
ASEAN IVO



NAPC: Networked ASEAN Peat Swamp Forest Communities

ASEAN IVO Project Review and Progress Report



Prof. Ir. Dr. Aduwati Sali (UPM)
ASEAN IVO Project Review 2021

Project Overview

- Project Title:
 - ◆ NACP: 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 2021 (3 years)
- Project Amount: USD76,000



What's the Story?

1
Transboundary haze -
How can we improve and
complement the existing
peatland management?

3
How can we ensure the
peatland forest is
covered?

NAPC: Networked ASEAN Peat Swamp
Forest Communities

for the Network Organization
of ASEAN Institutes and NICT

ASEAN IVO NICT Japan

Balek, Brunei

Jambi, Indonesia

Raja Musa Forest Reserve, Malaysia

Project Leader:
Universiti Putra Malaysia
USD 76,000
(1/7/2018 - 30/6/2020)

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2
How can we promote
cost-effective IoT
system?

4
What are we going to do
with the peatland data?

Peatland in ASEAN – before NAPC

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 Sudlibyo 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

Wardli Wardli
© 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: Romano Garcia/AP

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.



Raja Musa Forest Reserve (RMFR), Selangor, Malaysia

Badas, Brunei

East Tanjung Jabung, Jambi, Sumatera, Indonesia

NAPC 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



Data Analytics



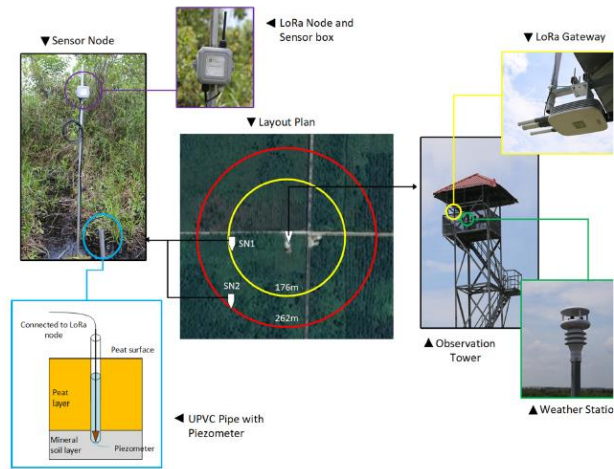
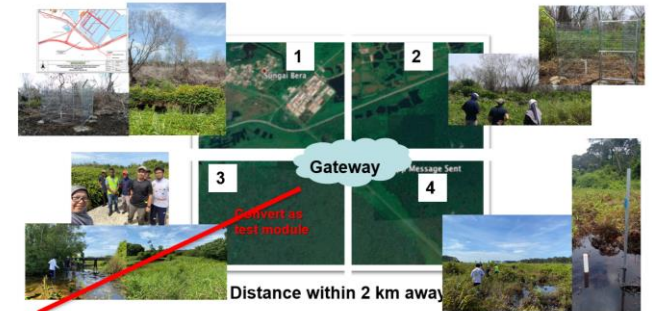


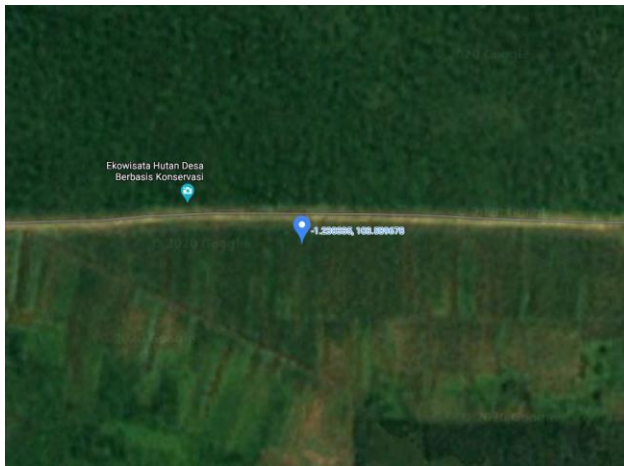
Fig. 1. Overall layout plan of the deployed IoT system, with each component highlighted.

Deploy to 4 sectors with 4 sensor node station



Due to the harsh location we decided to convert node3 as our test module in the lab. If problem exist with any of our 3 other sensors we can replace and fix it without any further downtime.

Jambi Indonesia



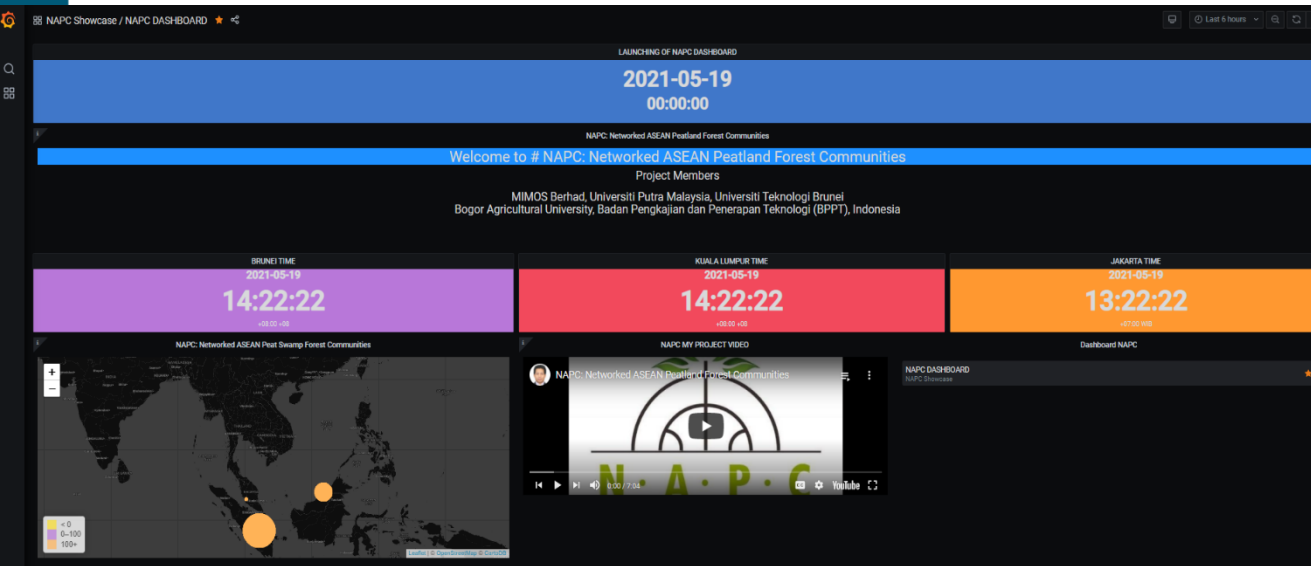
RMFR Malaysia



Badas Brunei

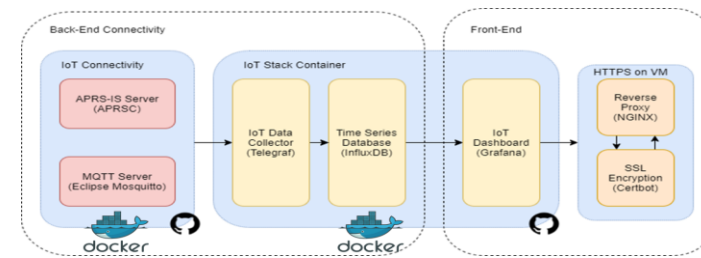
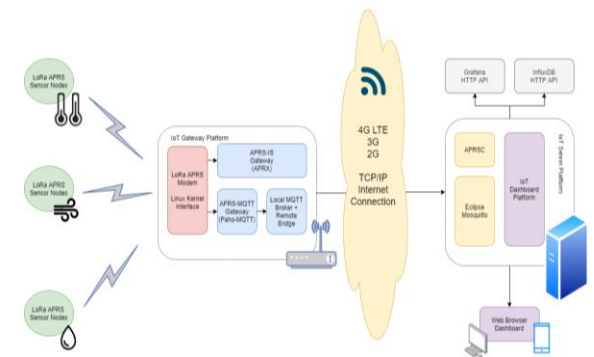
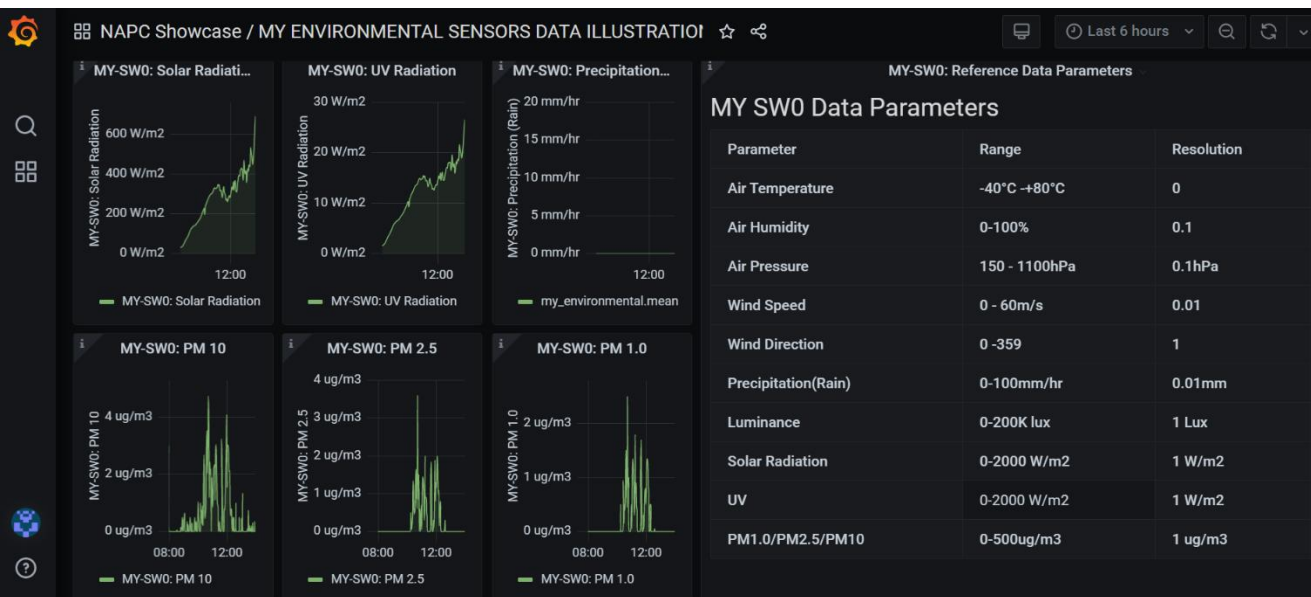


Project Activity IoT System Deployment



Project Activity

NAPC Dashboard



Project Activity

NAPC Workshops

2nd Workshop on Techno-Socio Innovation on Sustainable Peatland Management

CHAIRPERSONS:
 Prof. Inas Sibangng
 Dr. Lailan Syaifina
 Prof. Adhawi Sali
 Dr. Wida Susanty

RESOURCE PERSONS:
 Dr. Yuli Aditya
 Prof. Adhawi Sali
 Dr. Wida Susanty
 Dr. A. Sulaiman
 Dr. Israr Alhar
 Prof. Bambang H. Saharjo
 Prof. Adhawi Sali
 Dr. Mia Sitawati
 Mr. Faizal Parish
 Prof. Inas Sibangng
 Dr. Wida Susanty
 Dr. Erlanto Indra Putra
 Dr. Anisul Saad
 Dr. Lailan Syaifina

**FACULTY OF FORESTRY AND ENVIRONMENT
IPB UNIVERSITY**

The 2nd Bru-NAPC Workshop
 Theme: *Lesson Learned on Peatland within the Region*
 4th March 2021

Session 1: Understanding Peatland
 Prof Mitsuru Osaki, Hokkaido University
 Zeeidi Bercudin, IBO
 Dr Lailan Syaifina, IPB, Indonesia

Session 2: Peatland Management
 Dr A Subaman, UPM
 Dr Babayo Sukri, UEG
 Dr Ahmad Zamrudin, INTROP, UPM

Session 3: Adaption of Technology
 Pg Dr Rafidah Pg. Prof Adhawi Sali, UPM
 Dr Ir Yudi, BPPT
 Dr Ir Noordin Ramli, MIMOS

Session 4: International Best Practices
 Dr Alex Cobb, SMART
 Mr Faizal Parish, GEC
 Dr Yusako Morita, Kyoto University

Bru-NAPC Stakeholders: SMART, AITI, ANIAN, DST, LENO, SPSH, Wetlands, BMD

NAPC: Networked ASEAN Peatland Forest Communities Final Workshop
 23 March 2021

Launching of NAPC Dashboard

DATO' AHMAD FADZIL ABDUL MAJID Pengarah Jabatan Perhutanan Negeri Selangor Peat Swamp Forest Management in Selangor	09.00 - 12.00
NURIZANA AMIR AZIZ MetMalaysia Malaysia Fire Danger System (FRDS)	14.00 - 14.30
FAIZAL PARISH Global Environment Center Peatland Management in ASEAN	14.30 - 15.00
FITRIAH AZIZAN MetMalaysia/SMART UPM Greenhouse Gas Emissions Under Different Land-use Change in Selangor Peatland	15.00 - 15.30
DR. MOHD ZAHIRASRI MOHD TOHIR Faculty of Engineering UPM Smouldering Peat Fire Dynamics	15.30 - 16.00
	16.00 - 16.30

Organised by: WIPNET and INTROP, Universiti Putra Malaysia

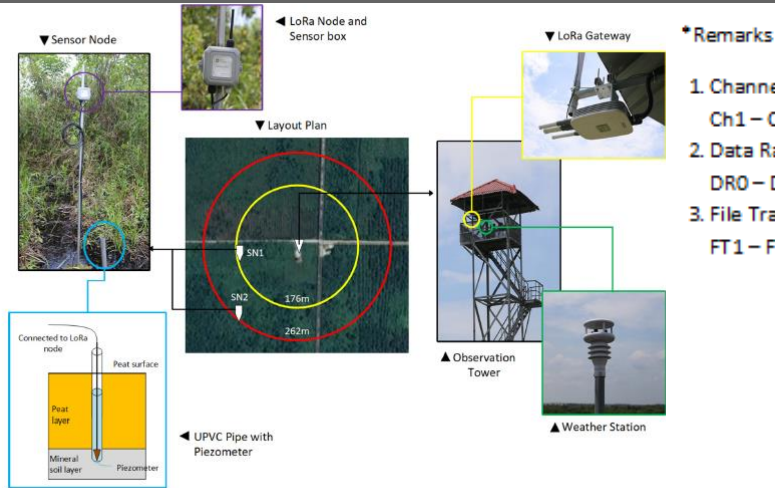
1
Indonesia
 19 – 20 Jan 2021

2
Brunei
 4 March 2021

3
Malaysia
 23 – 25 March 2021

R&D Results

LoRa Optimisation for Peatland Monitoring



- Remarks
1. Channel (Ch) assign:
Ch1 – Ch7
 2. Data Rate (DR) assign:
DR0 – DR5
 3. File Transfer (FT) attempt:
FT1 – FT10 (File size: 13byte)

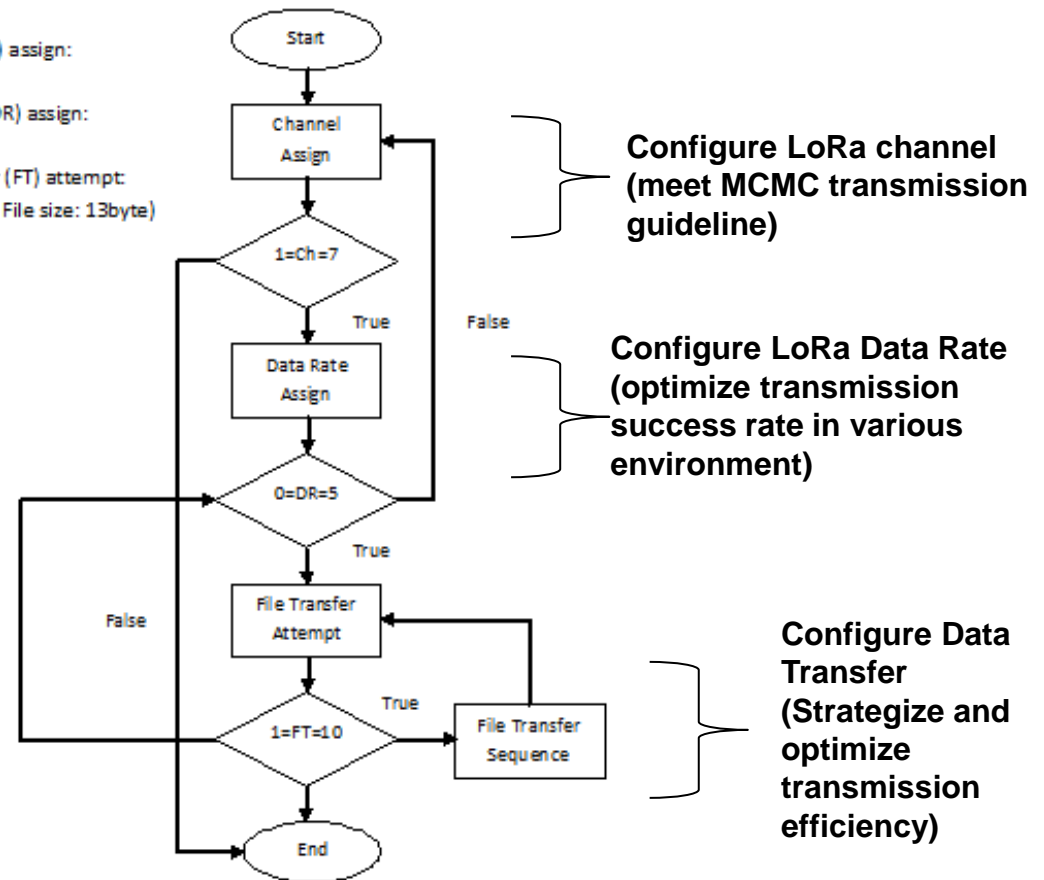


Fig. 1. Overall layout plan of the deployed IoT system, with each component highlighted.

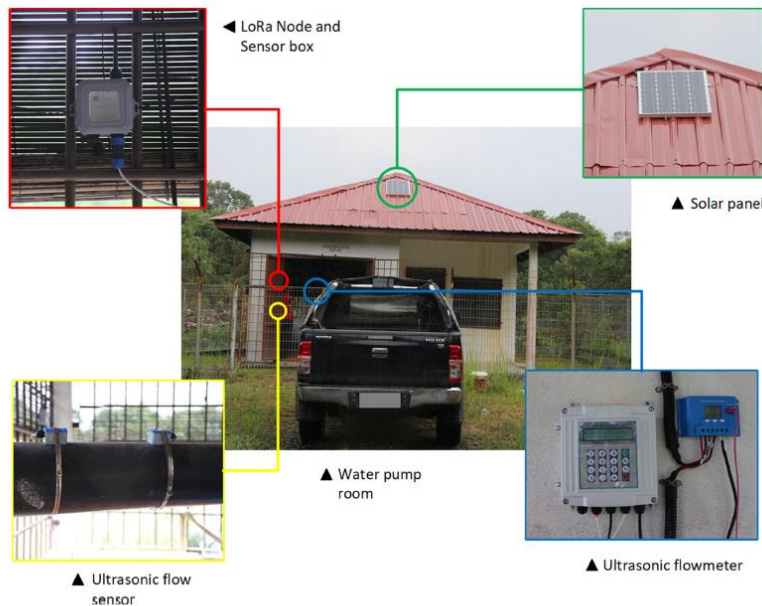


Fig. 3. Water pump room and its components.

Aduwati Sali, Azizi Mohd Ali, Borhanuddin Mohd Ali, Sharifah Mumtazah Syed Ahmad Abdul Rahman, Jiun Terng Liew, Nur Luqman Saleh, Ahmad Ainuddin Nuruddin, Sheriza Mohd Razali, Ibtisam G. Nsaif, Nordin Ramli, Hafizal Mohamad, Naomi Terada, 'Peatlands Monitoring in Malaysia with IoT Systems: Preliminary Experimental Results'. In: Suhaili W.S.H., Siau N.Z., Omar S., Phon-Amuaisuk S. (eds) Computational Intelligence in Information Systems. CIIS 2021. Advances in Intelligent Systems and Computing, vol 1321. Springer, Cham. https://doi.org/10.1007/978-3-030-68133-3_23

R&D Results

Machine Learning (ML) in Peatland Management

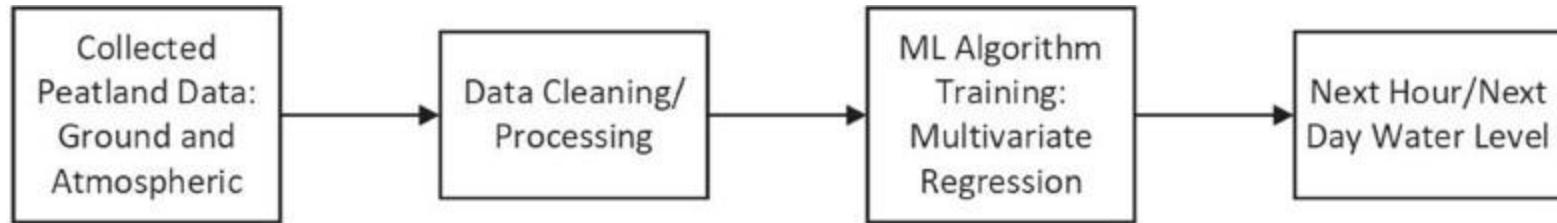


Fig. 4. Complete procedure of ML in proposed peatland management.

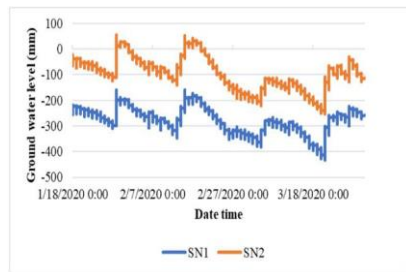


Fig. 5. GWL recorded by ground sensor nodes.

Table 1. Fire risk codes from GEC.

Water table depth range (mm)	Colour code	Fire risk
500 to 0	Blue	Low
-500 to 0	Green	Medium
-500 to -700	Yellow	High
-700 to -1000	Red	Extreme

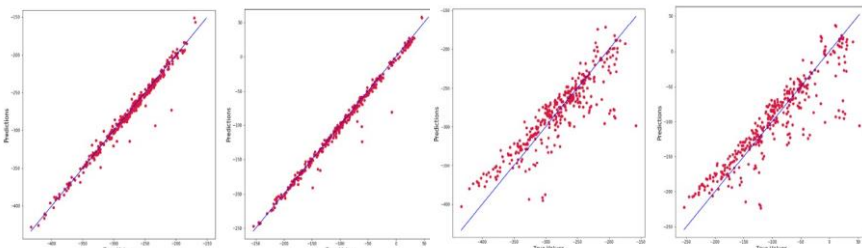
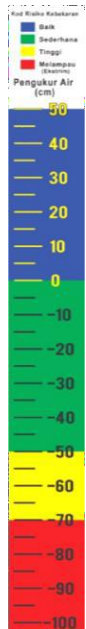


Fig. 6. Performance of ML model in predicting next hour GWL, left for SN1, right for SN2 **Fig. 7.** Performance of ML model in predicting next day GWL, left for SN1, right for SN2.

Jiun Terng Liew, Aduwati Sali, Nor Kamariah Noordin, Borhanuddin Mohd. Ali, Fazirulhisyam Hashim, et al.. Sustainable Peatland Management with IoT and Data Analytics. 22nd IFIP WG 5.5 Working Conference on VIRTUAL ENTERPRISES, PRO-VE 2021, Nov 2021, Saint-Etienne, France. 10p. ([emse-03346490](https://doi.org/10.1109/emse-03346490))

Ground Water Level (GWL) RMSE (next hour):
7.4407

Ground Water Level (GWL) RMSE
(next day – 24-hour): **27.4672**

Scientific Contribution

- Publications:
 - Aduwati Sali, Azizi Mohd Ali, Borhanuddin Mohd Ali, Sharifah Mumtazah Syed Ahmad Abdul Rahman, Jiun Terng Liew, Nur Luqman Saleh, Ahmad Ainuddin Nuruddin, Sheriza Mohd Razali, Nordin Ramli, Hafizal Mohamad, Naomi Terada, 'Radio Frequency LoRa Measurement Campaign at Different Land Use Area in Peat Swamp Forest of Peninsular Malaysia', IEEE Access, Nov 2021
 - Aduwati Sali, Azizi Mohd Ali, Borhanuddin Mohd Ali, Sharifah Mumtazah Syed Ahmad Abdul Rahman, Jiun Terng Liew, Nur Luqman Saleh, Ahmad Ainuddin Nuruddin, Sheriza Mohd Razali, Nordin Ramli, Hafizal Mohamad, Naomi Terada, 'Neural Network for Peatland Ground Water Level (GWL) Prediction in IoT System, IEEE Access, Nov 2021
 - Aduwati Sali, Azizi Mohd Ali, Borhanuddin Mohd Ali, Sharifah Mumtazah Syed Ahmad Abdul Rahman, Jiun Terng Liew, Nur Luqman Saleh, Ahmad Ainuddin Nuruddin, Sheriza Mohd Razali, Ibtisam G. Nsaif, Nordin Ramli, Hafizal Mohamad, Naomi Terada, 'Peatlands Monitoring in Malaysia with IoT Systems: Preliminary Experimental Results'. In: Suhaili W.S.H., Siau N.Z., Omar S., Phon-Amuaisuk S. (eds) Computational Intelligence in Information Systems. CIIS 2021. Advances in Intelligent Systems and Computing, vol 1321. Springer, Cham. https://doi.org/10.1007/978-3-030-68133-3_23
 - Jiun Terng Liew, Aduwati Sali, Nor Kamariah Noordin, Borhanuddin Mohd. Ali, Fazirulhisyam Hashim, et al.. Sustainable Peatland Management with IoT and Data Analytics. 22nd IFIP WG 5.5 Working Conference on VIRTUAL ENTERPRISES, PROVE 2021, Nov 2021, Saint-Etienne, France. 10p. (emse-03346490)
- Intellectual Property:
 - Copyright, LoRa Optimisation for Peatland Monitoring
 - Copyright, IoT-based Peatland Monitoring with Data Analytics

Promotional Video

<https://www.youtube.com/watch?v=VgVkC87Onts&t=114s>

youtube.com/watch?v=VgVkC87Onts&t=114s

Apps UPM : Fakulti Kejur... Amar Ishak mentio... DOKUMEN | PUSAT... International Journ... 9+ Google Funding & tenders (5) | Microsoft Teams Reading list

LoRa Optimization for Peatland Monitoring

**NETWORK ASEAN PEAT SWAMP FOREST COMMUNITIES
IoT Based System
Amaran Awal Bagi Mencegah
Kebakaran Hutan Paya Gambut**



UPM
BERSAMA SAMA MELAKSANAKAN TRANSFORMASI



ICT Virtual Organization
of ASEAN Institutes
and NICT

0:11 / 9:00

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Awards and Recognitions

CONGRATULATIONS!

REGIONAL FINALISTS

Mid-Career Scientist Category

Aduwati Sali
Malaysia

Hongying Li
Singapore

Senior Scientist Category

Neni Santawandri
Indonesia

Saini Lai Aye
Myanmar

UNDERWRITERS LABORATORIES-ASEAN-U.S. SCIENCE PRIZE FOR WOMEN 2021
THEME: CLEAN WATER AND CLEAN AIR

FESTIVAL OF IDEAS

NETWORK ASEAN PEAT SWAMP FOREST COMMUNITIES IoT Based System

Amaran Awal Bagi Mencegah Kebakaran Hutan Paya Gambut

PROF. IR. DR. ADUWATI SALI
Fakulti Kejuruteraan, UPM

U.S. Mission to Asean (USASEAN) 5 Julai jam 11:21 PG

Inspired by her sons' health issues with asthma, exacerbated by the annual haze in the region due to peatland forest fires, #Malaysia representative in the 2021 Science Prize for Women supported by USAID - US Agency for International Development and UL, Professor Aduwati Sali of Universiti Putra Malaysia, focuses her research on peatland monitoring and management to prevent the frequent haze pollution in the region.

Learn more about her work here: <https://bit.ly/3cu74Rt>



سي ايه ايس. ايس. ٢٠٢١

BEST PAPER PRESENTATION AWARD

SESSION 3: NETWORKING, SECURITY AND IOT

Liew Jiun Terng
Peatland Monitoring in Malaysia with IOT Systems : Preliminary Experimental Results

Organiser: AUN/SEED-Net, JICA, DST, BIBD, SCI, Sprintville technologies, Springer, tech.one, AD

Republic of Croatia

INTERNATIONAL AWARD OF MERIT

In conjunction with

The Malaysia-Croatia Technology Exchange 2021

This Certificate is awarded to:

ADUWATI SALI, NUR LUQMAN SALEH, LIEW JIUN TERNG, AZIZI MOHD ALI, BORHANUDDIN MOHD ALI, SHARIFAH MUMTAZAH SYED AHMAD, AINUDDIN AHMAD NURUDDIN, SHERIZA MOHD RAZALI, NORDIN RAMLI, HAFIZAL MOHAMAD, NOBUYUKI ASAI, NAOMI TERADA

UNIVERSITI PUTRA MALAYSIA

Celebrating 20th Anniversary 22 - 26 March 2021

MTE 2021
The International Expo on Innovation and Technology

A Virtual Event

International Innovation Awards Silver Award

Presented To

ADUWATI SALI, NUR LUQMAN SALEH, LIEW JIUN TERNG, AZIZI MOHD ALI, BORHANUDDIN MOHD ALI, SHARIFAH MUMTAZAH SYED AHMAD, AINUDDIN AHMAD NURUDDIN, SHERIZA MOHD RAZALI, NORDIN RAMLI, HAFIZAL MOHAMAD, NOBUYUKI ASAI, NAOMI TERADA

UNIVERSITI PUTRA MALAYSIA

Innovation Title

LORA OPTIMISATION FOR PEATLAND MONITORING

Category

CT

Organized by: PROF. DR. DATUK WIDA DR. ROSA BINTI ARUL RAMAN, IA 2021 Awards Committee Chair

Supported by: PEROTEMP, Universiti Putra Malaysia, MTE 2021, UTM, UIN, UIN, UIN, UIN, UIN

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DR. WIDA SUSANTY HJ SUHAILI

Assistant Professor at the Universiti Teknologi Brunei and Brunei's Finalist for the 2020 ASEAN-U.S. Science Prize for Women for her work stopping forest fires

congratulations from U.S. Embassy Brunei Darussalam

Liked by firshuaili and 387 others

View all 15 comments

pqahjmdlee_congrats miss @widasuhaili

National Finalists

The United States Government through the U.S. Agency for International Development (USAID), in partnership with the Association of Southeast Asian Nations (ASEAN) and Underwriters Laboratories (UL) are collaborating to strengthen ASEAN science and technology capacity and gender equality and empowerment through the annual ASEAN-U.S. Science Prize for Women. The 2020 Prize will provide promising, ASEAN-based, early- to mid-career female scientists with recognition awards from ASEAN and the US Government for their academic and professional achievements.

The ASEAN-U.S. Science Prize for Women 2020 supported by UL focuses on the Theme of The Preventive Healthcare.

The prize seeks to award two laureates, early career women from the ASEAN region working in applied science.

The top two finalists will consist of one first prize winner that will receive a USD 20,000 award and one honorable mention that will receive a USD 5,000 award.

The 10 National Finalists of the Prize 2020 are below. Please click on the finalists name to see their bio.

Dr. Wida Susanty Hj Suhaili	Dr. Chantal Pang	Dr. Nisa Riana Yusuf	Dr. Nur Hafizah Yusoff	Dr. Nur Hafizah Yusoff
Dr. Nur Hafizah Yusoff	Dr. Nur Hafizah Yusoff	Dr. Nur Hafizah Yusoff	Dr. Nur Hafizah Yusoff	Dr. Nur Hafizah Yusoff

Project Promotion and Media Coverage

UPM, Mimos partner to develop IoT-based early warning system to curb peat fires

By Digital News Asia August 18, 2020

- During impending heatwave, peat forests are susceptible to fire
- New IoT system uses sensors to make monitoring of peat conditions easier



Well, it seems that on top of a global pandemic, Malaysians will now have to hunker down for a period of heat and dryness. The Malaysian Meteorological Department had recently predicted that the country will experience a dry spell caused by the Southwest Monsoon season, which is expected to continue until mid-September.

← Khairy Jamaluddin ... 63.2K Tweets

Tweets Tweets & replies Media Likes

Retweeted

MIMOS Berhad @mimos... · 7h

UPM, MIMOS partner to develop IoT-based early warning system to curb peat fires. digitalnewsasia.com/digital-econom... #technology #university #Collaboration #DNA @officialmosti @Khairykj



UPM, Mimos partner to develop IoT-based early warning system to... digitalnewsasia.com

1 11 17

Rencana FINALIS BRUNEI KONGSI PENYELIDIKAN CEGAH KEBAKARAN TANAH GAMBUT

Finalis pertandingan penyelidikan teknologi IoT-based untuk mencegah kebakaran tanah gambut. Tim Mimos Berhad dan Universiti Malaysia Sarawak (UMS) telah memenangi pertandingan ini.

Penyelidikan mengenai peat fire prevention system menggunakan sensor IoT-based. Sistem ini akan memantau kelembapan tanah dan suhu, serta mengirimkan data ke pusat pemantauan untuk tindakan pencegahan.

Penyempurnaan sistem ini akan dilakukan dalam masa terdekat. Tim Mimos Berhad dan UMS akan bekerjasama untuk membangunkan sistem yang lebih canggih dan berkesan.

Lifestyle



Fighting peat fires with technology

An interview with Assistant Professor at the Universiti Teknologi Brunei Dr. Wida Suaryanti Bari Haji Suhaili, who recently became the national finalist for Brunei in the 2020 ASEAN-US Science Prize for Women.

"I started my research on the IoT-based peat fire prevention system in Brunei last year. It was a challenge because peat fires are a major problem in Brunei, and the Department of Environment, Parks and Recreation (DEPR) was the lead agency in this project. I was supported by my supervisor, Assistant Professor Dr. Wida Suaryanti Bari Haji Suhaili, who provided me with the necessary resources and guidance.

The research focuses on using IoT sensors to monitor the moisture levels and temperature of the peat soil. When the sensors detect a potential fire, they send data to a central server, which then triggers an early warning system. This system can alert the authorities and the local community about the fire, allowing them to take immediate action to prevent it from spreading.

The system is still in the development stage, but it has shown promising results. I hope that this technology can be widely adopted in Brunei and other countries to combat peat fires effectively.

Sensor cegah kebakaran tanah gambut

UPM dan Mimos Berhad bekerjasama membangunkan sistem IoT-based untuk mencegah kebakaran tanah gambut. Sistem ini akan memantau kelembapan tanah dan suhu, serta mengirimkan data ke pusat pemantauan untuk tindakan pencegahan.

Sistem ini akan dipasang di kawasan-kawasan yang berisiko tinggi mengalami kebakaran tanah gambut. Dengan menggunakan sensor IoT-based, sistem ini dapat memantau perubahan suhu dan kelembapan tanah secara real-time. Apabila terdeteksi adanya peningkatan suhu atau penurunan kelembapan yang signifikan, sistem akan mengirimkan peringatan dini kepada pihak berwajib untuk tindakan pencegahan.

Sistem ini juga dapat digunakan untuk memantau kesehatan tanah gambut secara keseluruhan. Dengan mengetahui kondisi tanah yang lebih baik, pihak berwajib dapat mengambil langkah-langkah untuk menjaga kesehatan tanah gambut dan mencegah terjadinya kebakaran.

Menggunakan IoT kita telah mengatasi kekhawatiran sensor menghantar data setiap dua minit kepada Dashboard (papan pemuka) untuk mengimbas maklumat tanah serta paparan sistem dalam talian.

UPM dan Mimos Berhad bekerjasama membangunkan sistem IoT-based untuk mencegah kebakaran tanah gambut. Sistem ini akan memantau kelembapan tanah dan suhu, serta mengirimkan data ke pusat pemantauan untuk tindakan pencegahan.

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Kumpulan data tiga negara

Dalam projek ini, Mimos Berhad dan UMS bekerjasama untuk membangunkan sistem IoT-based yang akan memantau kelembapan tanah dan suhu di tiga negara: Brunei, Malaysia, dan Indonesia. Projek ini bertujuan untuk meningkatkan kerjasama antara negara-negara tersebut dalam menangani masalah kebakaran tanah gambut.

Sistem ini akan dipasang di kawasan-kawasan yang berisiko tinggi mengalami kebakaran tanah gambut di ketiga negara tersebut. Dengan menggunakan sensor IoT-based, sistem ini dapat memantau perubahan suhu dan kelembapan tanah secara real-time. Apabila terdeteksi adanya peningkatan suhu atau penurunan kelembapan yang signifikan, sistem akan mengirimkan peringatan dini kepada pihak berwajib untuk tindakan pencegahan.

IoT atasi kebakaran tanah gambut

UPM dan Mimos Berhad bekerjasama membangunkan sistem IoT-based untuk mencegah kebakaran tanah gambut. Sistem ini akan memantau kelembapan tanah dan suhu, serta mengirimkan data ke pusat pemantauan untuk tindakan pencegahan.

Sistem ini akan dipasang di kawasan-kawasan yang berisiko tinggi mengalami kebakaran tanah gambut. Dengan menggunakan sensor IoT-based, sistem ini dapat memantau perubahan suhu dan kelembapan tanah secara real-time. Apabila terdeteksi adanya peningkatan suhu atau penurunan kelembapan yang signifikan, sistem akan mengirimkan peringatan dini kepada pihak berwajib untuk tindakan pencegahan.

Fighting peat fires with technology

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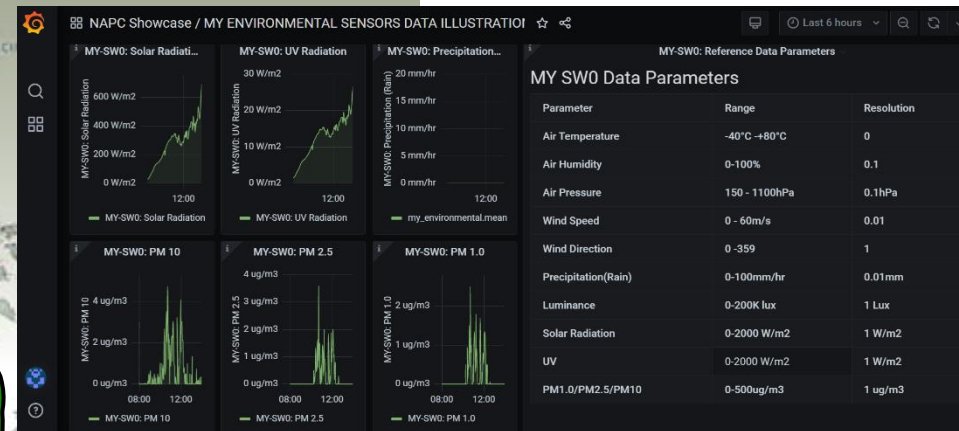
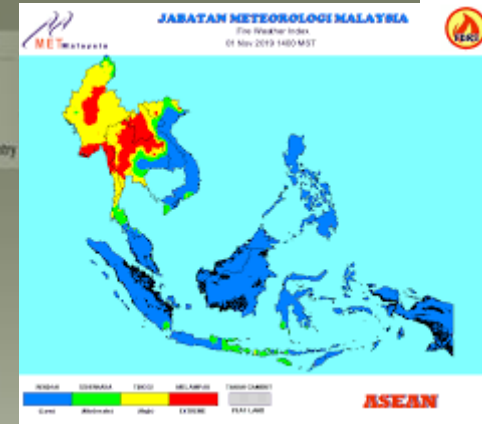
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Sistem ini juga dapat digunakan untuk memantau kesehatan tanah gambut secara keseluruhan. Dengan mengetahui kondisi tanah yang lebih baik, pihak berwajib dapat mengambil langkah-langkah untuk menjaga kesehatan tanah gambut dan mencegah terjadinya kebakaran.



Future Work

Sensor ID	Sensor Type	Measurement Unit	Min-max value	Acceptable range
Weather station	Temperature	Celsius	0 - 100	30 - 40
	Humidity	%	0 - 100	50 - 70
	Pressure	LUX	0 - 30000	2000 - 10000
	Light intensity			
Rain gauge	Rain gauge	mm	0 - 80	Daily
	Anemometer, Wind Vane	knots		0.5m-1.1degree
Sensor 1A	Soil Water Temperature	Celsius	0-100	
	Soil moisture In-Situ Rugged (Water level)	Cb (centibars) meters	0-200 30 (Burst-40)	Cm3 range 0-1
Sensor 1B	Soil Water Temperature	Celsius	0-100	
	Soil moisture In-Situ Rugged (Water level)	Cb (centibars) meters	0-200 30 (Burst-40)	
Sensor 1C	Soil Water Temperature	Celsius	0-100	
	Soil moisture In-Situ Rugged (Water level)	Cb (centibars) meters	0-200 30 (Burst-40)	
Sensor 1D	Soil Water Temperature	Celsius	0-100	
	Soil moisture In-Situ Rugged (Water level)	Cb (centibars) meters	0-200 30 (Burst-40)	



1

Peatland Data Analytics for Forest Fire Estimation

2

Integration with FDRS for Alert System



Thank you!

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