ASEAN IVO

ICT Virtual Organization of ASEAN institutes and NICT

NAPC: Networked ASEAN Peat Swamp Forest Communities

ASEAN IVO Project Review and Progress Report

Prof. Ir. Dr. Aduwati Sali (UPM)

Room Monet, Crimson Hotel, Manila, Philippines

21 Nov 2019, Thursday

Presentation Outline

- Project Overview
- Raja Musa Forest Reserve (RMFR)
- Technological Innovation:
  - IoT-Based Peat Swamp Monitoring
- Social Innovation:
  - Community Engagement
- Summary of Project Activities

Project Overview

- Project Title:
  - NAPC: Networked ASEAN Peat Swamp Forest Communities
- Project Fund:
  - ICT Virtual Organization of ASEAN Institutes and NICT (ASEAN IVO)
- Project Members:
  - Wireless and Photonic Network Research Centre (WiPNET), UPM Malaysia
  - Institute of Tropical Forestry and Forest Products (INTROP), UPM Malaysia
  - MIMOS Berhad, Malaysia
  - School of Computing and Informatics, Universiti Teknologi Brunei (UTB), Brunei
  - Faculty of Forestry, Bogor Agricultural University, Indonesia
  - NICT Asia Center, Chulalongkorn University, Thailand
  - Badan Pengkajian dan Penerapan Teknologi (BPPT), Indonesia
- Project Duration: July 2018 – June 2020 (2 years)

Why This Project is of Paramount Importance

Red skies in Jambi caused by haze filtering out sunlight

ASEAN+

Monday, 23 Sep 2019

9:29 AM MYT

JAMBI: The skies turned red here on Sunday (Sept 22) due to the haze, caused by widespread forest fires, that has risen to the upper levels of the atmosphere, reports *Sinar Harian*.

The Malay daily reported that Indonesia National Board for Disaster Management information chief Agus Wibowo Soet had explained that the phenomenon, which was also known as "Rayleigh Scattering", was caused by the movement of haze away from hotspots.

Indonesian astronomer Marufin Sudibyo also explained that the skies did not turn red because of a sudden increase in temperatures.

"Rayleigh Scattering happens when sunlight is dispersed by smoke, dust or airborne particles that filter shorter wavelengths and release longer wavelengths that are in the orange or red spectrum, making the area appear to be dim and red," he said.

Marufin also told Sinar Harian that in the Jambi situation, the density of the micro- and nano-particles in the air was large enough to make it much more dense than the normal atmosphere.

However, he stressed that the phenomenon did not have any adverse effects on human vision.

Haze: Still no respite for Malaysians

NATION

Monday, 23 Sep 2019

PETALING JAYA: There is no respite for Malaysians from the haze, as many areas are recording polluted air levels or are at the brink of breaching the "unhealthy" mark.

This is despite forecast that the haze may lift soon.

The geographical scope of the haze has widened, with more parts of the country experiencing polluted air.

As of 5pm yesterday, the number of areas with high API readings across the country rose to 45.

This was a stark contrast to only 18 areas which were classified as having unhealthy or very unhealthy API levels at 5pm on Saturday.

Very unhealthy air quality levels were recorded at Johan Setia in Klang (208) at 5pm yesterday, while Sri Aman peaked at 205.

NEWS NATIONAL

To blunt impact of forest fires, Brunei to introduce new law to tackle open burning

Incidents of open burning recorded daily in past year

Wardi Wasil

© AUGUST 5, 2019

Firefighters extinguish fire on peat land forest in Central Kalimantan during Indonesia's worst bout of haze in 2015. The fires were lit by companies clearing vast tracts of land for plantations. Photo: Romeo Gacad/AFP

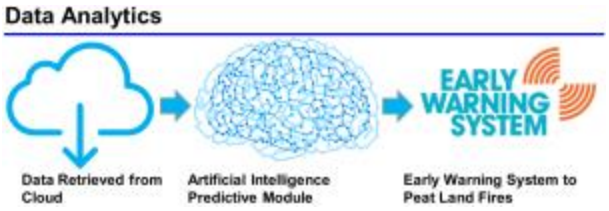
SHARE TWEET SUBMIT

BANDAR SERI BEGAWAN – Brunei is set to introduce a law that will tackle "rampant" open burning in an effort to mitigate bush and forest fires.

- Burned peatland releases more smoke than regular forest fires due to the carbon content of peat.
- The carbon is also the source of fine particulate matter, the stuff that makes haze bad for health.

Project Overview

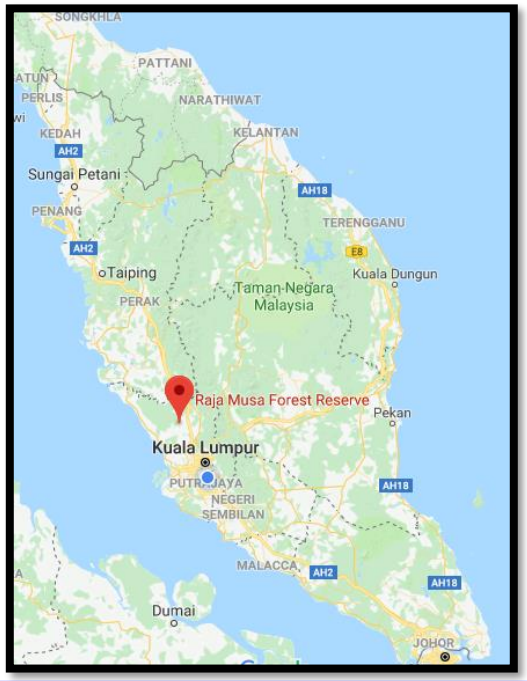
- Deploy **IoT-based solution for peat swamp forest monitoring** with the communities
- **Technological innovation**: to deploy, analyse and disseminate information using an IoT-based peat swamp forest monitoring system
- **Social innovation**: to conduct social programs for peat swamp forest communities such as educational and entrepreneurship events related to the peat swamp forest

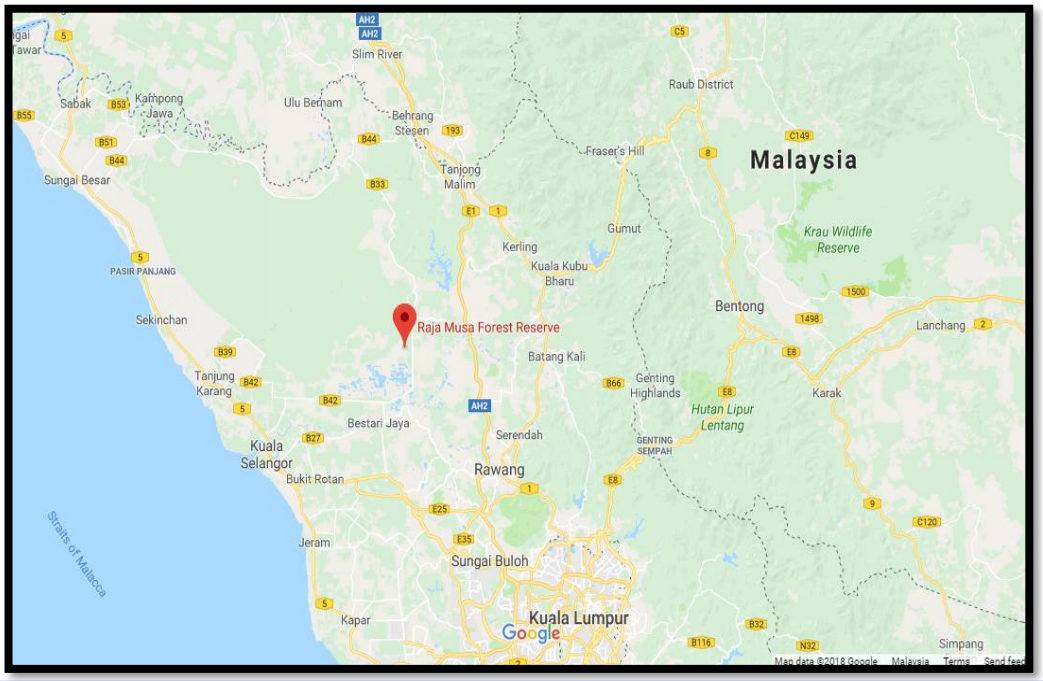


MALAYSIA:
RAJA MUSA FOREST RESERVE

Raja Musa Forest Reserve

- Raja Musa Forest Reserve (RMFR) is located at 3° 24' 48.0744" N,101° 23' 2.0256" E, in the north western part of Selangor State.
- The rainfall recorded for RMFR is between 58.6mm to 240mm per month.





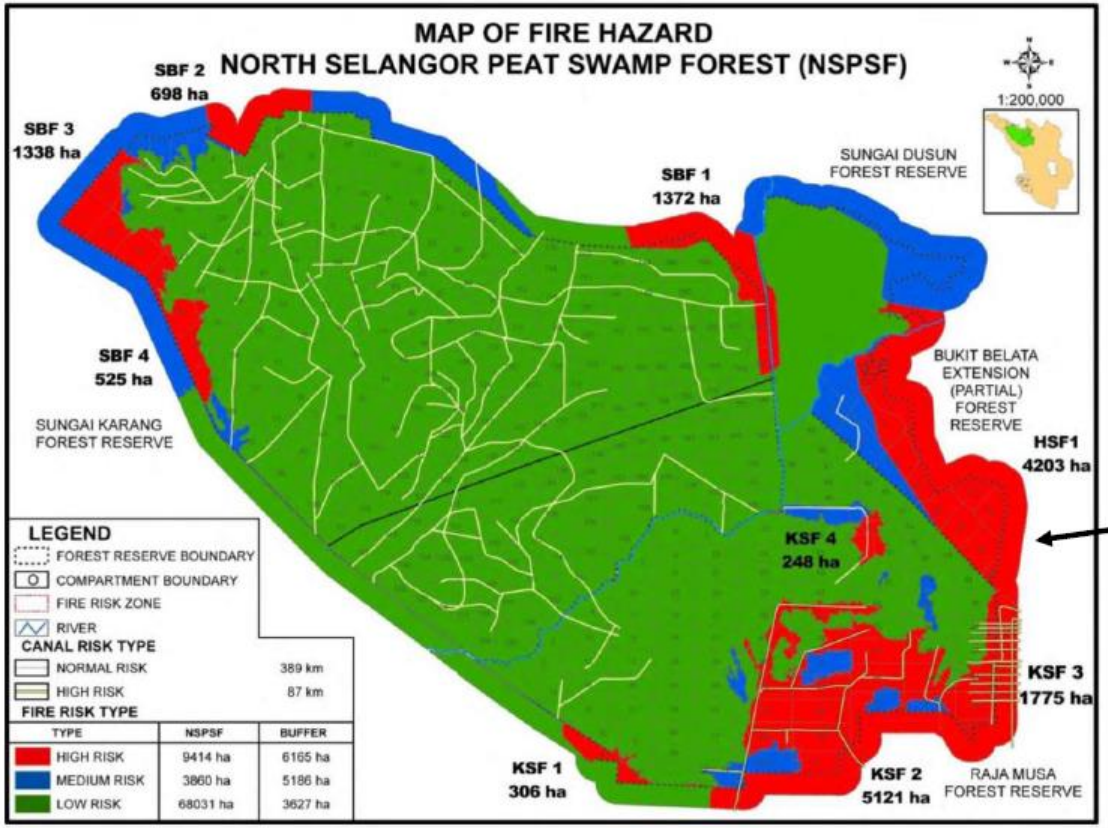
Map of Raja Musa Forest Reserve

Land use map of North Selangor peat swamp forest

Lookout tower in RMFR

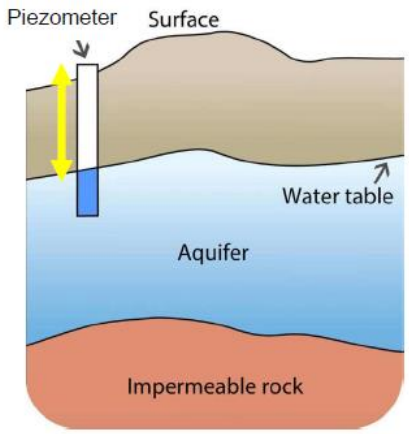
Peat swamp area in RMFR

Map – Fire Hazard

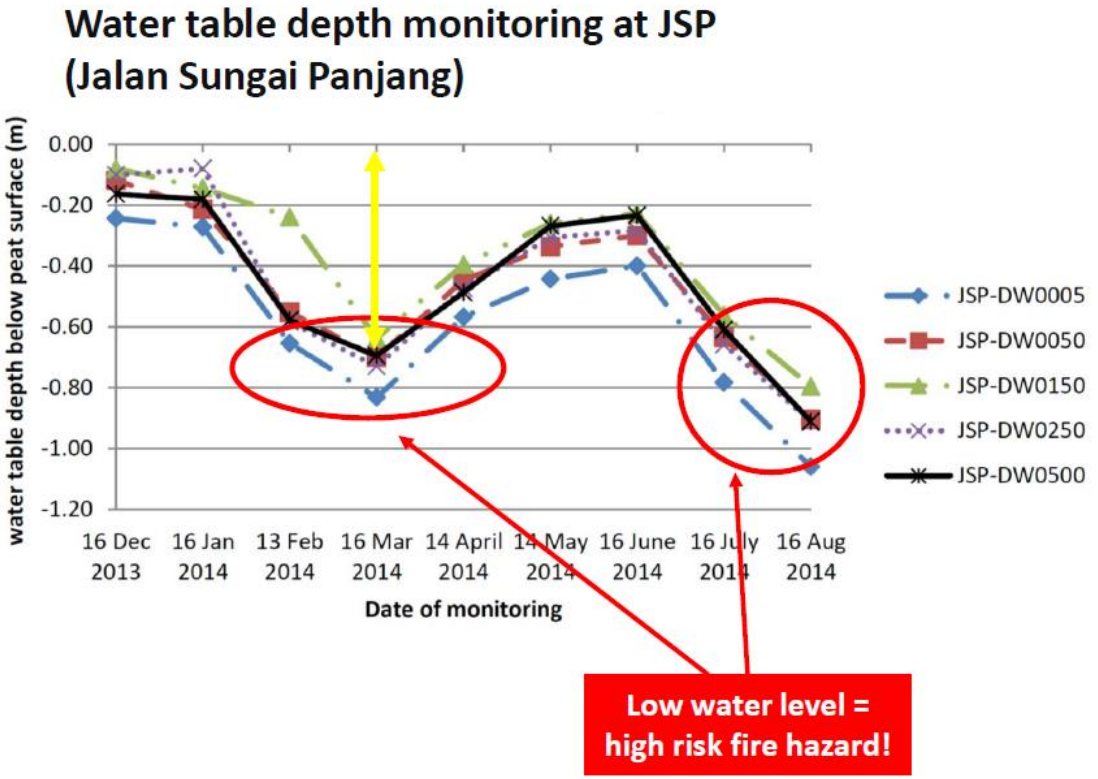


Red = High Risk

Manual Data Collection



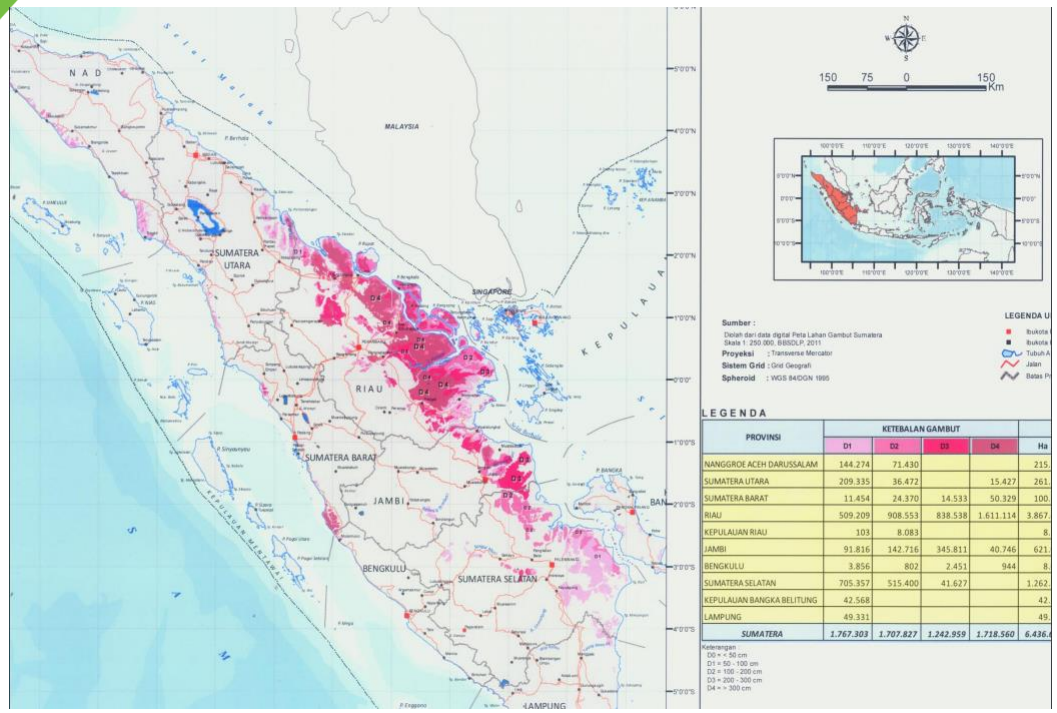
Monitoring water table
(level below which the ground is saturated with water)

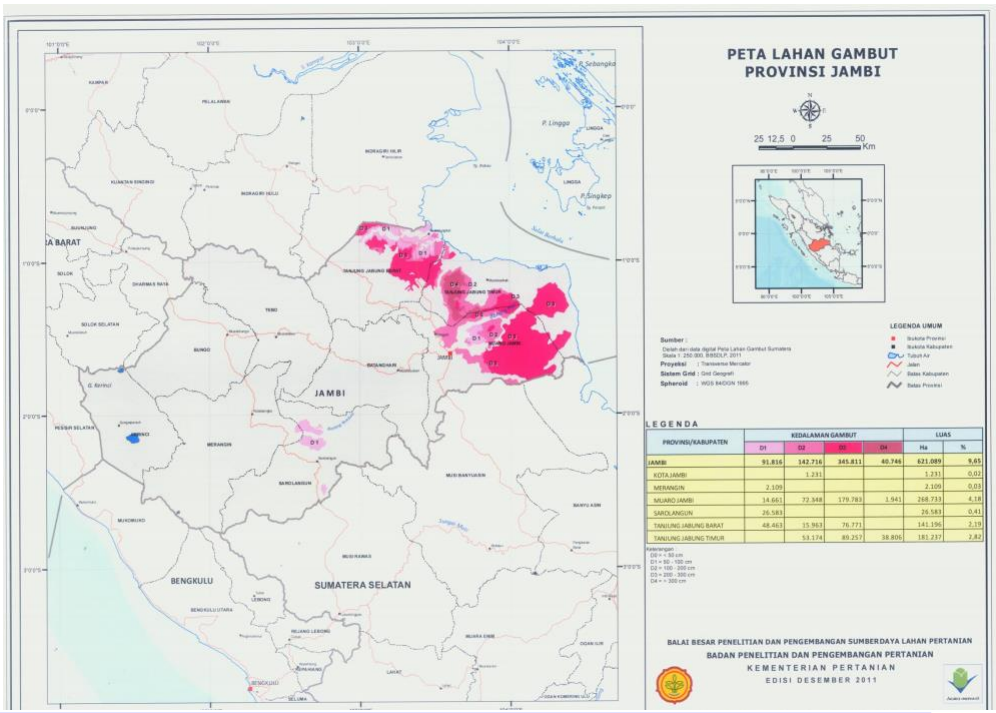


INDONESIA:
JAMBI, SUMATERA

Jambi, Sumatera

- Jambi is one of Province in Sumatera with the large peatland of 621,089 ha or 11.6% of the total area located at 0° 45’ - 2° 45’ South and 101° 10’ - 104° 55’ East.
- Jambi Province is one of the fire prone areas is bordered by Riau Province (North), South China Sea and Riau Islands Province (East), South Sumatera Province (South), and West Sumatera Province (West).





MAPFire 2019

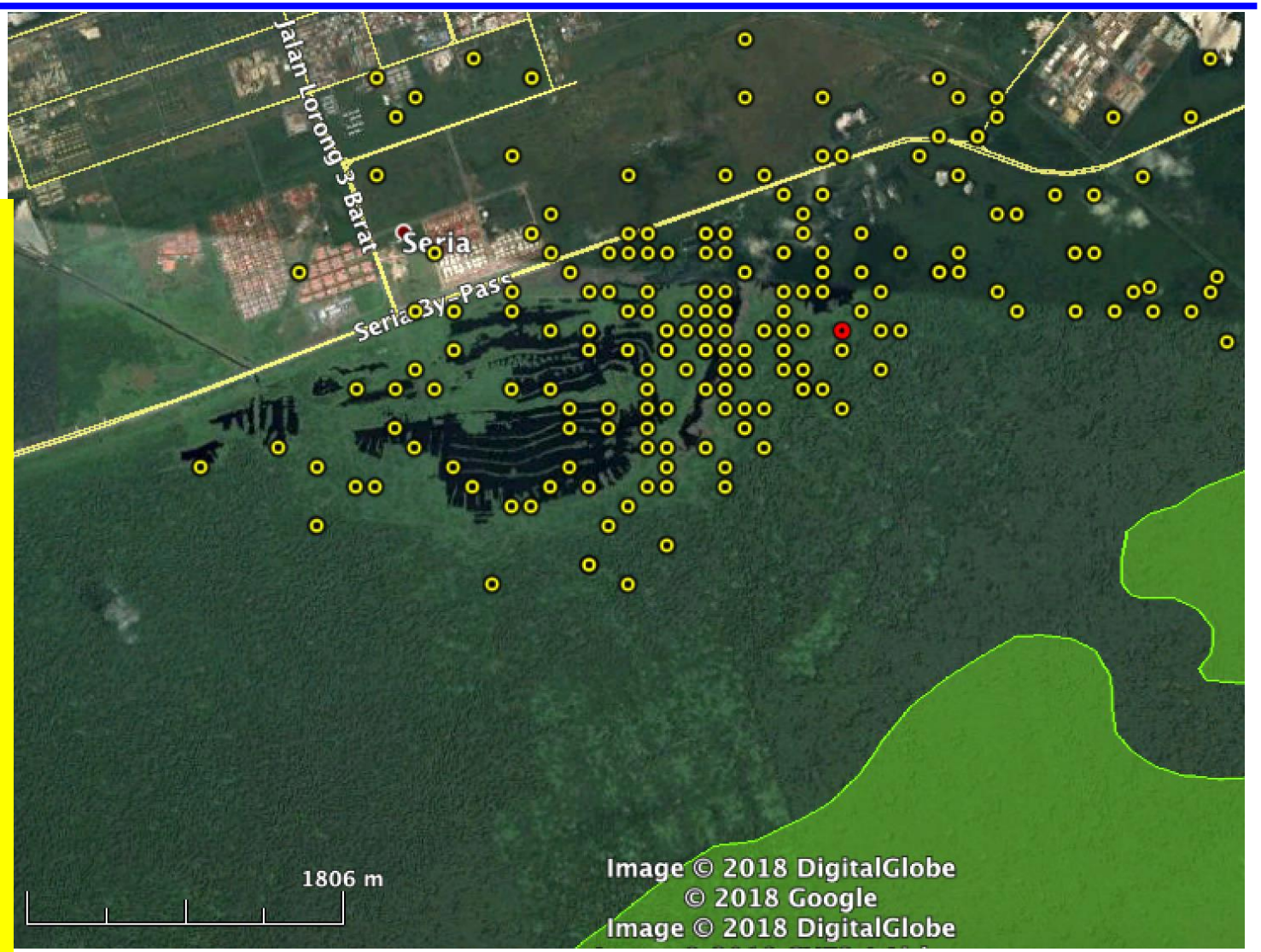
- MAPFire 2019 in conjunction with 2nd International Conference on Environment and Forest Conservation (ICEFC2019), http://icefc2019.ipb.ac.id/
- Agenda of MAPFire 2019

BRUNEI: BADAS

Specific Location in Brunei: Badas Peatland

- Study area
- N 4.59º E114.35º, 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.



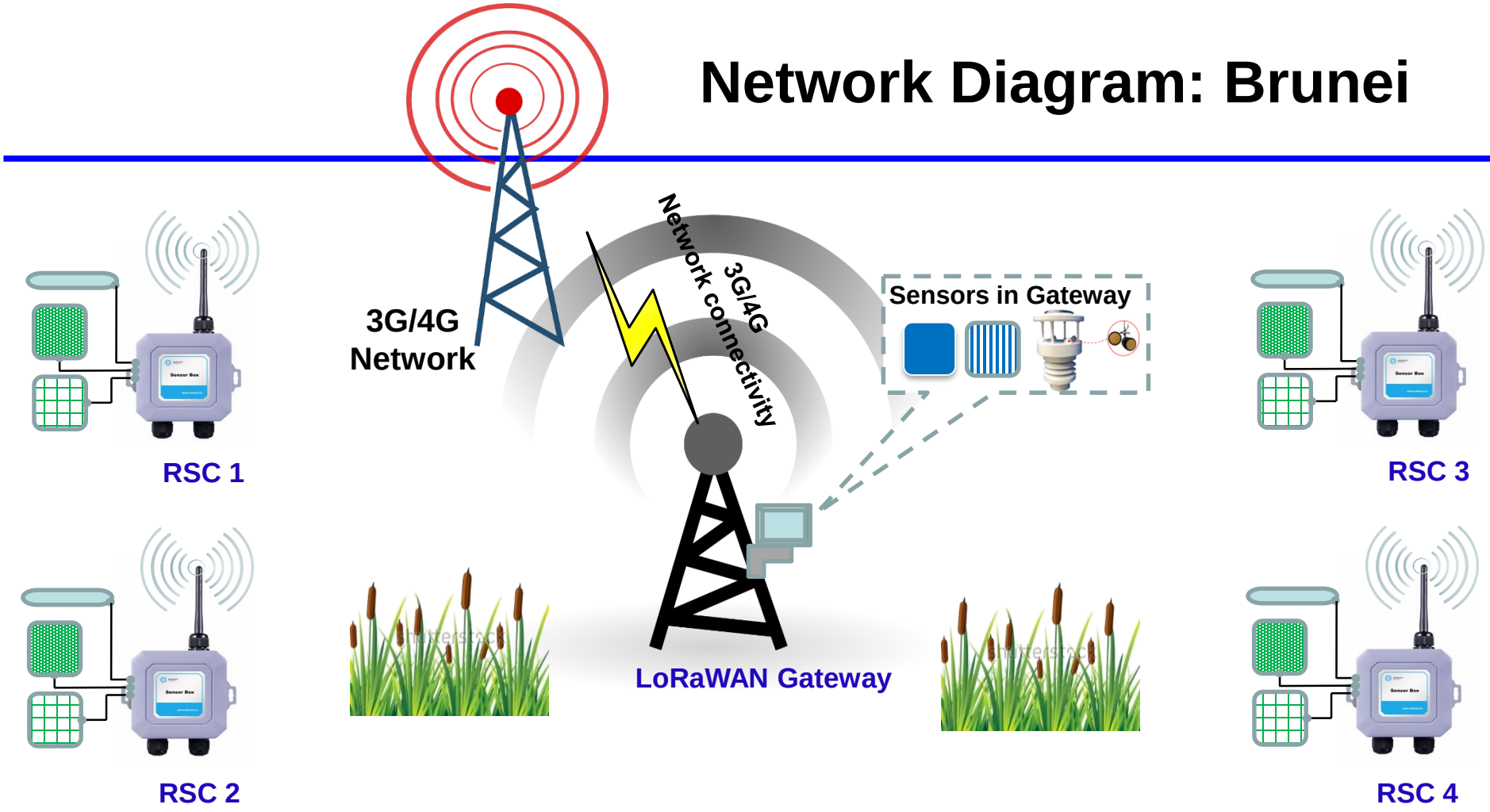
Degraded peatland. Alan Bunga forest 1 km away in background. Regeneration of invasive Acacia and grass in burnt area. Lakes and ponds are common features in peatland.

Government warning against use of land

Illegal growing of food

Housing estate

Network Diagram: Brunei



Sensors deployed in LoRaWAN Gateway

- 9370-P [Temperature, Humidity and Pressure Probe]
- 9325-P [Luminosity (luxes accuracy) Probe]
- WS-3000 [(anemometer + wind vane + pluviometer) probe]

Deployment in Remote Sensing Clusters (RSCs)

Sensors and data logger

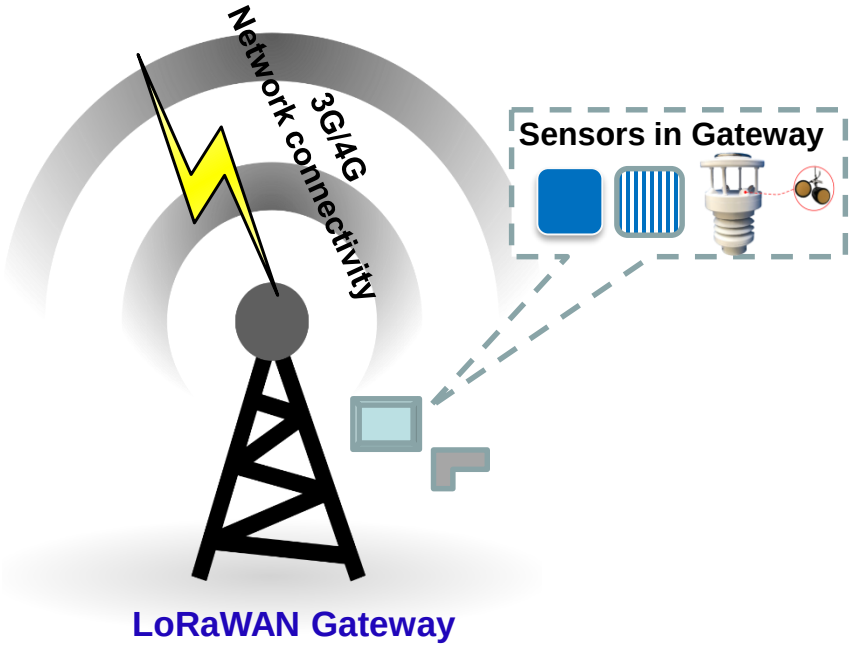
- 0091940 [In-Situ Rugged TROLL 200]
- 9255-P [Soil/Water temperature (Pt-1000) Probe]
- 9323-P [Soil moisture 8 m Probe 90,00 4 360,00]

LoRaWAN components

- LoRaWAN Device

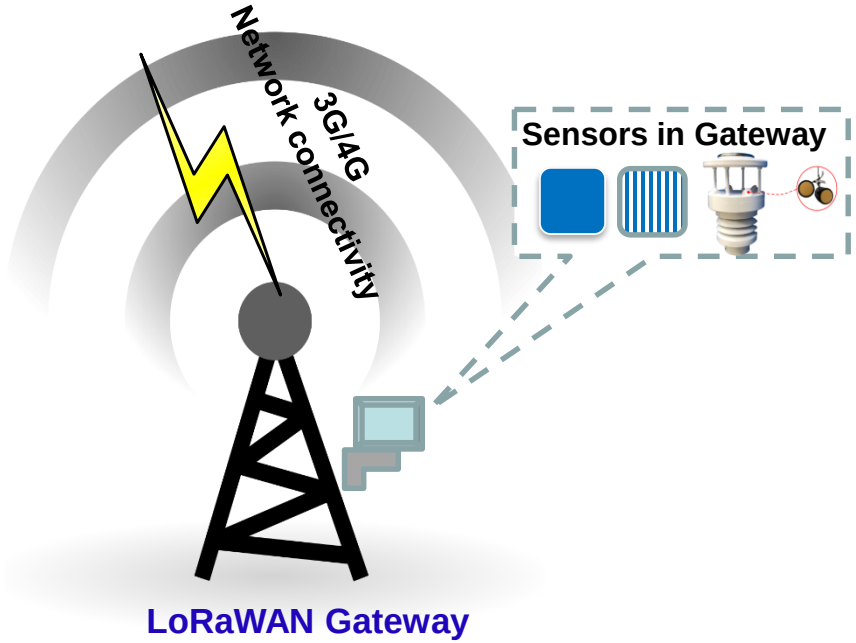
Gateway

- Gateway location



Sensor Testing – Weather Station

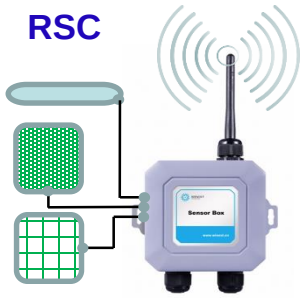
- Consulted Meteorology Department and they will help to calibrate our weather station



Sensor Testing – Sensor (RSC)

- Sensors

RSC



Deployment in Remote Sensing Clusters (RSCs)

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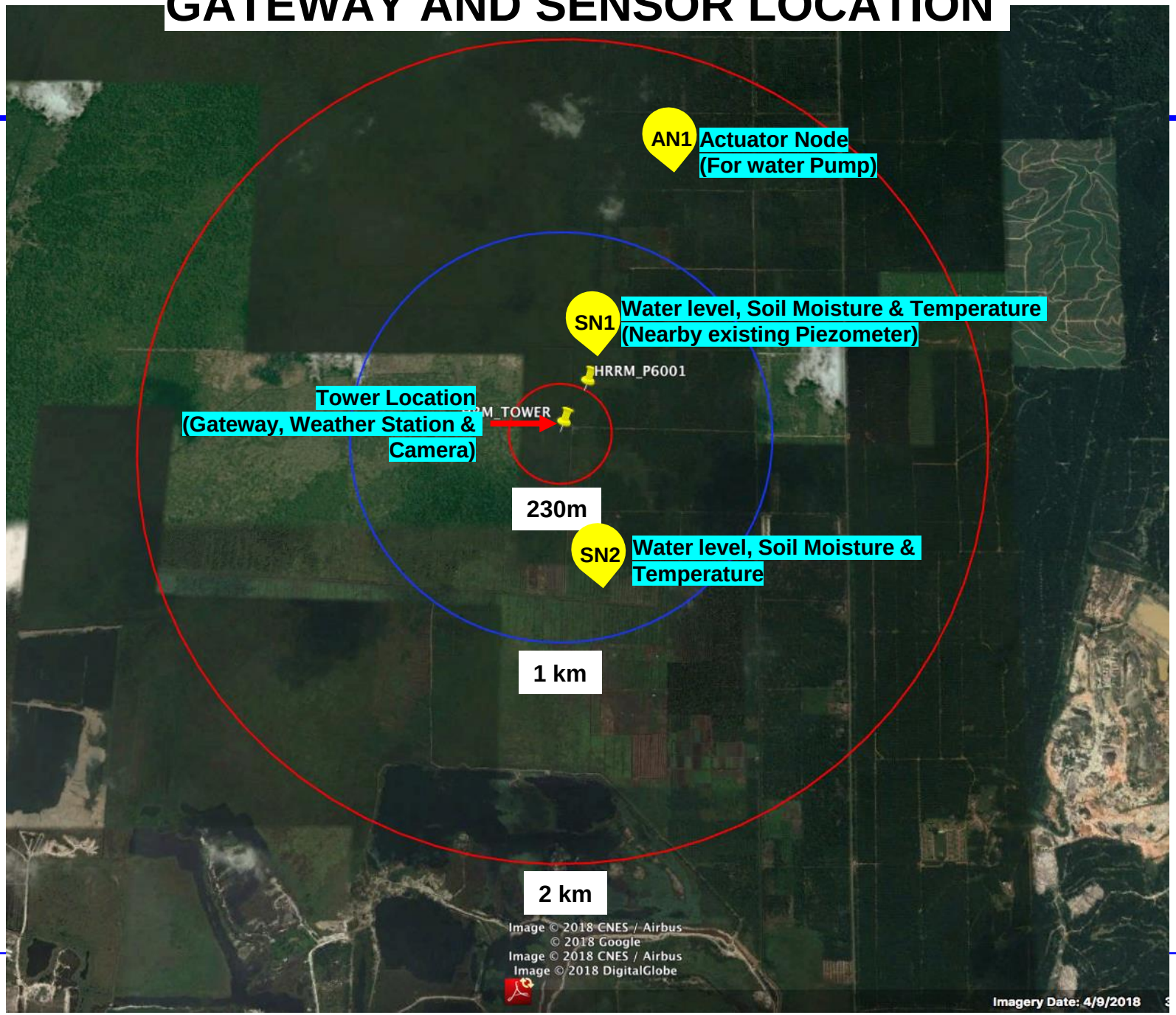
LoRaWAN components

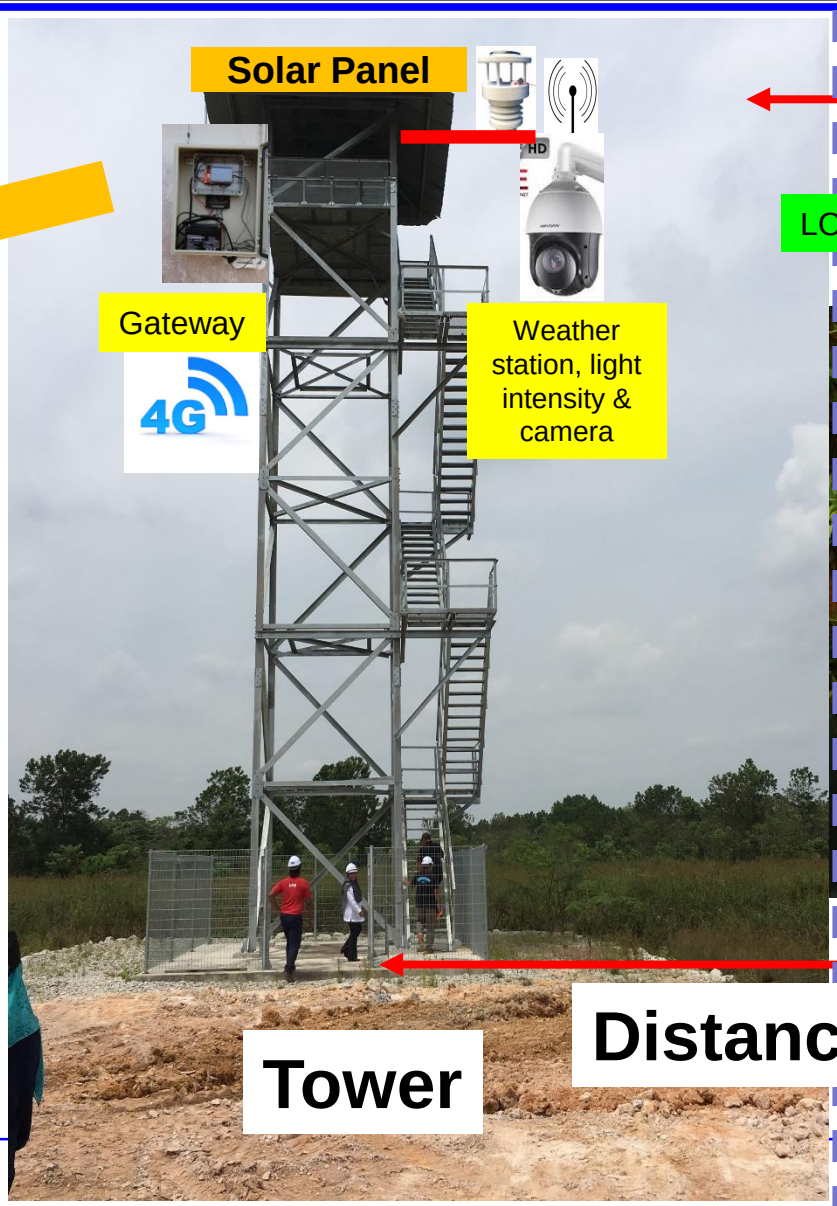
LoRaWAN Device

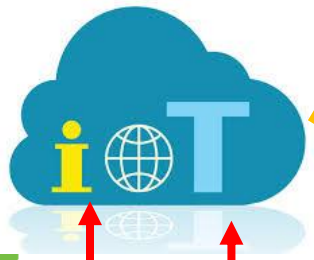
TECHNOLOGICAL INNOVATION

GATEWAY AND SENSOR LOCATION



Site Implementation

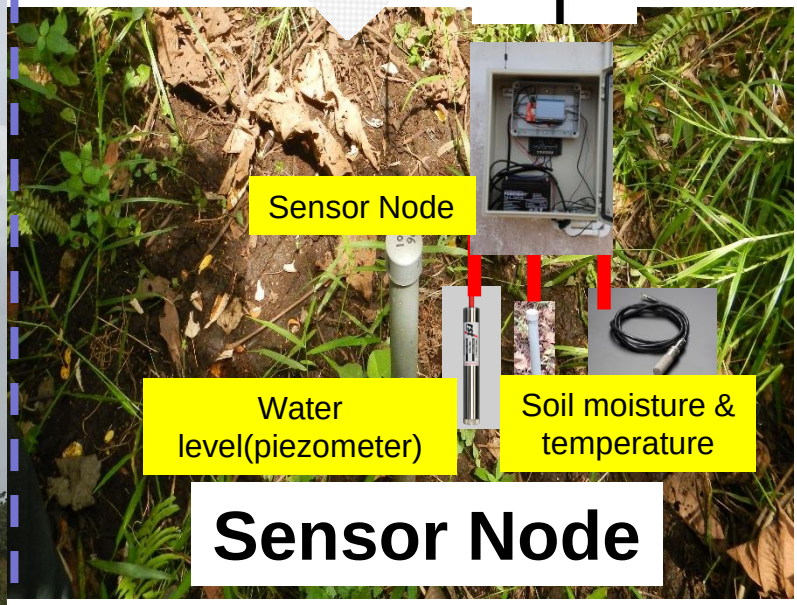




Server

GUI

LORA



Distance ~ 150m to 1km

Site Implementation

No.	Equipment
(a) Sensors and LoRA Nodes	
1	**Datalogger** Custom LoRaWan Datalogger for ground water level (piezometer, soil moisture)
2	**Datalogger** Enviromental LoRaWAN Data Logger - Custom LoRa Datalogger for Enviromental Sensor - RS485 communication for sensor. - Region: AS923 Incl. of - HY-WDS9E combine Barometric pressure, rainfall, temperature, humidity, radiation, wind speed direction, pm2.5, UV, illuminance.
3	Data Logger with Ultrasonic Flow Sensor - Custom LoRa Data Logger (Flow Sensor) - Solar Powered - incl. SUPMEA SPE-2000S Wall Mounted Clamp on Ultrasonic Flowmeter

Site Implementation

(b) Solar Panel, Camera and Backbone Connectivity	
4	**GW5000A LoRa Gateway** WINEXT GW500A Standard LoRaWAN protocol; Support AS923 Receive sensitivity: -143dBm; 8 uplink channels, 1 downlink channel; With CE/FCC certification
5	**Industrial LTE Modem** Mikrotik wAP LTE Outdoor 2G 3G 4G Router Modem - 12V DC input for solar power supply
6	**IP Camera** Hikvision DS2CD2021-IAX IR H.265+ 2.0MP OUTDOOR Bullet Network IP Camera
7	**Telco Simcard** Unlimited 10GB monthly data
8	**Power System** - 100W Solar panel, solar charger controller, cables, 100 AH batteries, - 20W Solar panel, solar charger controller, cables, 10 AH batteries, - custom mounting frame for enclosure, panel and wiring accessories.
(c) Civil works and installation	
9	**Civil Work - Borehole for Water Level Sensor**
10	**Engineering Work** Installation work, integration, commissioning - cabling layout and wiring - install mounting accessories - control communication RS485/modbus
11	Skylift Rental per day

WATER LEVEL & SOIL MOISTURE

TOWER – G/W, WEATHER STATION



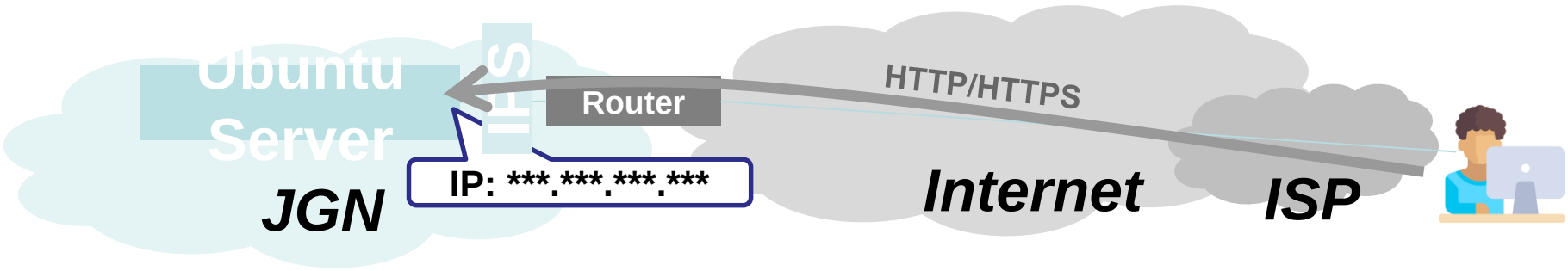



PUMP HOUSE – WATER VOLUME

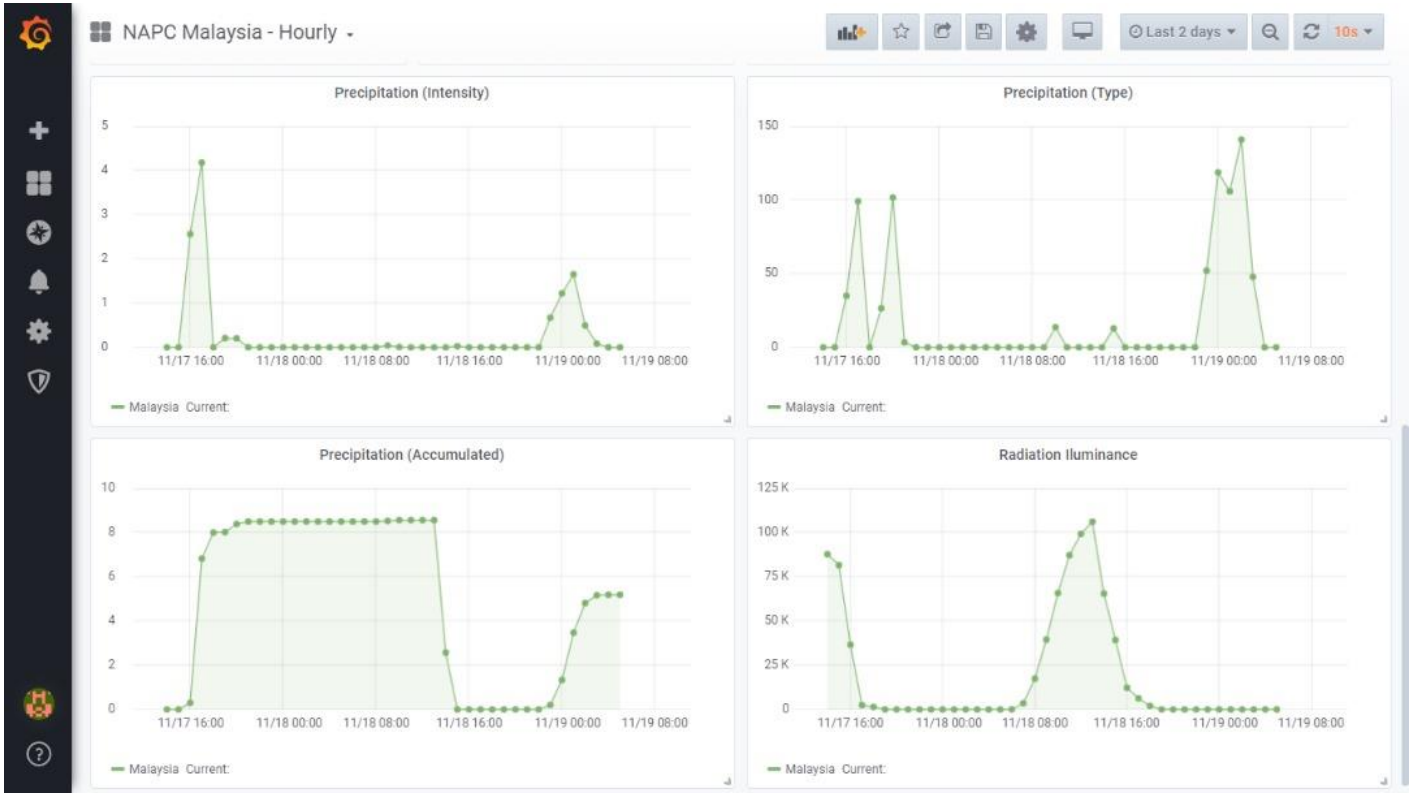
Information about Peatland Data Collected from IoT System

Sensor ID	Sensor Type	Measurement Unit	Min-max value	Acceptable range
Weather station	Temperature, Humidity, Pressure Light intensity	Celsius, %, LUX	0 – 100, 0 – 100, 0 – 30000	30 – 40, 50 – 70, 2000 – 10000
	Rain gauge	mm	0 - 80	Daily
	Anemometer, Wind Vane,	knots		0.5ms-1 1degree
Sensor 1A	Soil Water Temperature Soil moisture In-Situ Rugged (Water level)	Celsius Cb (centibars) meters	0-100 0-200 30 (Burst:40)	Cm3 range 0-1
Sensor 1B	Soil Water Temperature Soil moisture In-Situ Rugged (Water level)	Celsius Cb (centibars) meters	0-100 0-200 30 (Burst:40)	
Sensor 1C	Soil Water Temperature Soil moisture In-Situ Rugged (Water level)	Celsius Cb (centibars) meters	0-100 0-200 30 (Burst:40)	
Sensor 1D	Soil Water Temperature Soil moisture In-Situ Rugged (Water level)	Celsius Cb (centibars) meters	0-100 0-200 30 (Burst:40)	

JGN Implementation



- Basic Configuration:
  - ✓ 1 Ubuntu Server
- 1 Global Address
  - ✓ allow from any IP addresses



SOCIAL INNOVATION

Social Innovation: Community Engagement

- Stakeholders
  - Jabatan Perhutanan Negeri Selangor (JPNS)
  - Sahabat Hutan Gambut Selangor Utara (SHGSU)
  - Global Environment Centre (GEC)
  - Primary and Secondary Schools

- Community Engagement
  - Alert system – local technology acceptance
  - Social community program for community
    - Education – awareness programs
    - Entrepreneurship
    - Ecotourism

Project Activities

1st NAPC Workshop (Kick-off Meeting) – UPM, 6-7 Aug 2018

LoRa Sharing and Exchange Session - MIMOS, 18 Oct 2018

Global Environment Centre

Jabatan Perhutanan Negeri Selangor

Discussion with local authorities

and communities - to engage and get approval

Collaboration Meeting

Monthly Webex Meeting

Cisco webex

Stakeholder Involvements

- AITI – Signing in April 2019
- Internet connectivity - Cloud
  - DST have agreed to sponsor for connectivity 1GB/mth sim on data only.
  - Sign 28th August 2019
- LORA – Gateway
  - Sign MOU with ANIAN –LORA
  - 26th September 2019

Project Activities

2nd NAPC Workshop

UTB, 28 – 29 Jan 2019

UTB hosts dialogue session

A DIALOGUE session on Brunei-Networked ASEAN Peat Swamp Forest Communities (BRU-NAPC) under the ICT Virtual Organisation of ASEAN Institutes (ASEAN IVO) and National Institutes of Information and Communications Technology (NICT) was held at the Lecture Theatre 2, Library Complex, Universiti Teknologi Brunei (UTB) yesterday.

The session began with the recitation of *Surah Al-Fatihah* and *Doa Selamat* followed by welcoming speech by the Group Leader for Brunei NAPC for ASEAN IVO Project Dr Wida Susanty binti Haji Suhaili and an official opening by the guest of honour Assistant Vice-Chancellor (Research) of UTB Professor Dr Zuraini Abu Samah.

Forumon Peatland Conservation and Mitigation Attempts' was delivered by six local organisations and three regional members. The presenters were Forestry Officer from Heart of Borneo Zaridi bin Haji Bertadin, Senior Officer from Department of Environment, Parks and Recreation (JASTRe) Dayangku Haryanti binti Pengiran Haji Petra, Senior Superintendent of Fire and Rescue Muhd Shahreeni bin Haji Yussof, Environmental Affairs Advisor from Brunei LNG Sdn Bhd Almayati binti Haji Peradin, Technical Officer from Wetland

3rd NAPC Workshop

IPB, 26 – 27 Aug 2019

Sharing and Dissemination of Information

5th JASTIP Symposium,16-19 October 2018, Sepang, Malaysia

“Disaster Risk Reduction & Environmental Sustainability for Social Resilience“.

MESTECC-APCTT 2018 Conference on the 4th Industrial Revolution , 23-24 October 2018, Putrajaya, Malaysia

“New and Emerging Technologies in Achieving Sustainable Development Goals”

State Forestry Department

16 January 2019

-Meeting with Director of Selangor Forestry Department (DSFM)

- SFM agreed on proposed monitoring system
- Location of the gateway, sensors and actuator was agreed

Sahabat Hutan Gambut Selangor Utara (SHGSU)

Engagement with local community

- Meeting with SHGSU on 2 July 2019
- Awareness of the peatland IoT system
- Economic empowerment
- Ecotourism

Summary – List of Activities

Aug 2018

1st NAPC Workshop, UPM Malaysia
CRDA discussion

Jan 2019

2nd NAPC Workshop, UTB Brunei
Procurement process

Sept-Dec 2019

IoT System Deployment, Malaysia, Indonesia, Brunei
Peatland data acquisition
Cloud server configuration
CRDA signing process

Aug 2019

3rd NAPC Workshop, IPB Bogor, Indonesia
Cloud server meeting, UPM
ASEAN Transboundary Haze Centre
MAPFire

Jan - June 2020

Social Innovation Workshop, Brunei (Feb 2020)
Social Innovation Workshop, Indonesia (Apr 2020)
Final NAPC Workshop, Malaysia (June 2020)

Beyond June 2020

Haze prediction using Machine Learning
Transboundary Haze Centre research activities
Sustainable Peatland Management

Summary – List of Presentations and Publications

1. 5th JASTIP Symposium,16-19 October 2018, Sepang, Malaysia, “Disaster Risk Reduction & Environmental Sustainability for Social Resilience“
   - NAPC: Networked ASEAN Peat Swamp Forest Communities - Brunei’s Perspective
   - NAPC: Networked ASEAN Peat Swamp Forest Communities
2. MESTECC-APCTT 2018 Conference on the 4th Industrial Revolution , 23-24 October 2018, Putrajaya, Malaysia, “New and Emerging Technologies in Achieving Sustainable Development Goals”

National Institute of Information and Communications Technology

Thank you!

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