





NAPC: Networked ASEAN Peat Swamp Forest Communities Brunei's Perspective

Dr Wida Susanty Haji Suhaili
Universiti Teknologi Brunei, UTB
School of Computing & Informatics

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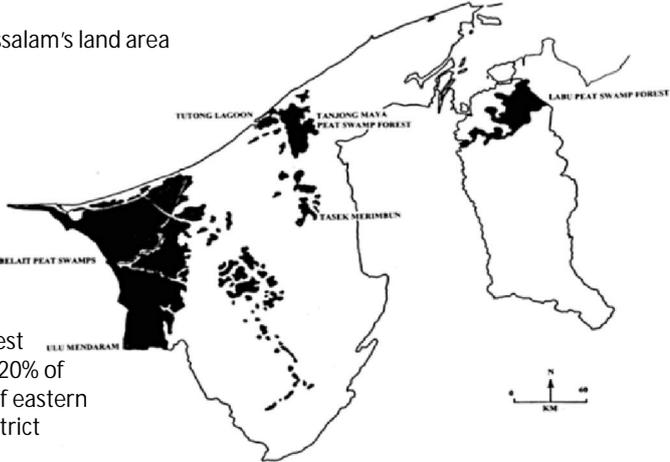


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Brunei's Peatlands

Peat Swamp Forest in Brunei

Brunei Darussalam's land area
5,765 sq km

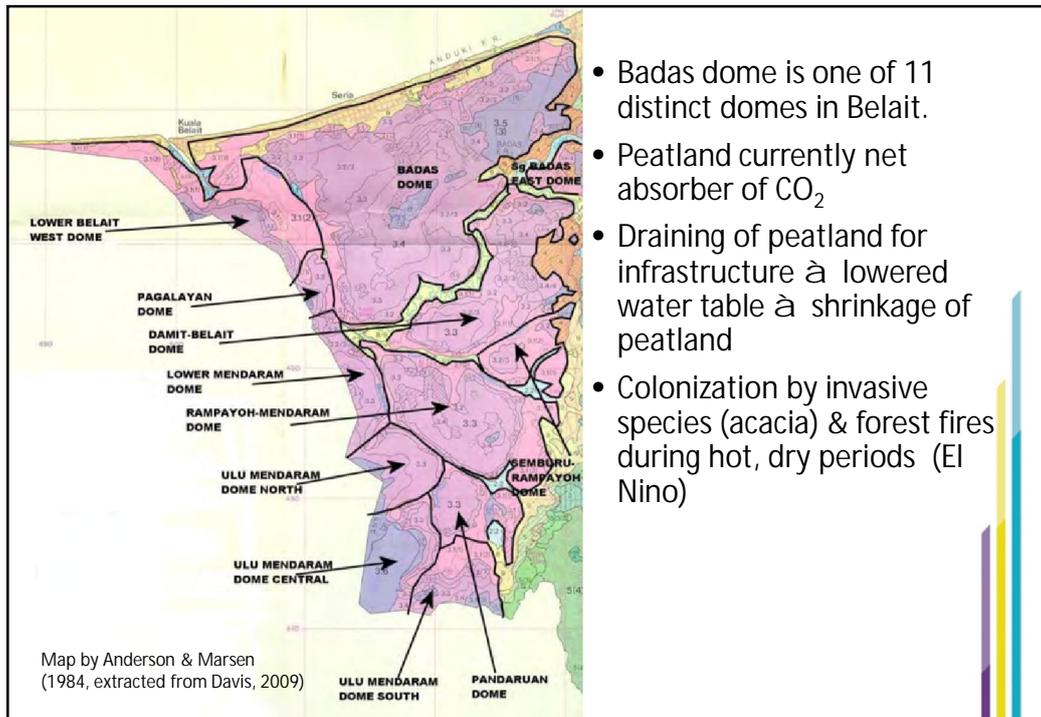
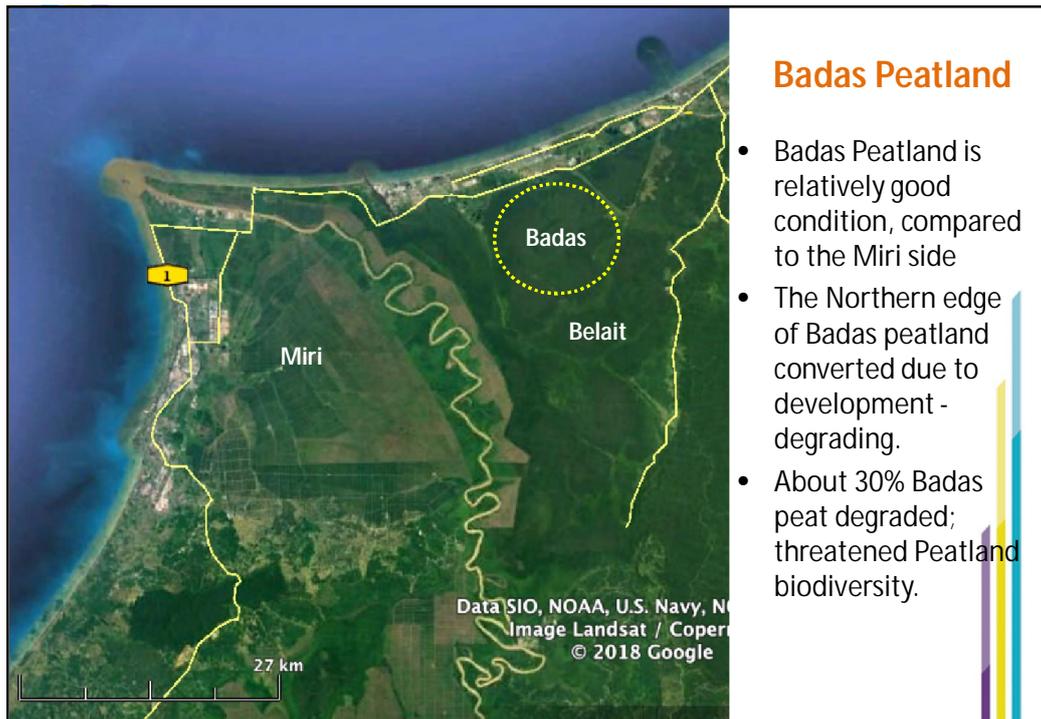


Peat Swamp Forest covering almost 20% of the entire area of eastern part of Belait District





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Peatland

- Peatland – good source of carbon
- Peatland – naturally can guard itself against fire and drought unfortunately when the eco system is disrupted it no longer can sustained this property
- Once fire break-out, an amount of carbon is release
- As the eco-system disrupted natural source of water is no longer available
- To get to the location is also difficult
- In densely peat forest, to bring in the water source to kill the water will be tedious and an expensive task
- 2016 , US\$5.6Millions to water bomb Brunei forest fire using helicopter.



Side affects of peatland forest fire

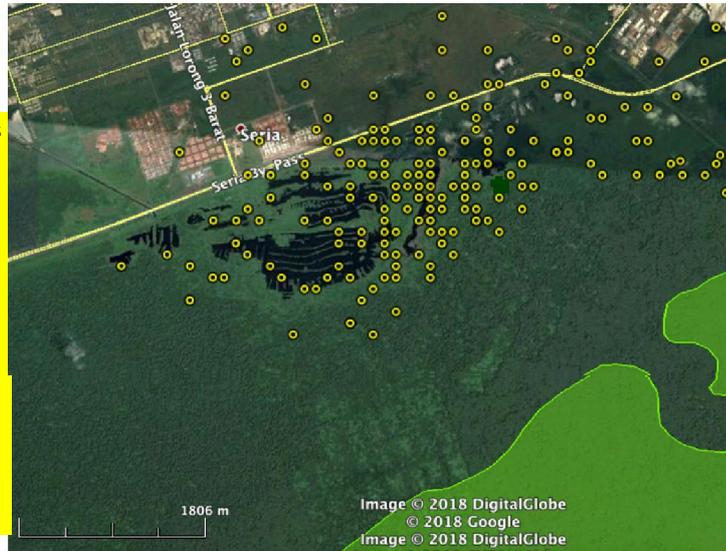
- Costly to kill the fire
- Economy: Disrupt daily operation of the affected area
- Health: Haze affect those with respiratory problems & children
- Haze can be so thick that it can affect neighbouring country, affect PSI reading for each country, leads to unexpected halt of daily operation
- Last long depending on severity
- And take weeks or months to clear and recover the environment



Brunei: Badas Peatland

- Study area
- N 4.59° E114.35°, radius 3 km

Yellow spots mark fire events in Feb-April 2016 (MODIS data). Black polygons are water bodies created by sand mining. Light green area (SE) is the central area of the peat dome, dominated by quite pristine "padang alan" (*S. albida*) forest. Just north of the road are housing estates. In NE corner is an oil & gas sector industrial estate. Informal, illegal farmers grow crops in burnt areas and gather food products from the peatland.



2016 Forest Fire around the housing area



Forest Fire along Seria-by-Pass



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Challenges of battling peatland forest fire

- In dealing with forest fire, 3 action will come into place: Monitor, Respond and Recovery
- Some reason of massive forest fire, due to:
 - Too late to act
 - Start of peatland fire is undetectable
 - Not visible. Difficult to know where its head
 - Dangerous, as the source of fire could be underneath and spread underneath
 - No source of water (mostly happening in degraded area)
 - Costly to kill or combat



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Peatland Forest Fire in ASEAN

- Fire from peat create impacts such as smoke haze which affect five neighbouring countries in South East Asia (Brunei, Indonesia, Malaysia, Singapore and Thailand)
- ASEAN measures:
 - ASEAN agreement on Transboundary Haze Pollution in 2002, and
 - ASEAN Peatland Management Strategy (APMS 2006 -2020) in 2006
- **Apart from preventive actions: early detection and suppression of fires is the only way to minimize the damage and losses**
- **Monitoring system using sensors**

What sensor??

Challenges for deploying sensor

- Deployment of sensors will be a challenge, in detecting the peatland forest fire.
 - Ambient, not true readings
 - Alert too late
 - Sensors burned
 - Battery life of sensor
 - Placement - positioning
 - Safety issues - animal, natural, human

Aims

- **Need to stop fire from happening**
- Explore on preventive measure that focus on a disaster management system that will prevent peatland fire from occurring due to dry condition.
- This is done by advancing the restoration technique of rewetting the area by using sensors that will trigger the water source to be released hence will rewet the land to avoid any dry soil.
- Monitor the water table

Stakeholders in Brunei

- JASTRE
- Heart of Borneo
- Forestry Department
- BLNG & BSP (Raise water table)
 - Wetland International (Rehabilitation Planting)
- Institute for Biodiversity and Environmental Research, UBD (Biodiversity)
- Singapore-MIT Alliance for Research and Technology (SMART) – (Biogeochemistry & Carbon flux)
- Fire & Rescue Department (Borrow pits & Fire breaks)

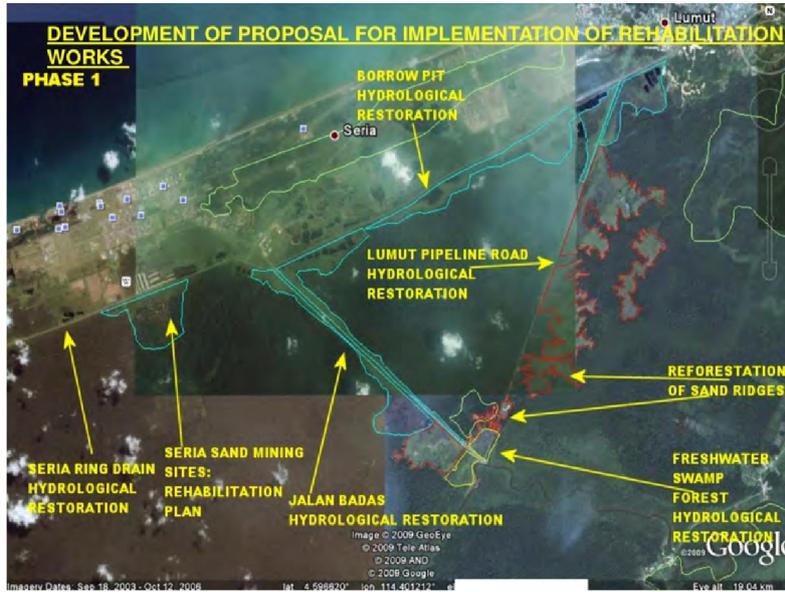
JASTRE -Focal Areas

- Awareness and Capacity Building
- Information Sharing
- Policies and Legislation – Stop logging operation in Peat Swamp Forest and fully ceased October 2017
- Fire Prevention, Control and Monitoring
- Restoration and rehabilitation

Way forward

- Further enhance existing governance and institutional framework
- Further information and knowledge sharing to the public and local community on the importance of peatland conservation and protection
- Exploring more opportunities: work in ASEAN perspective through collaborative projects
- Capacity building: ASEAN high level seminar on peatland forest.
- Sharing and learning from other countries experiences on the best management practices.

Location of Rehabilitation Activities (Davis, 2009)



Canal blocking:
help raise water table in the area



Monitoring of water table levels monthly is done through observation



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Enrichment Planting

Peat swamp: Plant on edges of intact forest and in areas of regenerating forest

Plant species: Shorea Albida (Alan)
Shorea pachyphylla (Meranti Kerukup)
Dryobalanos rappa (Kapur paya)



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Block outflows to box culverts under Lumut and Seria by-passes



Outflow from borrow pits on South side of highway



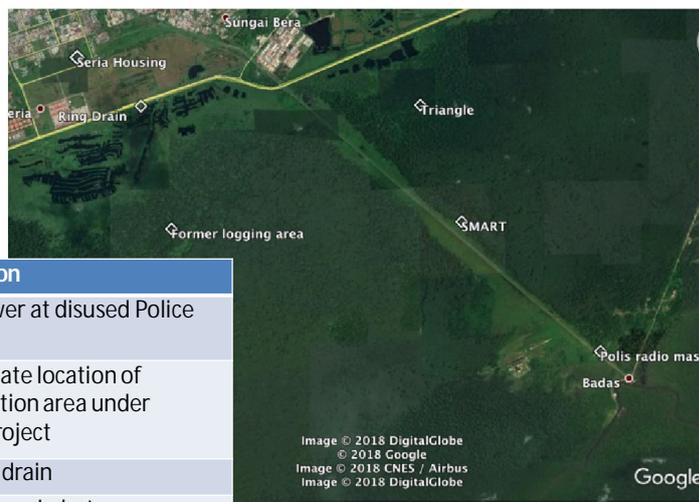
Fire & Rescue Department: Borrow pits & Fire Breaks along the fire prone areas.



Within NAPC project

- Social Innovation – to bring all the stakeholders together to create an awareness to the public, other social engagement programme
 - Technological innovation:
 - Place sensors at 4 strategic places to monitor the water table as well as the soil moisture
 - Detect rainfall, Measure the soil humidity, Measure the water table
 - LoRa gateway is used to transmit the collected data to the cloud
 - Processing is done and actions will be triggered once certain threshold reached.
 - Alert the respective parties
- Idea is to wet the land before fire happens, to mitigate and avoid fire from happening.

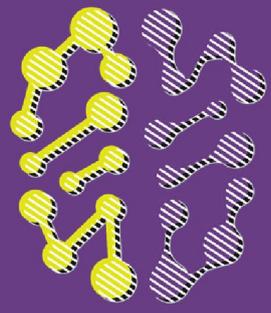
Identified Plots



Station	Description
Police Radio Mast	Radio tower at disused Police station
SMART	Approximate location of rehabilitation area under SMART project
Ring Drain	Centre of drain
Seria Housing	'Natural' area in between housing estate and old Seria homes.
Former Logging	Former logging area
Triangle	1 km off NW edge of triangle



2018
BICET
Brunei International Conference in Engineering and Technology
"Sustainable Development in Engineering and Technology"
12-14 November 2018



CIIS
Computational Intelligence in
Information Systems
16 – 18 November 2018

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UTB

Tungku Highway
Gadong BE1410
Brunei Darussalam
www.utb.edu.bn
Universiti Teknologi Brunei
universititeknologibrunei