



HOKKAIDO UNIVERSITY

Title	Future aspects of management in Toropical Peatlands
Author(s)	Setiadi, Bambang
Relation	泥炭地管理国際会議：熱帯および冷温帯泥炭地管理の在り方とその未来像 人と自然の調和とその持続性 (International Workshop on Peatland Management: Future Aspect of Management in Tropical and Cool Temperate Peatlands : Harmonious and Sustainable Relationship with Nature). 2013年10月10日 (木). 北海道大学百年記念会館会議室. 札幌市.
Issue Date	2013-10-10
Doc URL	https://hdl.handle.net/2115/53554
Type	conference presentation
File Information	No.2_Bambang Setiadi.pdf



International Workshop on Peatland Management

**FUTURE ASPECTS
OF
MANAGEMENT
IN
TROPICAL PEATLANDS**

By :

BAMBANG SETIADI

University of Hokkaido

October 10, 2013



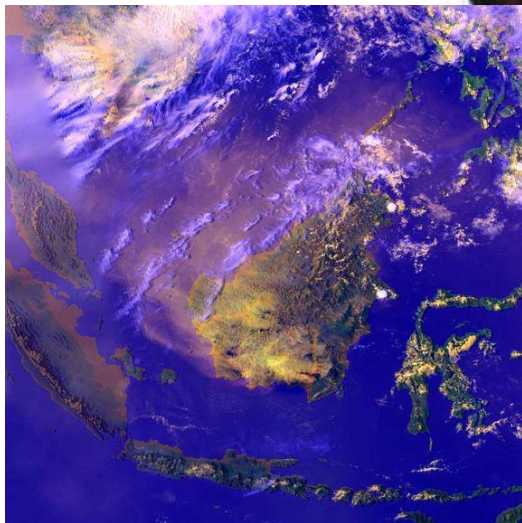
**ORBITING EARTH IN THE SPACESHIP,
I SAW HOW BEAUTIFUL OUR PLANET IS..
PEOPLE, LET US PRESERVE AND
INCREASE THIS BEAUTY, NOT DESTROY IT !**

YURI GAGARIN
First in space
12 April 1961.





**SAFE THE EARTH,
ITS THE ONLY PLANET
WITH PEATLAND....**



TARGET OF TODAY WORKSHOP :

WHAT...?

**FUNCTION
OF TROPICAL
PEATLANDS**

**DAMAGED
BY
HUMAN
ACTIVITY**

**BECOMING
GIGANTIC OF CARBON
EMISSION SOURCES**

PROGRESS...?

**HIGHLIGHT THE
LATEST SCIENTIFIC
AND
TECHNOLOGICAL
ADVANCES**

**MECHANISM
FOR
HUMAN ACTIVITY**

**THE REALIZATION
OF SUSTAINABLE
LOW CARBON
SOCIETY**

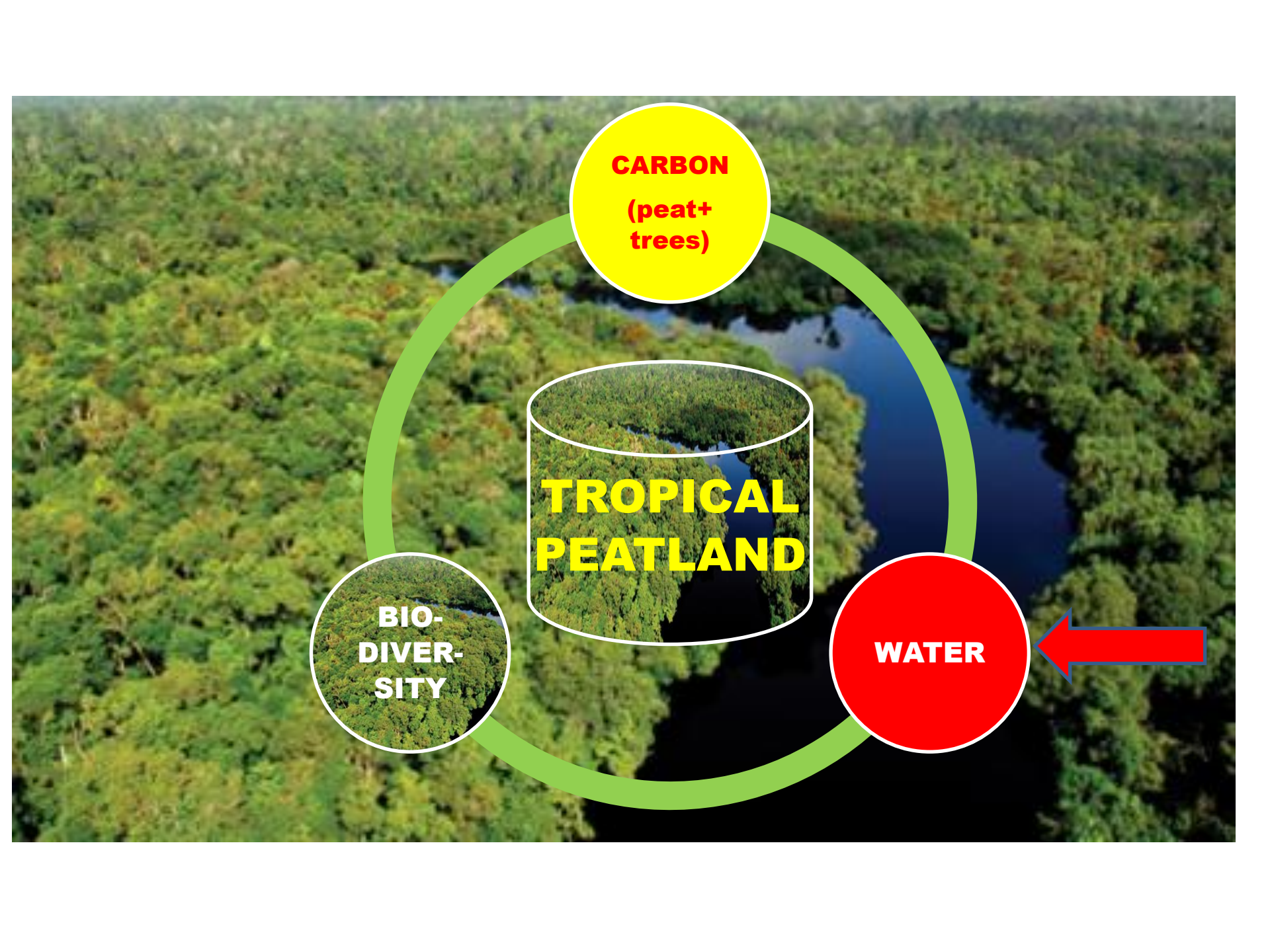
WHAT MAKE TROPICAL PEATLAND SO SPECIAL ?



PEAT IS :
***ORGANIC MATTER ACCUMULATED
THOUSAND YEARS , STORING CARBON IN
THICK LAYER***



KAMPAR LAKE, RIAU

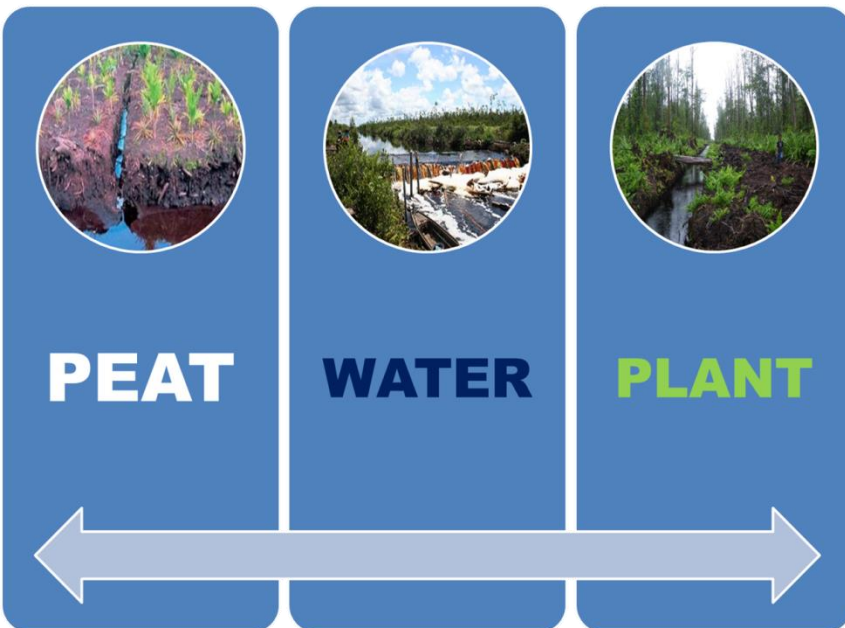
An aerial photograph of a lush green tropical forest with a winding river. Overlaid on the image is a diagram consisting of a thick green circular line. Three circles are positioned around this line: a yellow circle at the top, a red circle at the bottom right, and a white circle at the bottom left. A red arrow points towards the red circle from the right. In the center of the diagram is a white-outlined cylinder containing a smaller aerial view of the same landscape.

CARBON
(peat+
trees)

**TROPICAL
PEATLAND**

**BIO-
DIVER-
SITY**

WATER





**PEAT SWAMP FORESTS ARE IMPORTANT IN
GLOBAL CLIMATE CONTROL AND HARBOR
A HUGE AMOUNT OF GLOBAL CARBON.**

The Orangutan Tropical Peatland Project

"Working to Protect the Sabangau Peat-swamp Forest since 1999"



MEGA BIODIVERSITY



photo by Anup Shah



TROPICAL PEAT

HUGE AMOUNT OF
WATER



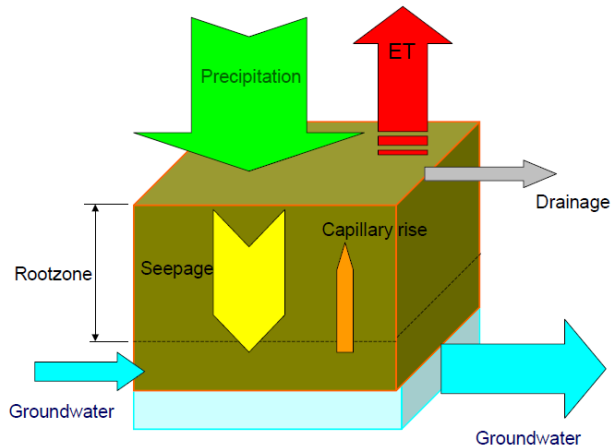


Figure 2 Schematic water balance of a unit area of tropical peatland (from Rieley & Page, 2005).

**Fresh water
balance
In the
tropical**



POTENTIAL CARBON CYCLING IN TROPICAL PEATLAND

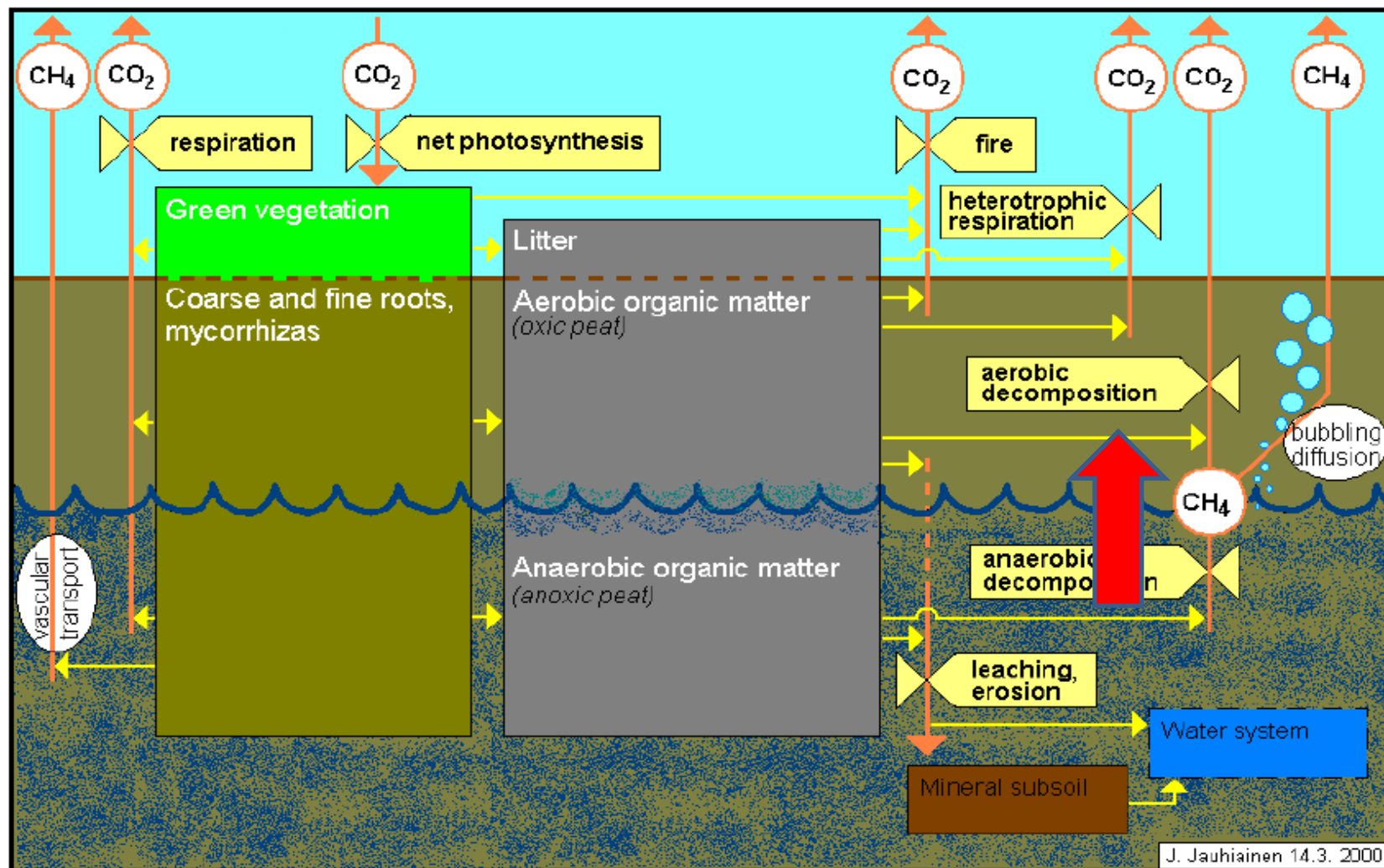
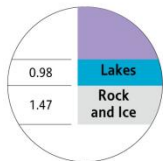
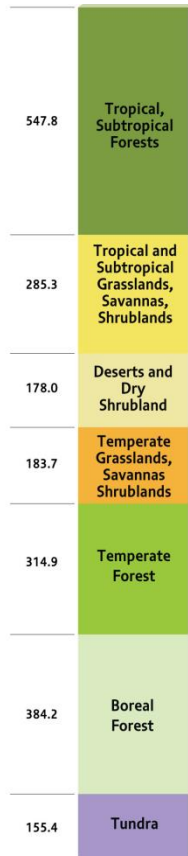


Figure 3 Potential carbon cycling pathways in tropical peat.

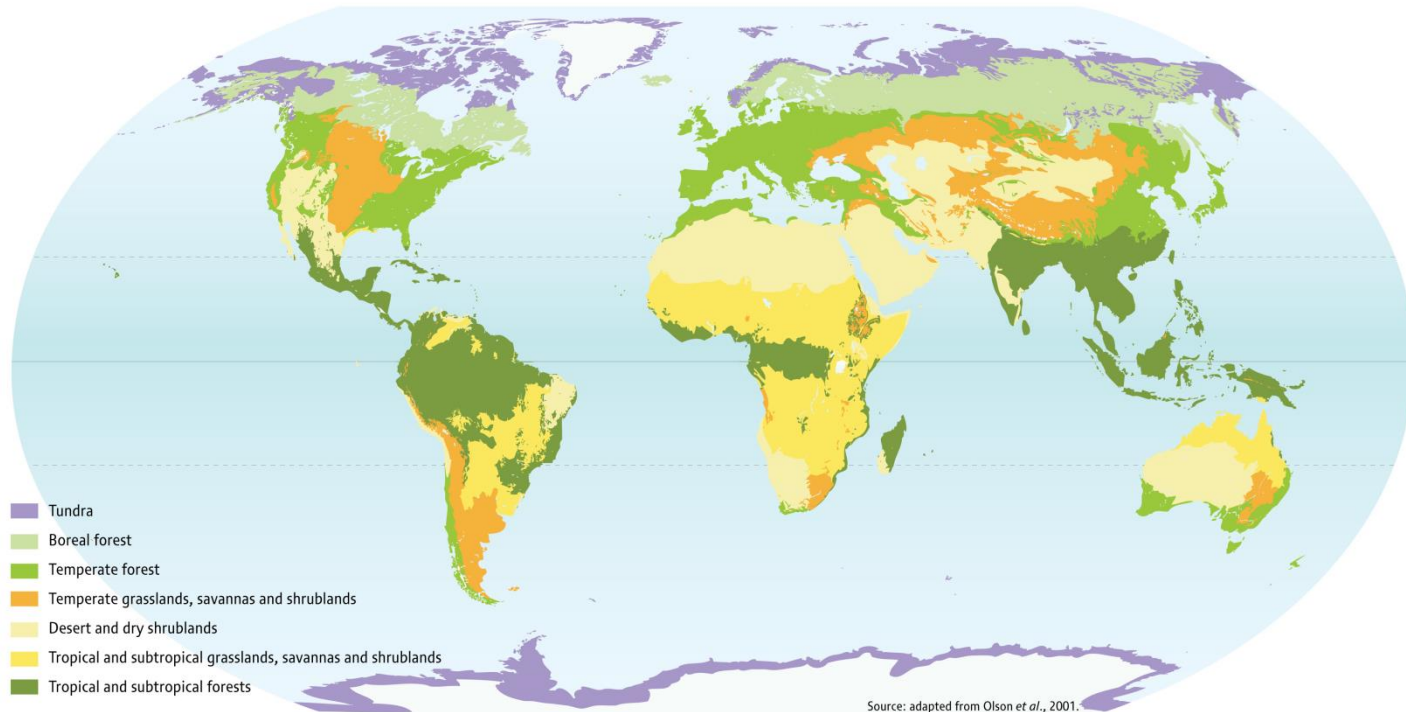
CARBON STORAGE IN ECOSYSTEMS

CARBON DENSITY IS PARTICULARLY **HIGH IN TROPICAL PEAT SWAMP**, WHERE DENSE VEGETATION AND TALL TREES MAKE UP A LARGE AMOUNT OF WOODY BIOMASS AND THE SOILS HAVE **VERY HIGH CARBON CONTENTS**.

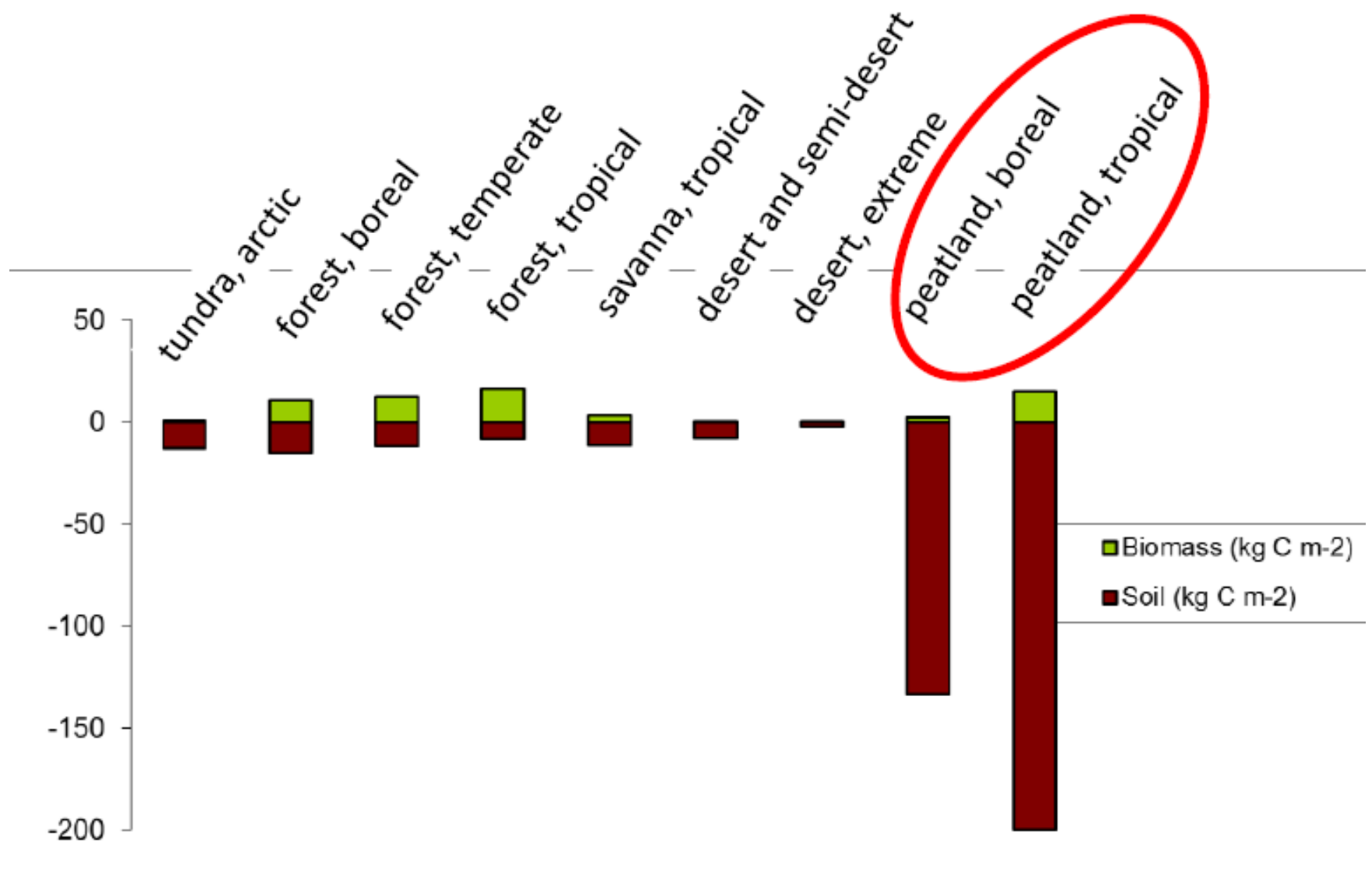
Carbon stored by biome
(Gigatonnes of C)



Source: UNEP - WCMC, 2009.



548 GIGATONNES OF C (GT C), IN THE WORLD'S **TROPICAL AND SUBTROPICAL FORESTS**,
BOREAL FOREST WITH **384 GT C**.
IN **TOTAL**, TERRESTRIAL ECOSYSTEMS **2100 GT C**.



Compared to other formations, peatlands contain disproportionately much carbon (largely in their soil)

Earth's Carbon Cycle

Atmosphere Carbon Store

**IF WE CAN NOT CREATE
PEAT OR WATER,
DON'T DESTROYED IT !!**

Coal, Oil & Gas

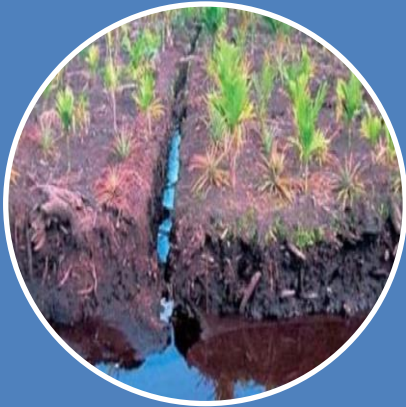
Limestone & Dolomite

Marine Deposits

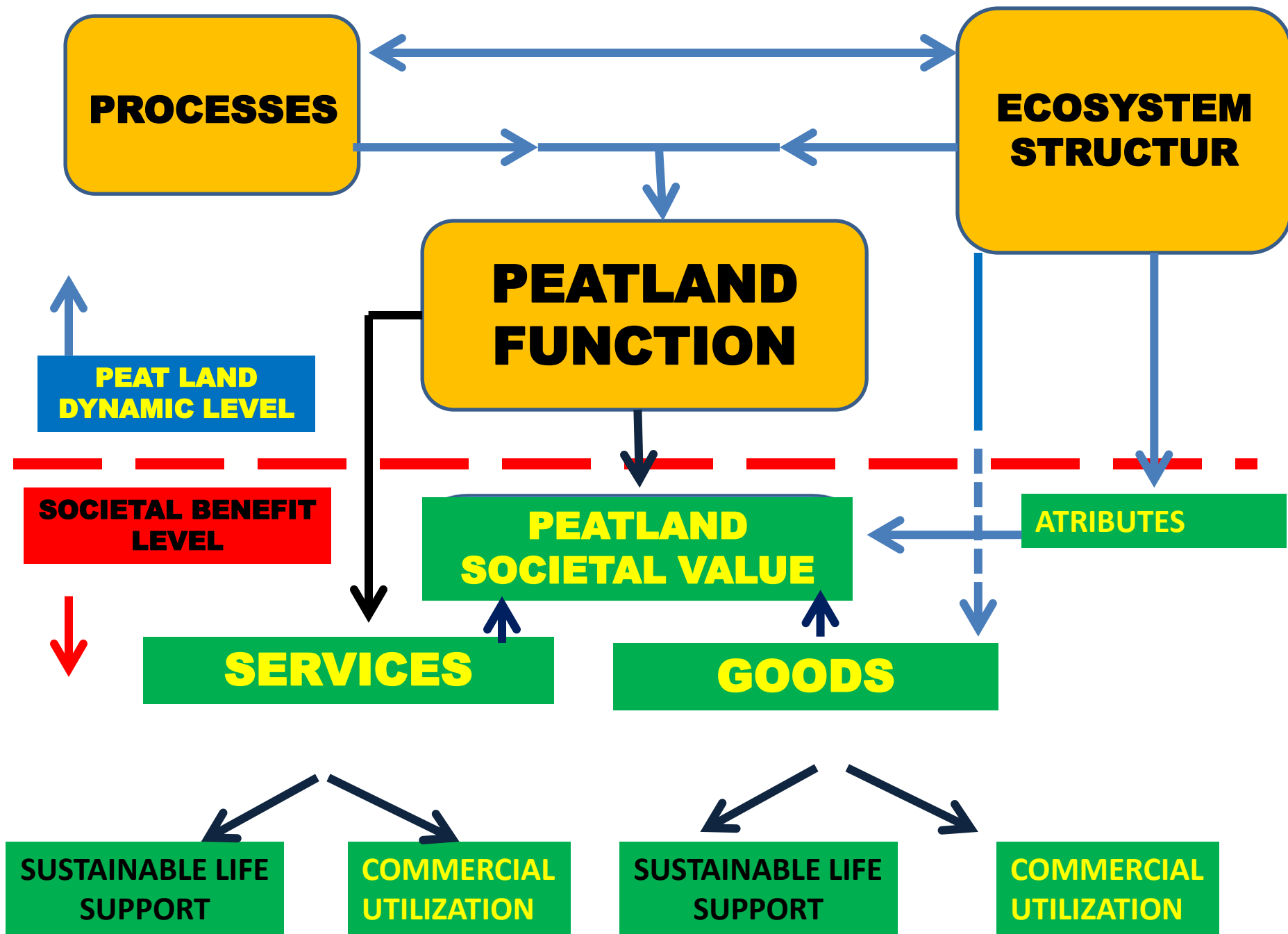
Lithosphere Carbon Store

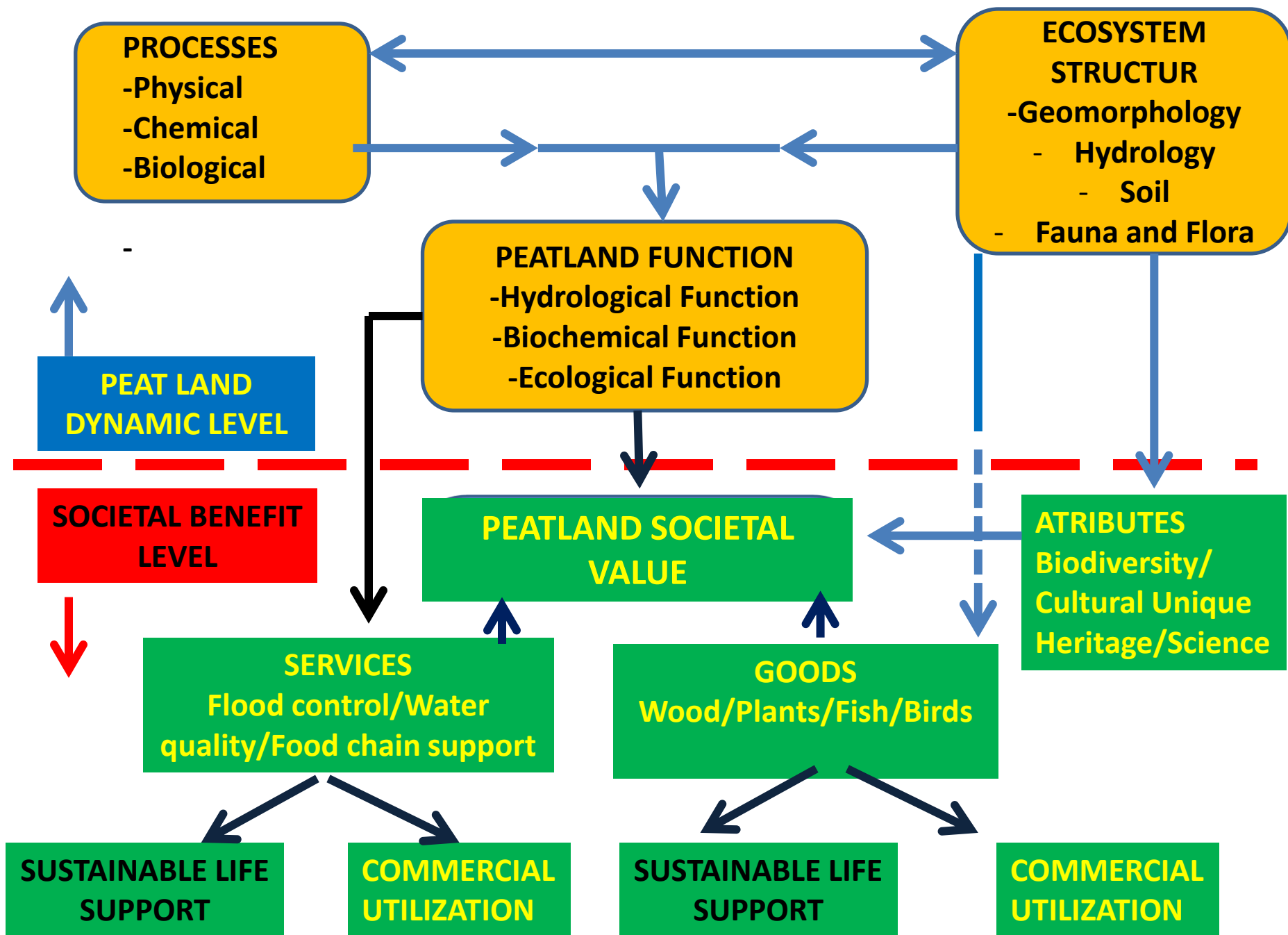
Ocean
Carbon Store





**WHAT WILL HAPPEN
IF WE DESTROY TROPICAL
TROPICAL PEAT LAND ??**







**IF WE DESTROY
TROPICAL PEAT**



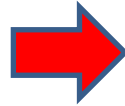


ON SITE

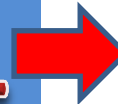


OFF SITE

LOCAL

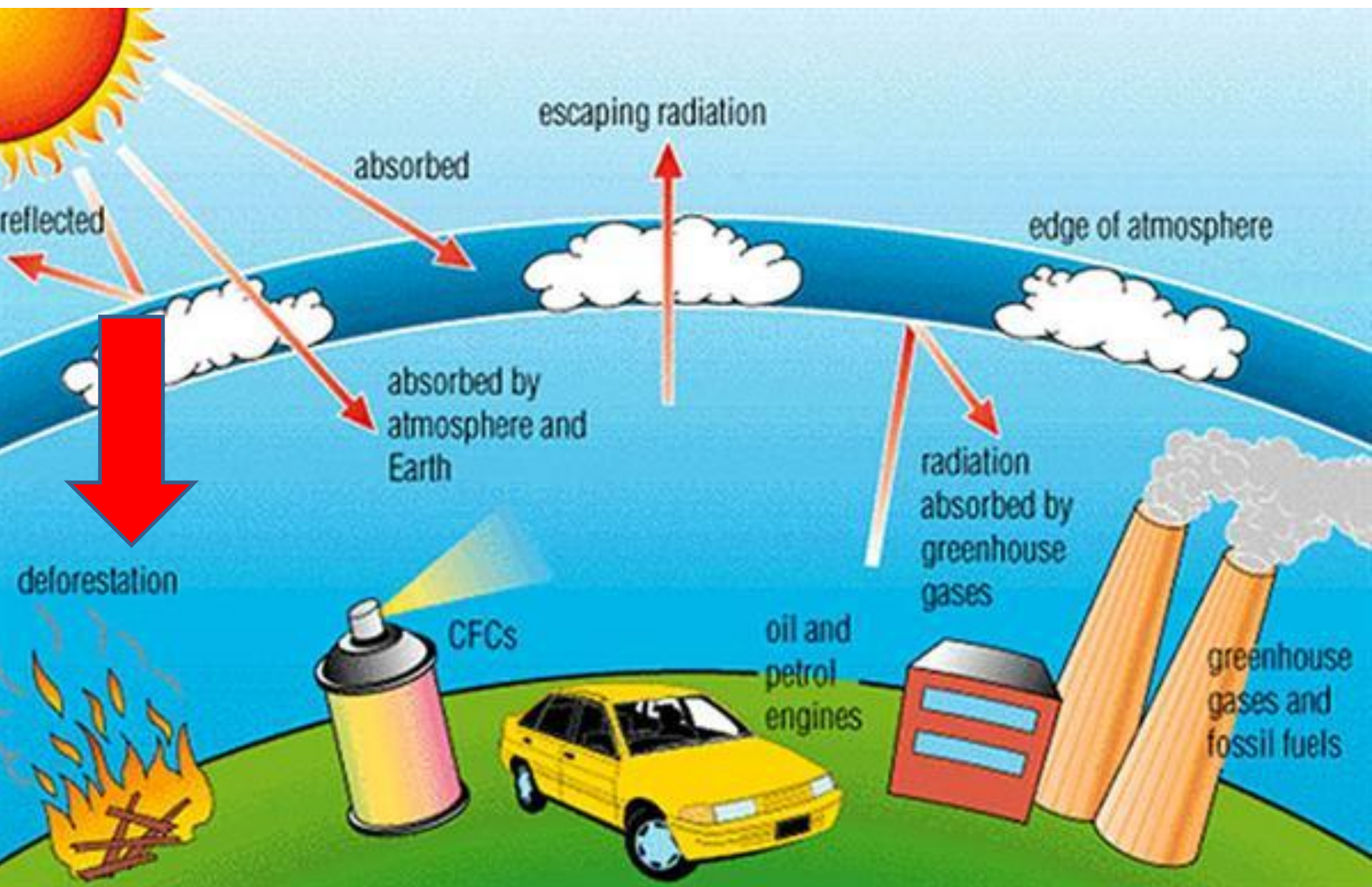


REGIONAL



GLOBAL





Global CO₂ emissions from drained peatlands

	Drained area (10 ⁶ ha)	CO ₂ (ton ha ⁻¹ y ⁻¹)	Total CO ₂ (Mton y ⁻¹)
Drained peatlands in SE Asia	12	50	600
Peatland fires in SE Asia			400
Peatland agriculture outside SE Asia	30	25	750
Urbanisation, infrastructure	5	30	150
Peat extraction	30	1	60
Boreal peatland forestry	12	1	12
Temperate/tropical peatland forestry	3.5	30	105
Total	63		2077

GLOBAL CO₂ EMISSIONS FROM DRAINED PEATLAND

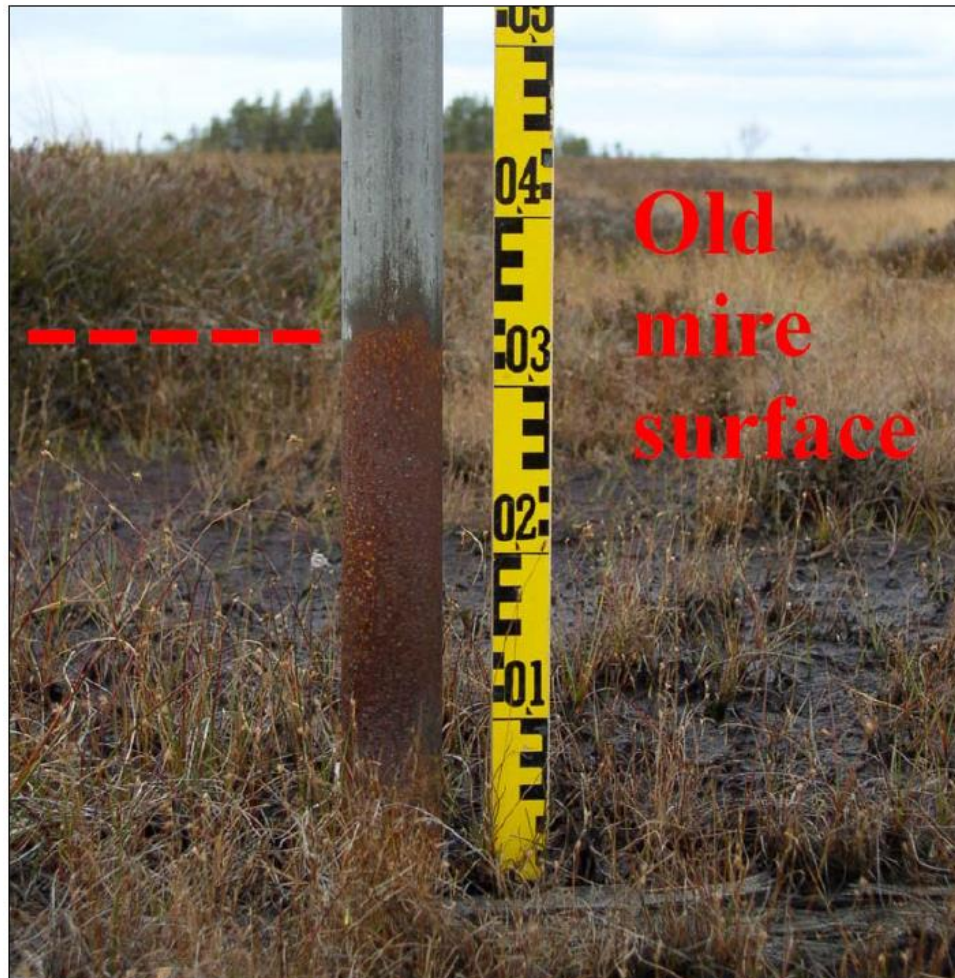
Joosten, Hans (2012)

DRAINED PEATLAND

**RESPONSIBLE
FOR 2 Gt of
CO₂ emission**



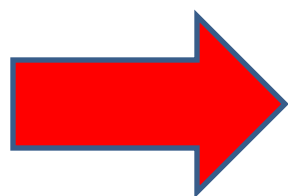
WHAT HAPPEN IF WE DRAIN PEAT



SUBSIDENCE LEVEL OF PEAT !!!

Top emitters (Mt a⁻¹)

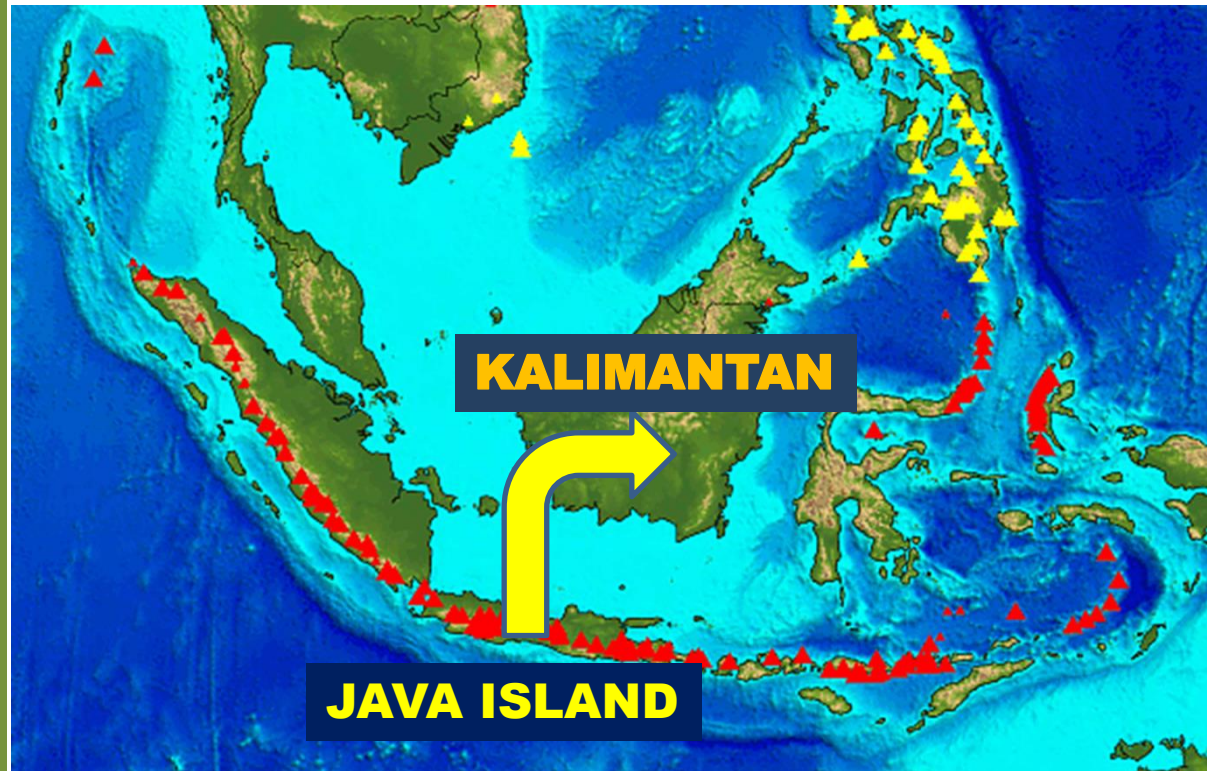
- The top (excl. extraction and fires) includes



Indonesia	500	Poland	24
Russia Eur. part	139	Russia Asian part	22
China	77	Uganda	20
Finland	50	Pap. New Guinea	20
Malaysia	48	Iceland	18
Mongolia	45	Sweden	15
Belarus	41	Brazil	12
USA (lower 48)	33	United Kingdom	10
Germany	32	Estonia	10

INDONESIA EXPERIENCE : MEGA RICE PROJECT ON TROPICAL PEATLAND

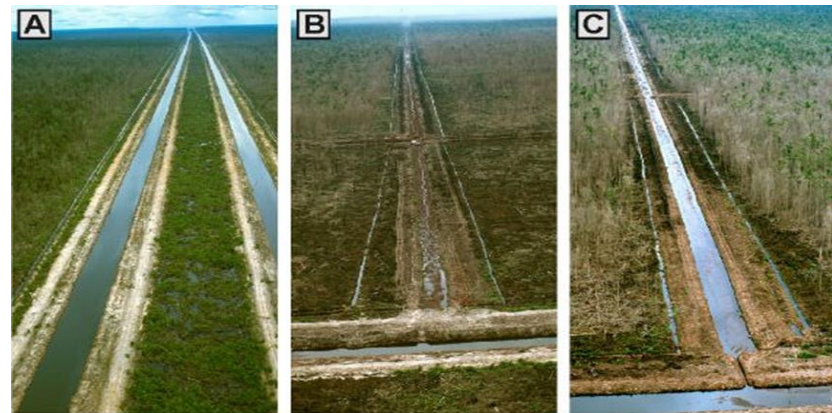
- 1980-1990 : IN JAVA ISLAND, RICE FIELD HAS CONVERSED INTO NON AGRICULTURE PURPOSES
- 100.000 HECTARES PER YEAR OR 1 MILL HA IN 10 YEARS
- GOVT. NEEDS TO SUBSTITUTE 1 MILL HECTARES FOR NEW RICE FIELD
- 1996 GOVT. ESTABLISHED MEGA RICE PROJECT IN TROPICAL PEATLAND IN CENTRAL KALIMANTAN



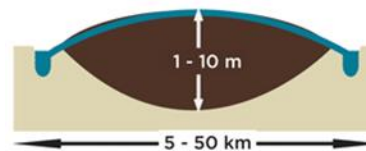
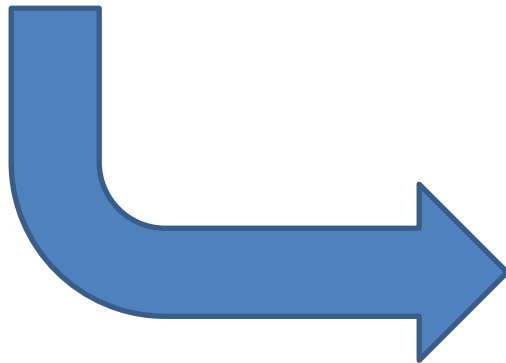
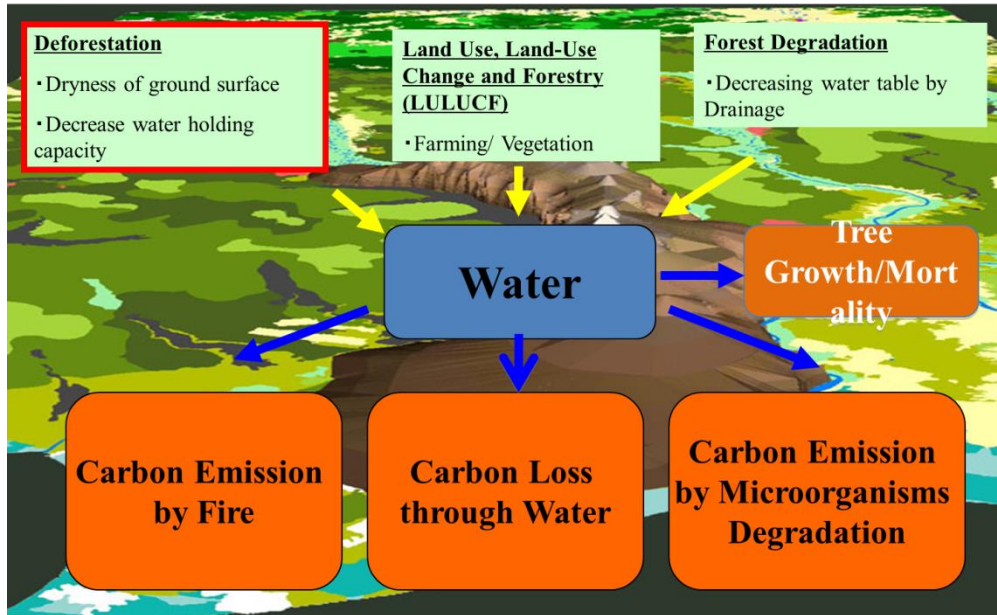
2.406.732HA IN **JUNE 1991** 1.560.377HA
(**64.8%**) WAS COVERED WITH FOREST



IN **MAY 1997** ; 1.377.442HA (**57.5%**); RES. IN
JULY 2000 ; 1.110.151HA (**45.7%**) WAS
COVERED WITH FOREST.



What Factors Regulate Carbon in Tropical Peat?



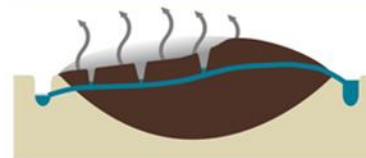
Natural situation:

- Water table close to surface
- Peat accumulation from vegetation over thousands of years



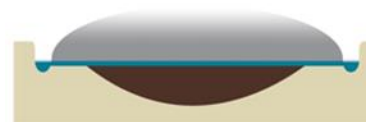
Drainage:

- Water tables lowered
- Peat surface subsidence and CO₂ emission starts



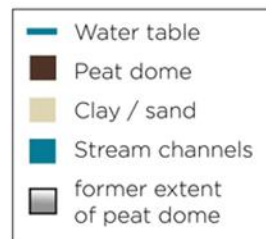
Continued drainage:

- Decomposition of dry peat: CO₂ emission
- High fire risk in dry peat: CO₂ emission
- Peat surface subsidence due to decomposition and shrinkage



End stage:

- Most peat carbon above drainage limit released to the atmosphere within decades,
- unless conservation / mitigation measures are taken

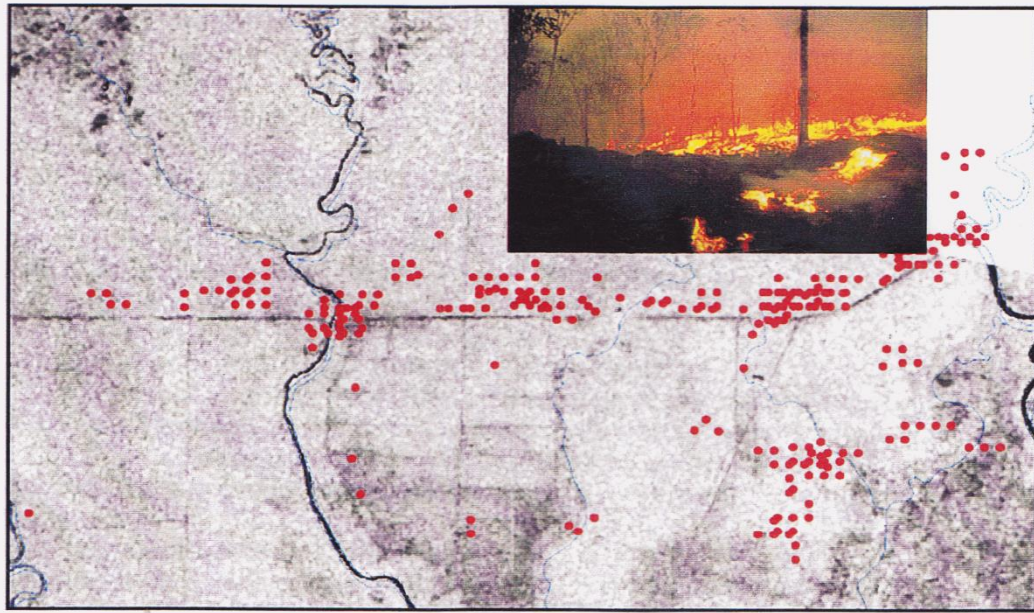


THE CONVERSION, DEGRADATION OR **UNSUSTAINABLE MANAGEMENT** OF TROPICAL PEATLANDS LEADS TO THE RELEASE OF CARBON TO THE ATMOSPHERE



**PEATLAND DEGRADATION
CONTRIBUTES UP TO
0.8 GT C PER YEAR**

**50% OF TROPICAL PEAT
FORESTS HAVE ALREADY
BEEN CLEARED**



FIRE HOT SPOTS



TROPICAL PEAT FIRES

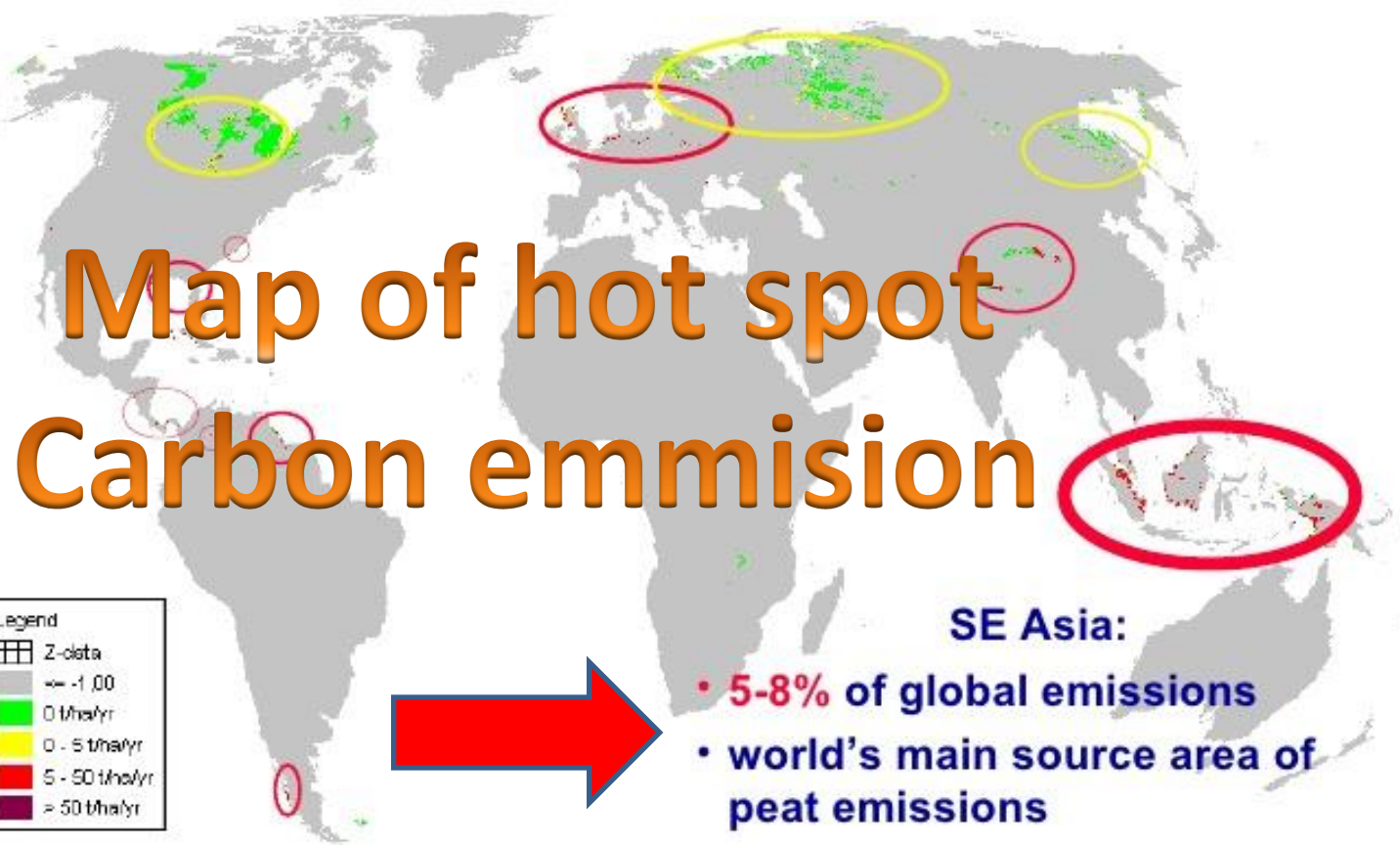
TOP 5 WORLD (2008) GHG EMISSION RANKING



COUNTRIES	Mt /a
INDONESIA	500
EUROPE	164
RUSSIA	161
USA	67
CHINA	66

Hotspots of CO₂ emissions from drained peat

< 0.5% of land surface → 9-15% of global emissions
~ half from Annex 1 countries



**H.E. PRESIDENT OF REP.INDONESIA
DR. SUSILO B. YUDHOYONO**



More than 80% of Indonesia's
emission result from deforestation
and degradation of carbon-rich
ecosystems like **peatlands !!**

DISTRIBUTION OF CARBON EMISSION IN INDONESIA

80%

FOREST AND PEATLAND FIRE



“INDONESIA WILL
VOLUNTARILY
REDUCE OUR GREEN
HOUSE GAS
EMISSIONS BY 26%
FROM BUSINESS-AS-
USUAL LEVELS BY
2020,”

G-8 Meeting Pittsburgh,
2009



**H.E. PRESIDENT OF REP.INDONESIA
DR. SUSILO B. YUDHOYONO**

HOW...?

YOGYAKARTA 1987

PROCEEDING

INTERNATIONAL PEAT SOCIETY
SYMPOSIUM ON

TROPICAL PEAT
AND
PEATLANDS
FOR
DEVELOPMENT

February 9-14, 1987
Yogyakarta, Indonesia

MANAGEMENT ECONOMICS AND
OTHER PEAT RELATED TOPICS

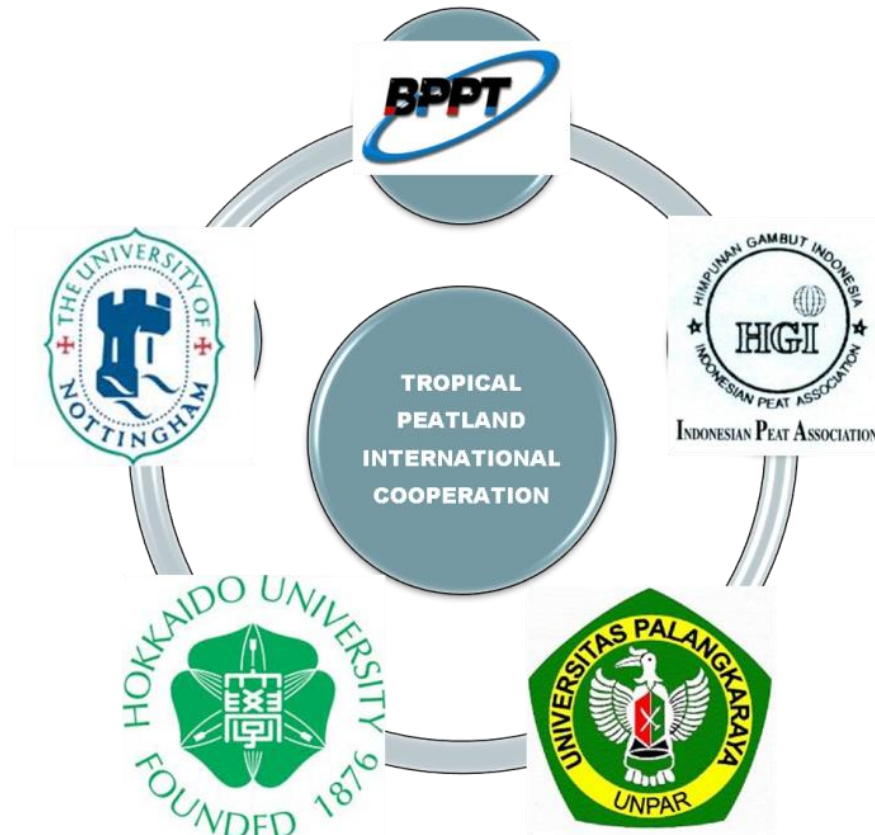
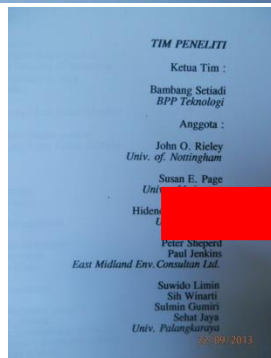
Organized by
GADJAH MADA UNIVERSITY
and

AGENCY FOR THE ASSESSMENT AND
APPLICATION OF TECHNOLOGY

- **PILOT PROJECT PANGKOH**
- **AGRO ECONOMY OF FARMING SYSTEM**
- **ENVIRONMENTAL ASPECT (ENERGY)**
- **CONSERVATION APPROACH**
- **PEAT FOR WASTE WATER SYSTEM**
- **THERE IS NO ISSUE : CARBON-SUBSIDENCE- WATER LEVEL- CLIMATE CHANGE**



PROPOSAL OF NATURAL LABORATORY OF PEAT FOREST (1993/1994)



**BAMBANG SETIADI – SUWIDO LIMIN –
JACK RIELEY – HIDENORI TAKAHASHI –
SUSAN PAGE**

1998 :



THE RECTOR OF UNPAR AGREED TO THE ESTABLISHMENT OF CIMTROP/UNPAR AS A SEMI INDEPENDENT INTERNATIONAL RESEARCH CENTRE (SEPTEMBER 1998 (2153/PT31/H/I/1998)).





Volunteers and staff at Barwan Camp





**UN Sec. Gen. BAN KI MOON
VISITED KALAMPANGAN AREA
Nov. 2011**







STRAPEAT SIBU - SESSANG MEETING
TANAHMAS HOTEL SIBU
4 - 5 APRIL 2002



STRAPEAT



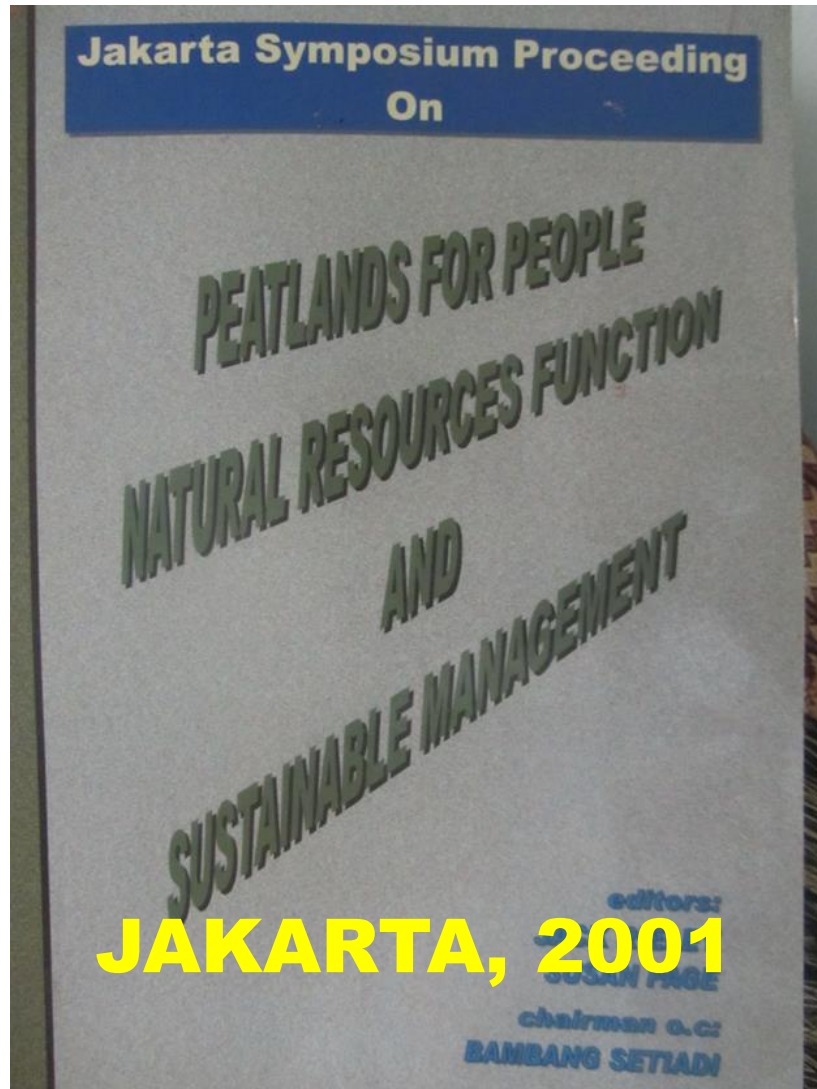
**ALL OF THEM
GRADUATED FROM
SEBANGAU !!!!**



BPPT – LOCAL GOVT.WEST KALIMANTAN

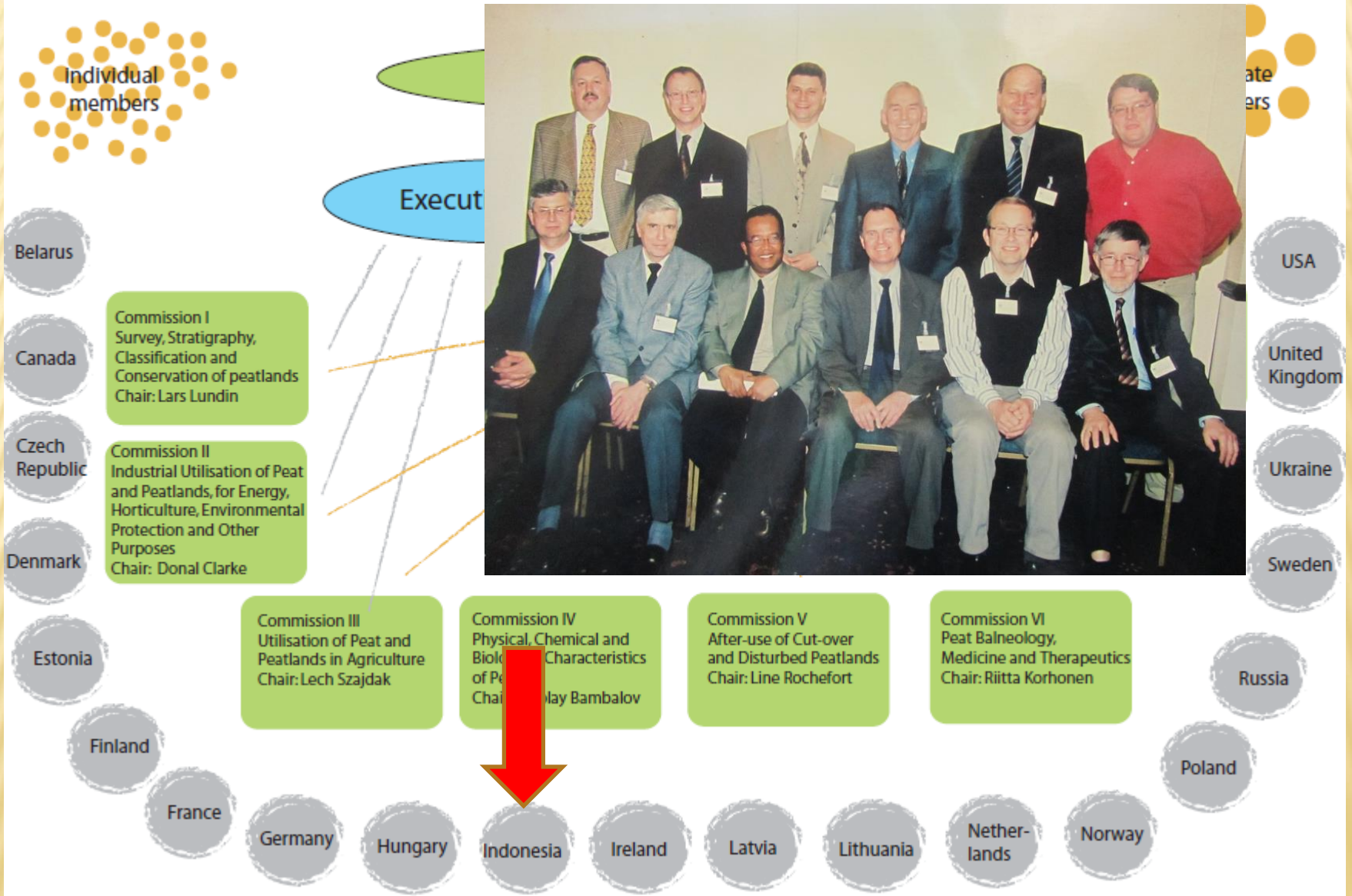


SUSTAINABLE MANAGEMENT OF TROPICAL PEATLAND

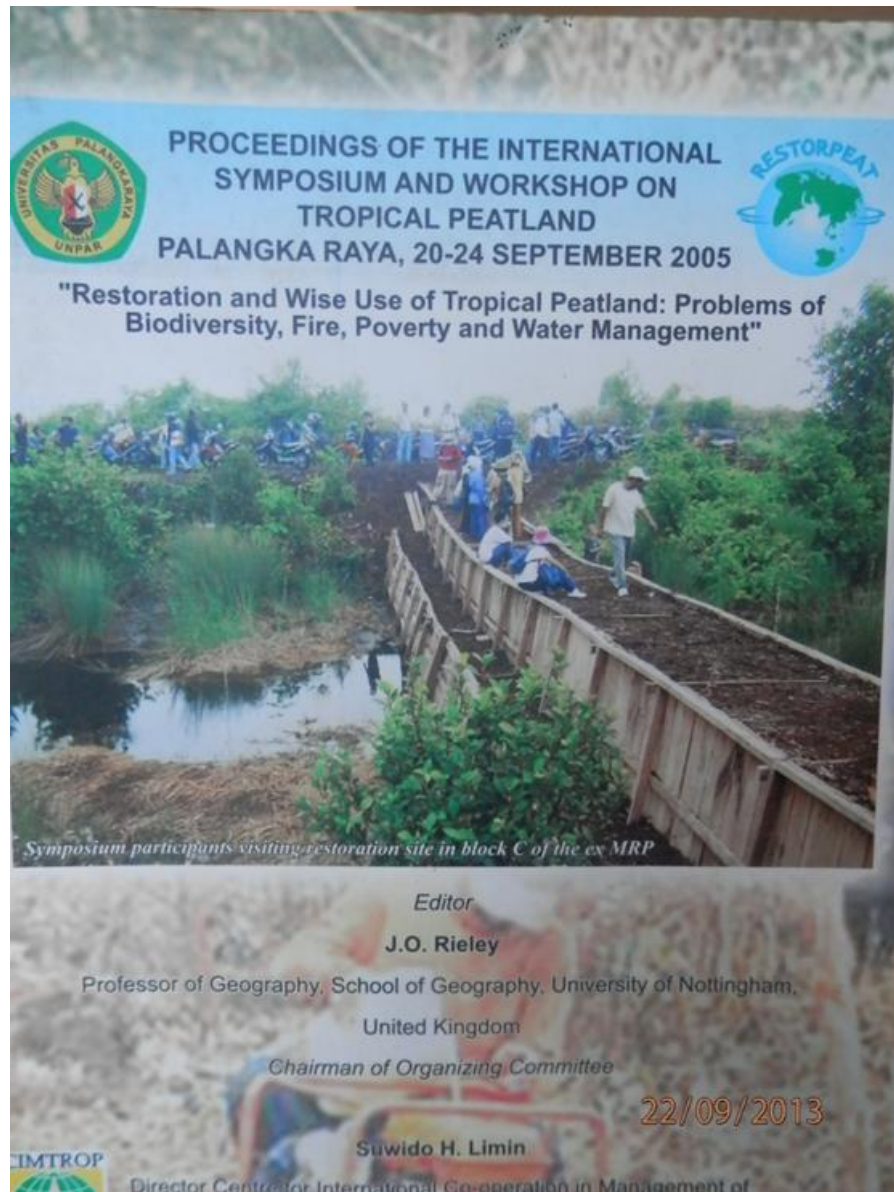


- **ECOLOGICAL AND NATURAL RESOURCES FUNCTION** (illegal logging, water catchment management, water balance, hydrological parameter)
- **IMPACT OF FIRE** (Carbon release, mega rice project, peat decomposition under peat fire damage)
- **ROLE OF TROPICAL PEAT AS CARBON STORE**
- (peat and climate change)
- **WISE USE AND SUSTAINABLE DEVELOPMENT**

Model of Organizing the Cooperation among IPS Commissions



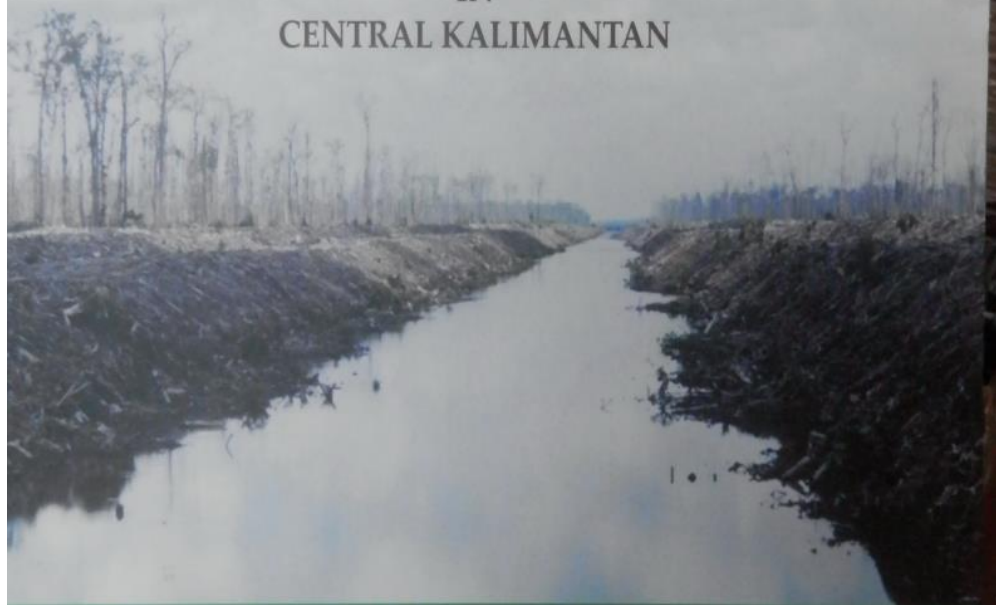
PALANGKARAYA 2005



- **RESTORATION TROPICAL PEAT** (water management, carbon store and loss resulting from fire)
- **GOVERNMENT APPROACH** (report of adhoc team, successful management, fire management)
- **BIODIVERSITIES** (Orang utan, blackwater, plants and mamal, seasonal change of CO)
- **CONTROLLING HAZE** (Local community)
- **LAKE AND PEAT**

AD HOC TEAM
THE EX-PLG PROJECT CENTRAL KALIMANTAN

ACCELERATION OF REHABILITATION & RESTORATION
ON
EX-PEAT AREA DEVELOPMENT
IN
CENTRAL KALIMANTAN



Editor : DR. Bambang Setiadi

PUBLISHED WITH THE 22/09/2013
RESTORPEAT - EU PROJECT 2007

REHABILITATION & RESTORATION ON EX MEGA RICE PROJECT



**YOGYAKARTA STATEMENT
ON
CARBON-CLIMATE-HUMAN INTERACTIONS
ON
TROPICAL PEATLAND
27-31 Agustus 2007**

YOGYAKARTA STATEMENT :

....In terms of *Green House Gasses management*, the maintenance of *large stores of C* in tropical forest and *deforestation* should be a *priority*.....

Strategy for Responsible Peatland Management



International Peat Society | IMIG MITD

Edited by Donal Clarke and Jack Rieley

STRATEGIES FOR WISE USE OF TROPICAL PEATLAND IN INDONESIA



WATER	BIODIVERSITY	CARBON	SOCIO-ECONOMICS	FIRE
Control	Forest quality	Mitigation	Sustainable livelihoods	Awareness Prevention Fighting
<u>Manage- ment</u>	<u>Nature conservation and Bio-rights</u>	<u>Carbon credits</u>	<u>Poverty eradication</u>	<u>Management</u>
Expertise	Protection and Trading	Trading	Strategies and policies	Expertise Integration Collaboration

WILD FIRE AND CARBON MANAGEMENT IN PEAT FOREST IN INDONESIA



2011

- (1) **Lack of awareness** of some plantation companies at the time of opening and cleaning of plantation land,
- (2) The locations of **many fires** in peatlands that are very difficult to extinguish,
- (3) **Damage to the structural** conditions of peatlands due to drainage infrastructure and canals
- (4) **Low accessibility** of the burned areas that constrains a rapid response to fire outbreaks,
- (5) **Limitations of facilities**, infrastructure, personnel and operational funds for fire prevention and control related to the total area of forest and land fires.



DOCTORS : 9
BEING PRODUCED : 6
MASTER : > 6



**MASTER DEGREE FOR NATURAL RESOURCES
AND CLIMATE CHANGE
UNIT FOREST AND PEAT FIRE PROTECTION**

WORKSHOP & CONGRESS OF HGI

Bogor, 2012





2012/09/13

GREEN HOUSE GAS MONITORING SYSTEM

JAKARTA, 29 APRIL 2013

The Second Workshop on
Green House Gas Integrated Estimating and Monitoring System
for Sustainable Peatland Management in Indonesia

Jakarta, 29 April 2013



FROM SEBANGAU TO THE WORLD



1993 - 2013



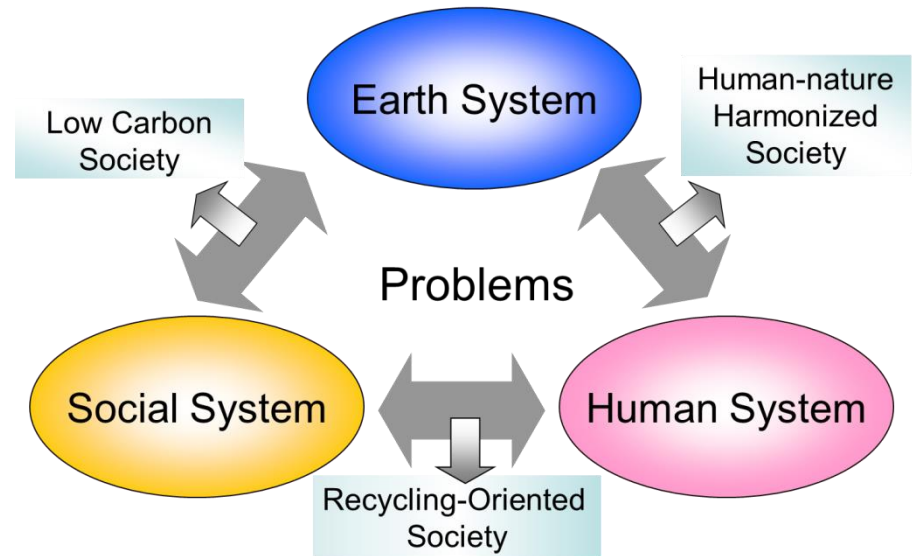
JST-JICA project on "Science and technology Research Partnership for Sustainable Development"

Wild Fire and Carbon Management in Peat-Forest in Indonesia



<http://www.census.hokudai.ac.jp/html/JSTJICA/index.html>

Sustainable Society



CARBON MANAGEMENT

TROPICAL PEAT

LOW CARBON SOCIETY



JAPAN SCIENCE AND
TECHNOLOGY AGENCY

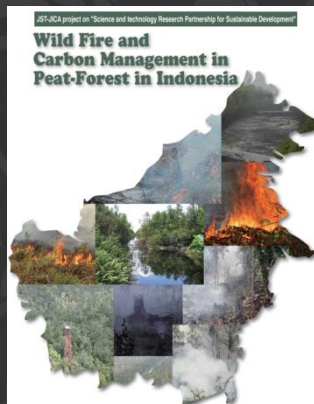


JAPAN INTERNATIONAL
COOPERATION AGENCY

SATREPS

SCIENCE AND TECHNOLOGY RESEARCH PARTNERSHIP
FOR SUSTAINABLE DEVELOPMENT)

THE WILD FIRE AT PEAT-LAND TENDS TO HAPPEN WHEN
GROUNDWATER LEVEL GOES DOWN.
THEREFORE, IF GROUNDWATER LEVEL IS MONITORED AND
REPORTED REGULARLY, NECESSARY AND PROMPT ACTIONS
COULD BE TAKEN TO EFFECTIVELY AVOID OR STOP WILD FIRE,
THUS TO REDUCE THE EMISSION OF CARBON DIOXIDE.

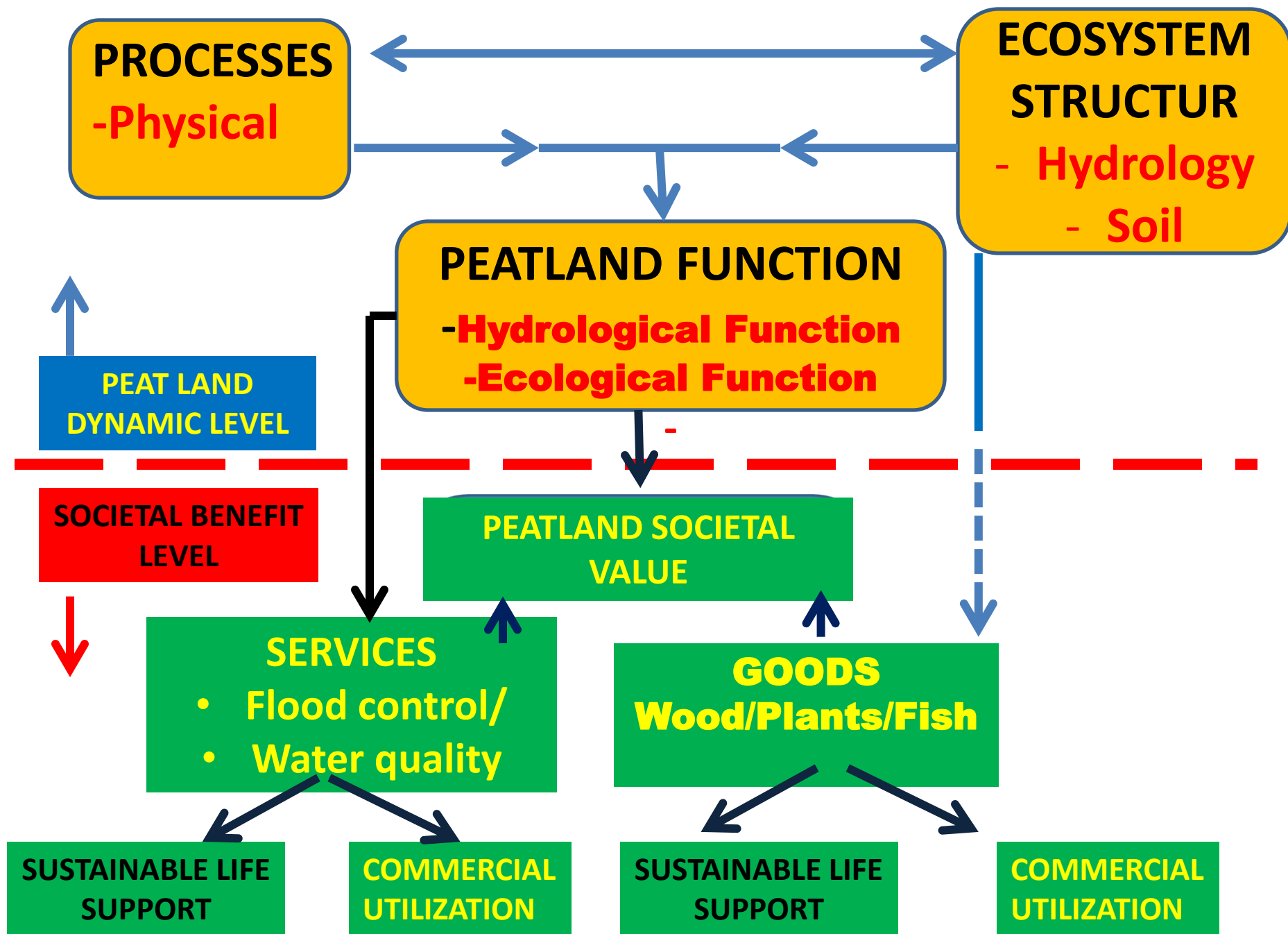


OUTCOMES OF SATREPS

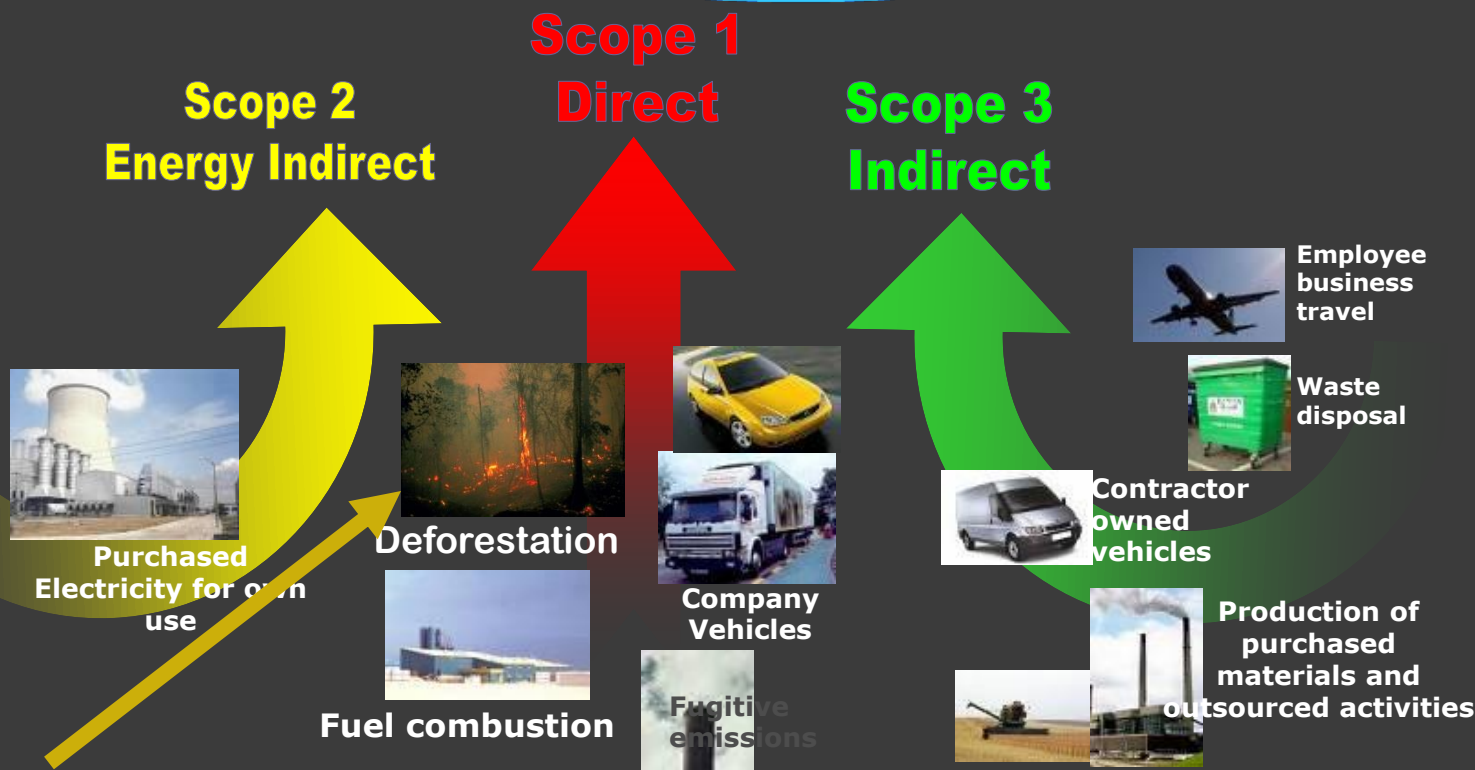
- **REAL TIME MONITORING SYSTEM**
- INTEGRATED MRV SYSTEM
- REAL TIME CO2 EMISSION MAPPING



PROJECT OF WILD FIRE AND
CARBON MANAGEMENT IN
PEAT-FOREST IN INDONESIA



CO₂ CH₄ N₂O HFCs FCs SF₆



Source: GHG Protocol Initiative, 2004
and Deforestation

STRATEGY : REDUCING CARBON EMISSION

1. FOREST AND LAND
FIRE CONTROL
2. WATER AND
HYDROLOGY
MANAGEMENT ON
PEATLAND,
3. FOREST AND LAND
REHABILITATION,
4. ILLEGAL LOGGING
CONTROL,
5. AVOIDING
DEFORESTATION
6. COMMUNITY
DEVELOPMENT



26%

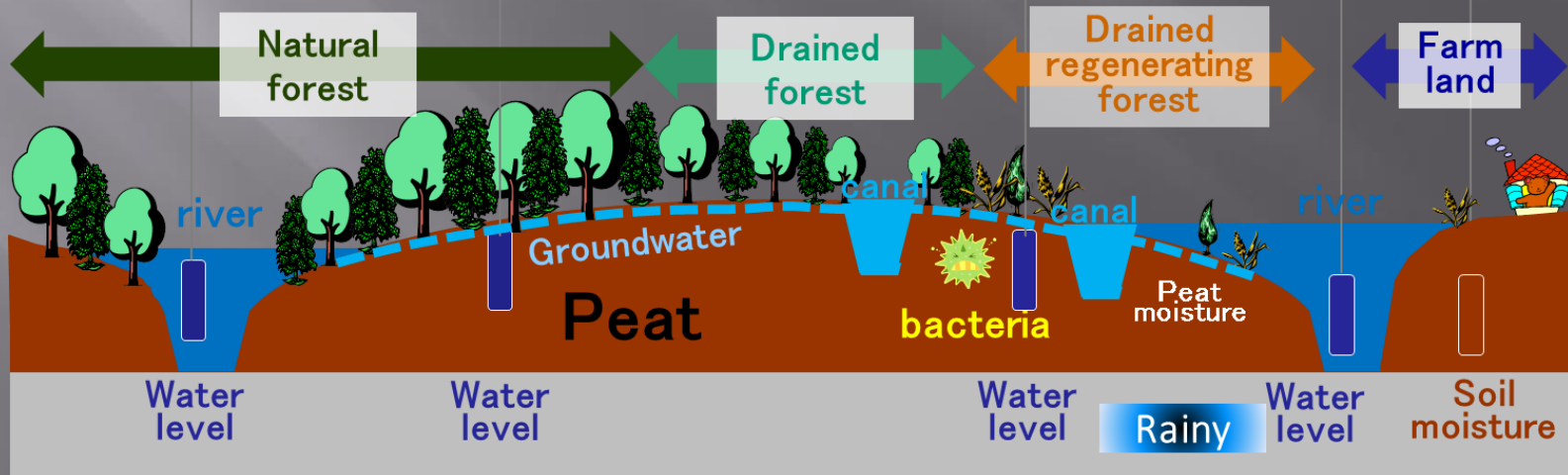
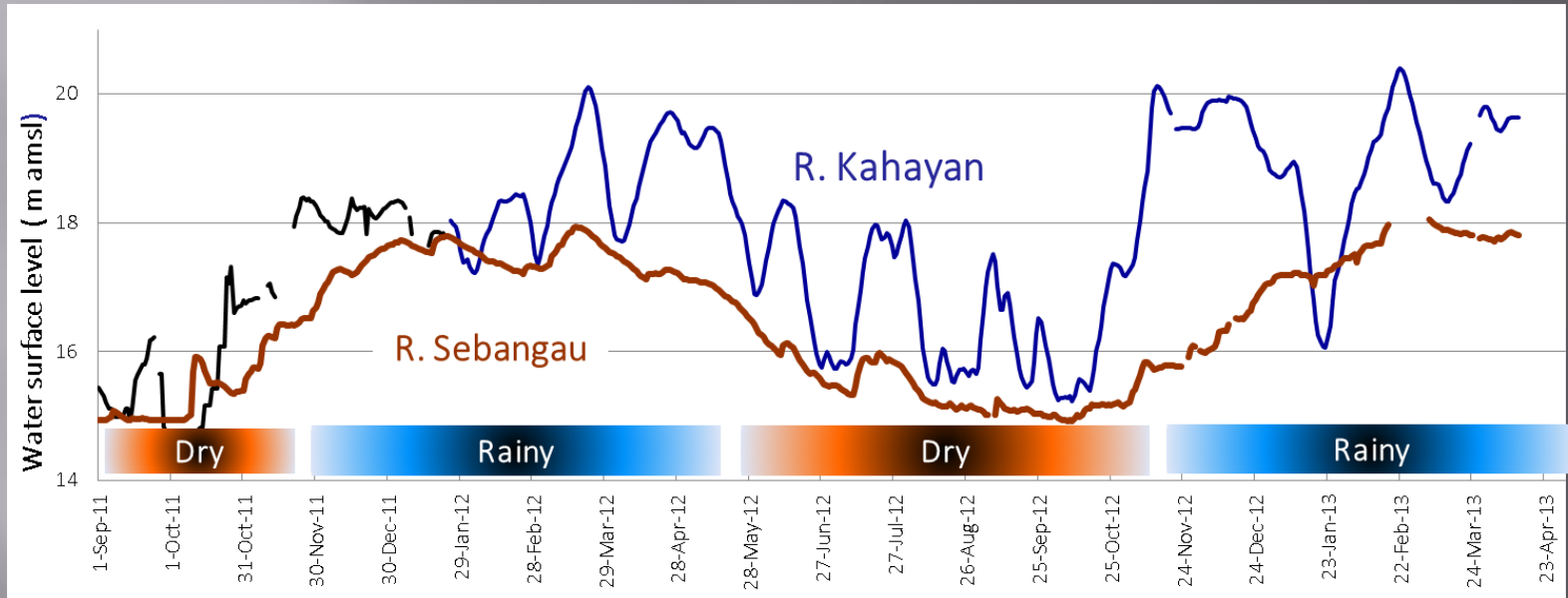


40%

TELEMETRY FOR MONITORING HYDROLOGY ON TROPICAL PEATLAND

Water management in peatland

-Rainy season-



FORUM EXPERTS FAO



CLIMATE SMART FISHERY; PALUDICULTURE ON TROPICAL PEATLAND

The workshop

*“Towards sustainable land
management practices for
peatlands – a special focus
on drained areas”*

FAO – Rome

7–9 May 2013

**BY :
BAMBANG SETIADI**



MANAGING KALIMANTAN WATER RESOURCES

FROM PEATLAND



• REVIVE THE "BEJE" FISHERIES

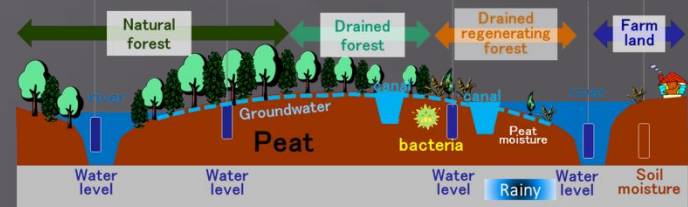
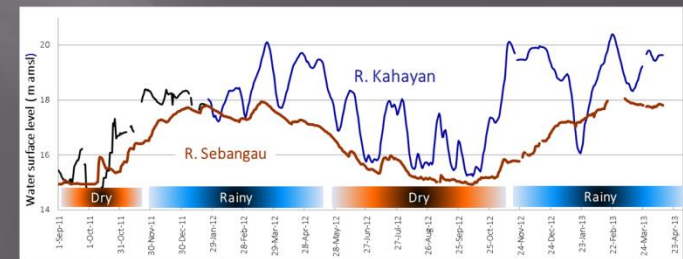


1. TO SUSTAIN THE FISHERIES RESOURCES
2. TO DEVELOP FISH FARMING ACTIVITIES OF SOME INDIGENOUS SPECIES,
3. TO CREATE FISHERIES RESERVES
4. TO PROVIDE BETTER MANAGEMENT OF FISHERIES RESOURCES.

FROM THE SPACE

Water management in peatland

-Rainy season-





FUTURE OF TROPICAL PEATLANDS IN SOUTH EAST ASIA AS CARBON POOLS AND SINKS

**PAPERS PRESENTED AT THE SPECIAL
SESSION ON TROPICAL PEATLANDS
AT
THE 13TH INTERNATIONAL PEAT CONGRESS
TULLAMORE, IRELAND, JUNE 2008**

CURRENT AND FUTURE CO₂ EMISSIONS FROM DRAINED PEATLANDS IN SOUTHEAST ASIA

A. Hooijer¹, S. Page², J. G. Canadell³, M. Silvius⁴, J. Kwadijk¹, H. Wösten⁵, and J. Jauhiainen⁶

- Of the 27.1 Million hectares (Mha) of peatland in Southeast Asia, 12.9 Mha had been deforested and mostly drained by 2006.
- Carbon dioxide (CO₂) emission caused by decomposition of drained peatlands was between 355 and 855 Mt/ y in 2006 of which 82% came from Indonesia, largely Sumatra and Kalimantan.
- At a global scale, CO₂ emission from peatland drainage in Southeast Asia is contributing the equivalent of 1.3 to 3.1% of current global CO₂ emissions from the combustion of fossil fuel.
- **IF CURRENT PEATLAND DEVELOPMENT AND MANAGEMENT PRACTICES CONTINUE, THESE EMISSIONS ARE PREDICTED TO CONTINUE FOR DECADES.**

BAMBANG SETIADI

**President of Indonesian Peat Association/
Indonesian National Committee of IPS**

**DO WE NEED
A ROAD MAP
FOR
TROPICAL PEAT?**

TULAMORE, JUNE 2008

PRIORITY CONSIDERATIONS FOR TROPICAL PEATLAND

- 1. TROPICAL PEAT DOME**
- 2. WATER IN TROPICAL PEAT**
- 3. WATER LEVEL CONTROL**
- 4. STRATEGIES FOR CARBON
MANAGEMENT**
- 5. CARBON CONSERVATION**
- 6. CARBON SEQUESTRATION**



PRIORITY CONSIDERATIONS FOR TROPICAL PEATLAND



2. WATER LEVEL CONTROL

- a. *The water table should be maintained at less than 100 cm below the peat surface.*
- b. *Minimize peat oxidation (decomposition) and subsidence and to control water*
- c. *Monitor water levels and subsidence rates.*



WHAT NEXT ?

NEEDS IT IS
URGENT



**DECOMPOSITION
AND SUBSIDENCE**



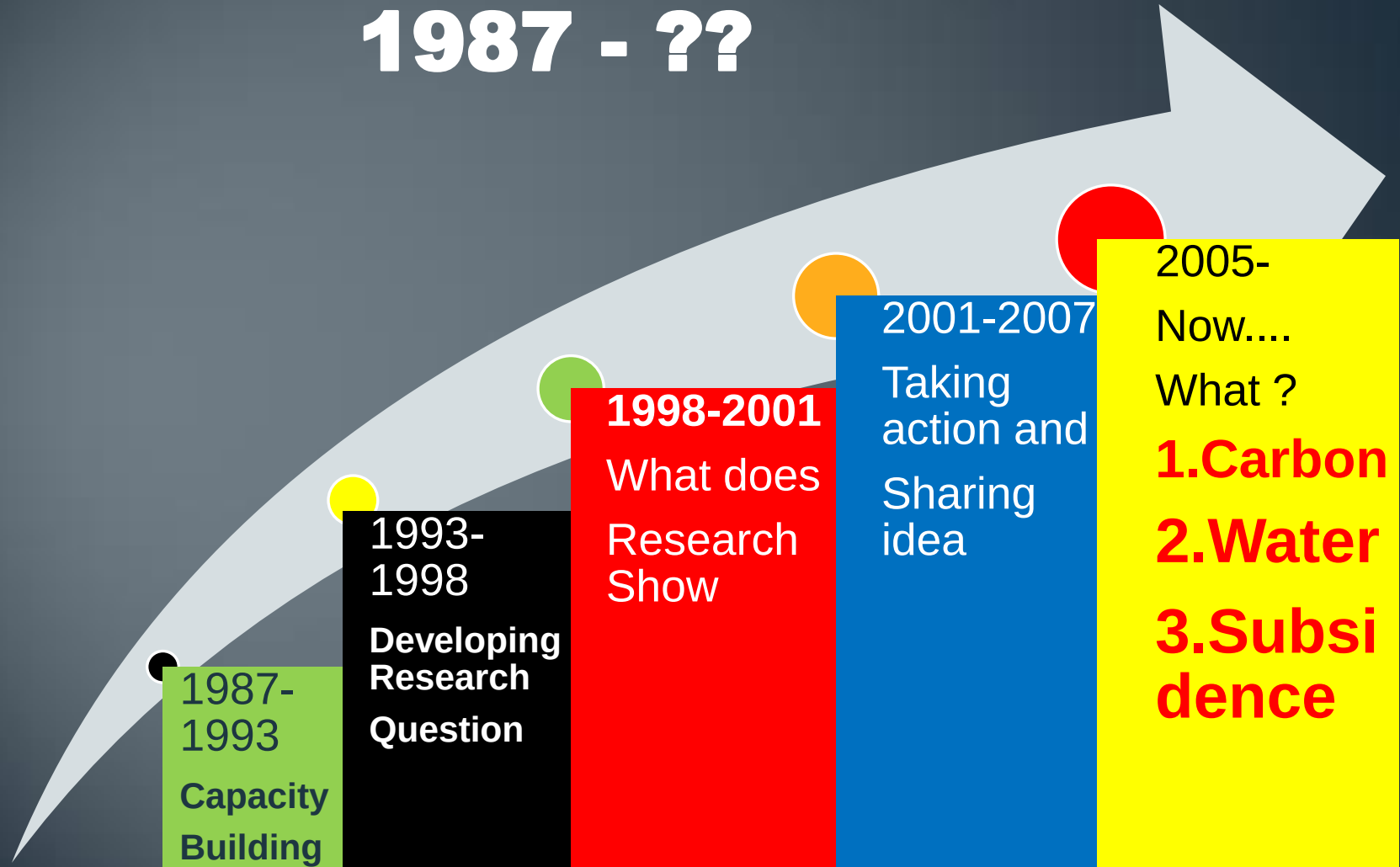
**WATER TABLE &
REWETING**



**FIRE CONTROL AND
MANAGEMENT**

FROM SEBANGAU TO THE WORLD

1987 - ??



INTERNATIONAL WORKSHOP ON THEMATIC GEOSPATIAL INFORMATION IN TROPICAL PEATLAND FOR AGRICULTURE

***theme “One Map Policy for Supportting Tropical
Peatland Sustainable Development***

Geospatial Information Agency (BIG), Indonesian Agency for Agricultural Research and Development (IAARD), Ministry of Agriculture, and Agency for the Assessment and Application of Technology (BPPT)

This international workshop aims to raise awareness of the importance for developing new updated national inventory and mapping of tropical peatland based on existing data, standardized of method used for the assesment tropical peatland

day, date : Thursday and Friday, November 7th and 8th, 2013

time : 09.00 – 17.00 WIB

**venue : Main Ballroom, IPB International Convention Centre,
Jl. Pajajaran Bogor**



THANK YOU !!