamp forest function.

For example:

- a. High school student has used the NLPSPF for education and planting several native species (since 2003 – present)
- b. Field study of many agencies, especially for master course student, Ph.D student and volunteer from Indonesia, also from abroad



Foreign
scientist

Indonesia high school
students from
Palangka Raya city

Fig. Education and field study activities of high school students and scientist from abroad in the NLPSF - Sabangau

Conclusion....

1. Peatland fire is a **major threat** to the peatland and forest exists and more danger compare than illegal logging, difficult to stop, and influent environment, habitat dan biodiversity, health, and sosioeconomics.
2. All of people and stakeholders should be **made aware of rules, laws and regulations, clearly and positively**.
3. Fire fighting team can not protect peatland fire alone but need participate from all of people to protect and control fire. Need to **increase awareness** the people with **education promotion** to explain the effect and protection of peat fire of forest to local people, local government and decision makers; enable local professional development.
4. Need to **find a enviromentally friendly** to clering the land without burning, e.g. making compost, etc.
5. **Involve local people by empowering them** to be custodians of the peatland from which they will receive benefits.



Canal of Kalampangan

@Tatsuo Sueda, 2007

Gate to
Kalampangan
zone,
(Block C)

Base camp
of TSA

Palangka Raya
city

Pulang Pisau
regency

Thank you