ECOHYDROLOGY APPROACH AS NEW WAY TO SUPPORT AGRICULTURE AND WATER RESOURCES MANAGEMENT IN PEATLAND AREA – CENTRAL KALIMANTAN

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United Nations Educational, Scientific and Cultural Organization

Asia Pacific Centre for Ecohydrology Under the Auspices of Unesco

ASIA PACIFIC CENTRE FOR ECOHYDROLOGY
APCE – UNESCO CATEGORY II CENTRE

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"Human interaction with the environment is at the center of water security.." (Anonymous)

Main Issues Related to Water in Asia Pacific Region

- Water Conflicts
- Loss of biodiversity
- Water pollution
- Lack of clean water and sanitation → water related-diseases
- Droughts and Floods

United Nations Educational, Scientific and Cultural Organization

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APCE – UNESCO POTENTIAL SUPPORT FOR SDG ACHIEVEMENTS RELATED TO WATER RESOURCES MANAGEMENT IN ASIA AND THE PACIFIC REGION

APCE HQ in Cibinong - Indonesia

Organization Structure of APCE

Executive Director

Executive Secretary

Research Program

Database & Information System

Training, Capacity Building & Collaboration

Social, Culture & Public Awareness

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STRATEGIC GOALS

1. To promote local resources base ecohydrological research
2. To strengthen local capacity to adopt ecohydrological concept and approach
3. To provide easy access to local resources based ecohydrological information and knowledge
4. To enhance public awareness of local resources based ecohydrological practices

APCE Contribution to the implementationf of SDG's

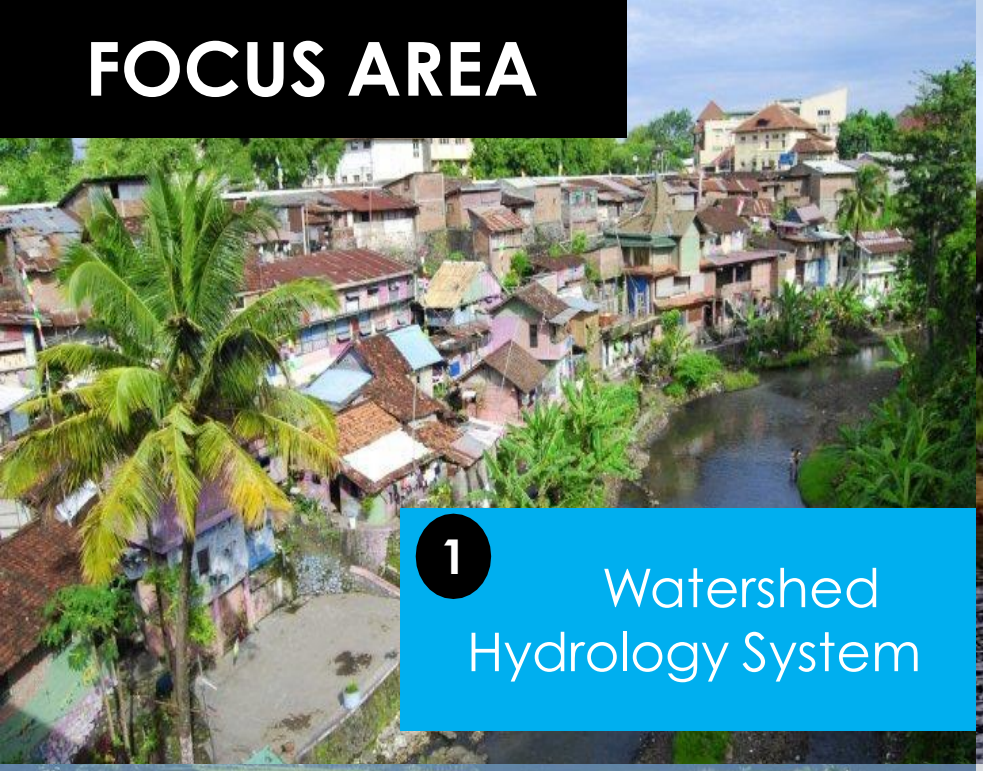
Goal 6: Ensure access to water and sanitation for all

Goal 13: Take urgent action to combat climate change and its impacts

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss

APCE involved in Goal 6, Goal 13 and Goal 15

FOCUS AREA



1 Watershed Hydrology System

2 Peatland Hydrology System

3 Subak hydrology System

4 Arid Zone Hydrology System

5 Urban Hydrology System

6 Small Islands Hydrology System

Main Issues of Peatland Problems

Deforestation and land degradation rate during 1997- 2000 period was 2.8 million ha annually including peatland degradation, and forest degradation has decreased to well below one million ha/year at present.

Ecohydrology is a transdiciplinary science derived from the larger earth systems science movement and examining mutual interactions of the hydrological cycle and ecosystems

Peatland degradation	Peat characteristics	Ecohydrology

Peat swamp forest has important role for equilibrium and maintenance of living environment such as water reservoir, carbon storage, climate change and biodiversity

Human interventions to natural conditions that change the characteristics of the peatland, such as peat land subsidence that is irreversible, excessive drying of peatlands that triggered acid soils and vulnerable to wild fires, especially during dry seasons with reduced water levels, but flooding during rainy seasons

Introduction...

- Customized ecohydrology principles fitted into the peatland management in Central Kalimantan should consider the basic nature of peatland conditions as described by Widjaja-Adhi, [6] into four flooding zones A, B, C, and D

- in the present study close attention would be given to find out more on the interactioncs and interrelationships between controlling environmental factors of vegetation and water regimes.
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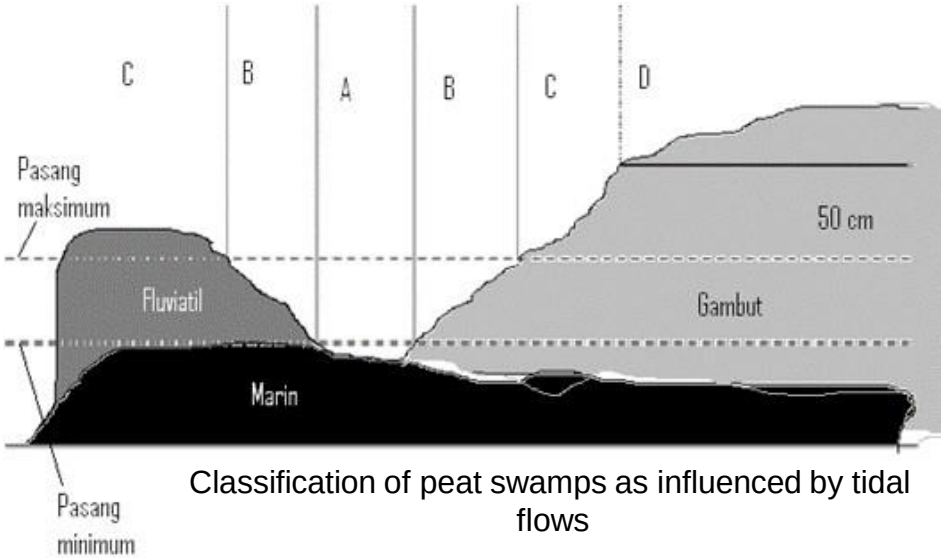
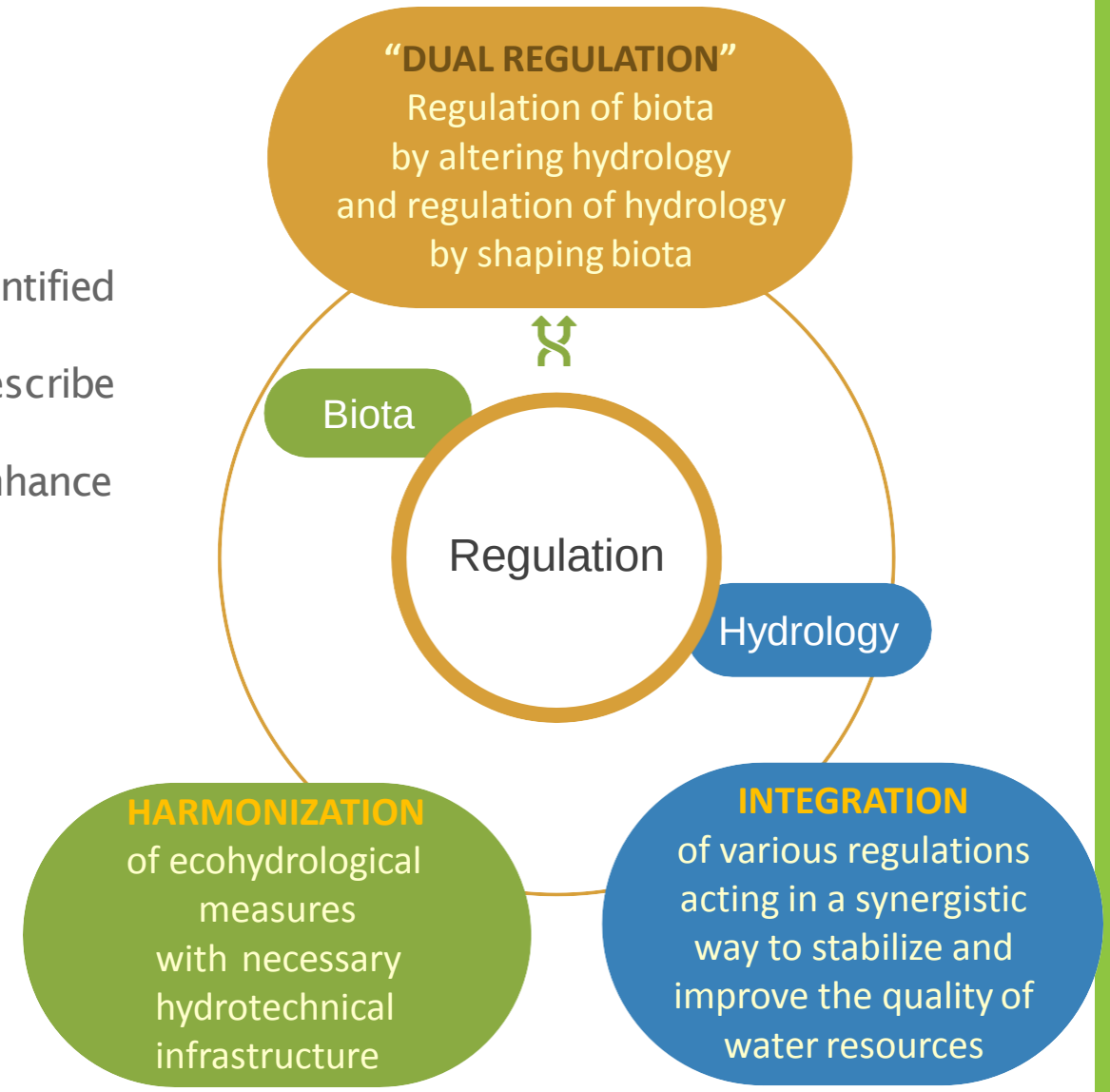


Classification of peat swamps as influenced by tidal flows

Ecohydrology Approach

Ecohydrology principles:

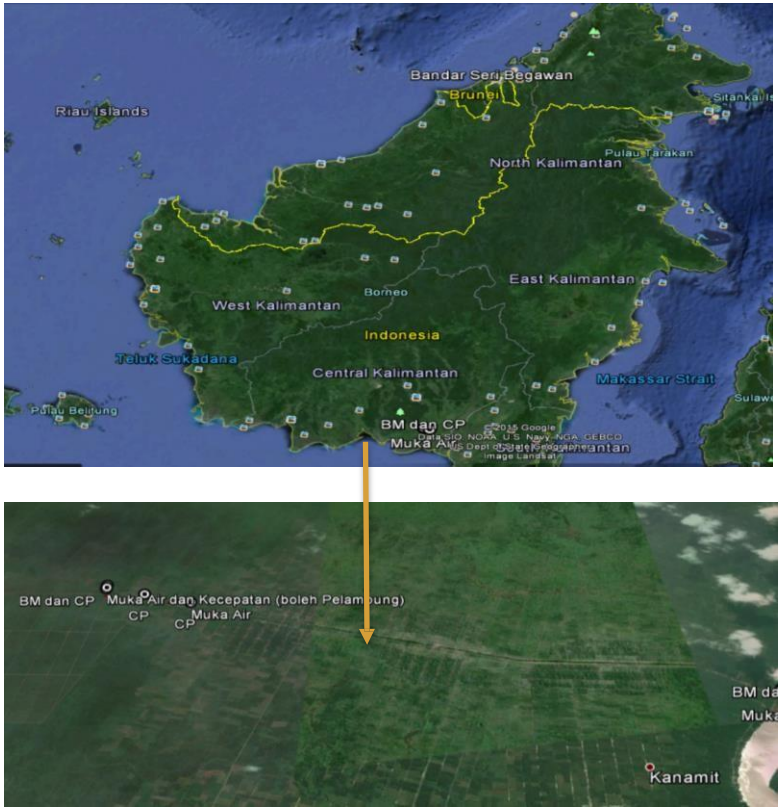
1. Hydrological principle to quantified threats,
2. Ecological principle to describe ecological integrity, and
3. Ecotechnological principle to enhance ecosystem capacity.



Objectives

- The objective of this research was to study comprehensive ecohydrology aspects in ex mega rice project, Central Kalimantan in order to support sustainable agricultural practices and water resources management in peatland areas.

Study Area



- The study site located specifically at peatland area in Ex-Mega Rice Project Block C, Pangkoh area, Kanamit Barat, Pulau Pisang Regency, Central Kalimantan. (2^0 52' 19.00"- 2^0 53' 06.80" S and 114^0 05' 34.54"-114^0 07' 00.96" E)

Material &Methods

- The materials used are chemical materials, among others (KCl, H_2SO_4, K_2O, $NaHCO_3$, NH_4OAc, CaCl, etc.).
- The equipment used in this study is a laboratory tool for the analysis of soil and fertilizer, soil sampling tool, rulers, books and other stationery.

Methods of analysis of chemical and physical properties of peat

No	Chemical and physical properties	Tools / extraction / Methods
1.	pH H_2O (1:5)	pH meter
2.	EC (1:5, dSm^{-1})	EC meter
3.	Organic C	ashing
4.	Total –N	Kjeldahl
5.	Total P	Spektrofotometer
6.	P available	Spektrofotometer
7.	K availabel	Flamefotometer
8.	CEC	AAS /NH_4OAc
9.	Ca-exc, Mg-exc,	AAS/NH_4OAc
10.	K-exc dan Na-exc	Flamefotometer/
11.	Al dan H	KCl 1 N/Titrasi
12.	Water contents	Gravimetri

Economic Analysis

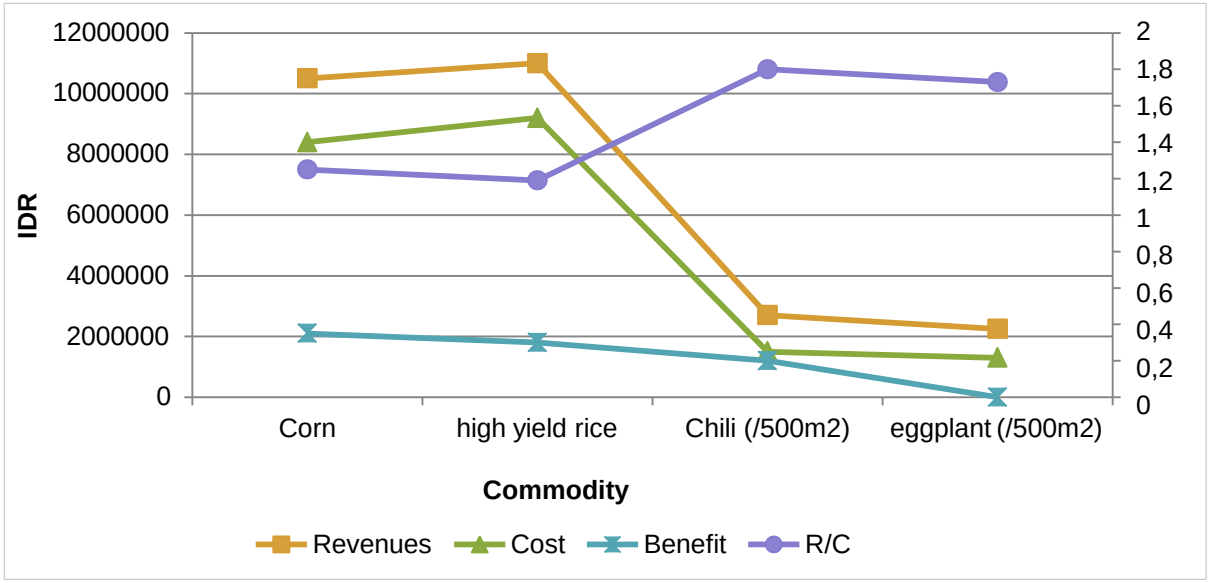
Chemical & Physical Peat analysis

Water Quality analysis

Analysis of the sustainability of agriculture in peatlands (soil, plant, social-economic)

Result & Discussion

Characteristics of farming in peatlands Pangkoh, Pulang Pisau



Analysis of the costs and revenues of farming crops on peat land, Pangkoh

Farmers in Kanamit Jaya has been oriented to plantation crops (oil palm and rubber), whereas in Kanamit Jaya some farmers still cultivate peatlands exist for food crops (rice, maize, pulses and horticulture).

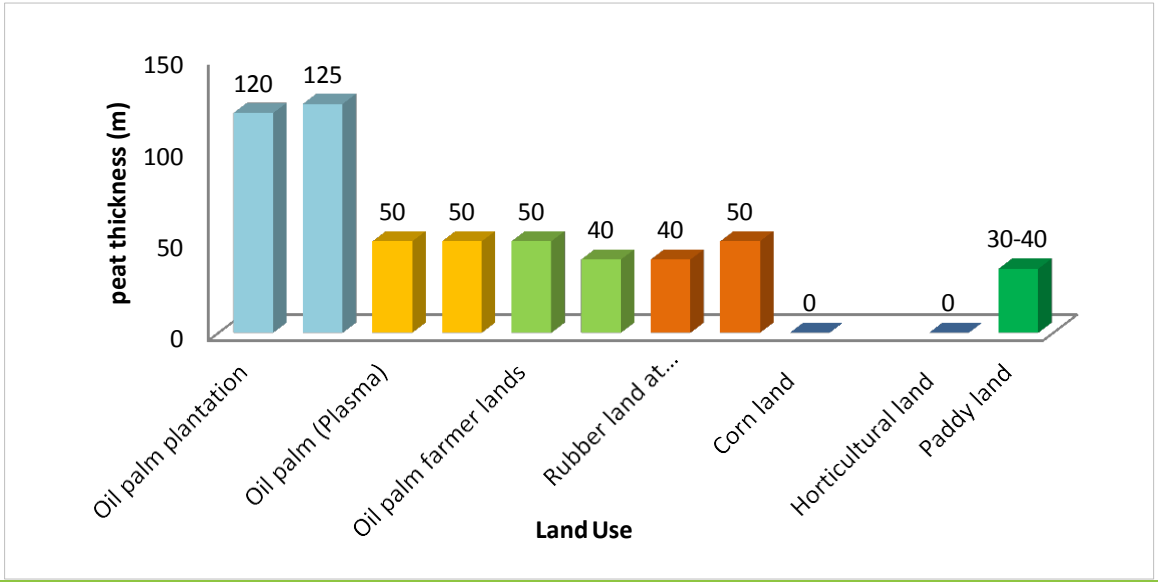
Result & Discussion...

Characteristics of biophysics at the study site

- The results showed that in the area Pangkoh 10 already dominated by acid sulfate soil. Acid sulphate soils associated with peat soils commonly found in the area around the tidal land, which covers go up with the loss of a layer of peat in the upper layers of sulfidic material.
- The value of 3,98 for soil pH is classified in very acid, in this condition, most of soil nutrients is not in available form, whereas toxic element such as iron and aluminum in high solubility.

Peat thickness also affects the hydrology of peat. Fluctuations in groundwater levels could reach 45 cm at the top of the dome and 60 cm on the outskirts of the dome

Peat thickness in several research sites



Result & Discussion...

- Excessive peat drainage can cause accelerated subsidence and soil conditions become more oxidative.
- The rate of decomposition of peat is strongly influenced by environmental factors include the temperature and groundwater levels

Result & Discussion...

Water Conditions

- In Pangkoh 10 already use the floodgates, but most of the canal blocking are not effective and are not equiped with floodgate.
- In Pangkoh 9, most tertiery canal also serves as a means of transportation

Water quality in Rei Tersil Site

Site	Color	Temp. (°C)	pH	Cond (mS/cm)	Turb (NTU)	TDS (mg/L)	DO (mg/L)
Rei Tersil	yellow	33.5	3.26	2.64	19.7	1690	3.10

Station	Nitrite (mg/L)	Nitrate (mg/L)	Ammonium (mg/L)	TN (mg/L)	TP (mg/L)	Sulfate (mg/L)	TOM (mg/L)
Rei Tersil	0.0157	0.7900	0.0407	4.5990	0.0247	161.4578	347.8899

Based on parameters, this type of water was in class IV under Government Regulation No. 82 of 2001 and it did not meet the quality for daily use as drinking water.

Conclussions

- Sustainability of agricultural practices in peatlands is strongly influenced by ecological, economic and social aspects,
- Ecohydrology approach for peatland management is suitable by implementing 4 principles : hydrology, ecology, ecotechnology and cultural principles.
- The dominant ecological aspect that affect sustainability in peatlands can be determined from the condition of the water management system in peatlands
- Characteristics of chemical properties and constraints faced in the management of peatland depends on the thickness of the peat layer, as well as the nature of the soil below the peat layer


Thank You

References