

# Preventing forest fire with IoT



*MIMOS and UPM join forces to reduce fire incidents in Raja Musa Forest Reserve, where the former sets up an IoT-based system while the latter contributes its expertise in wireless communication and forestry research.*

**By Fairuz Mohd Shahar**

The use of advanced technology such as Internet of Things (IoT) has rapidly gained traction not only in business but also in environmental sustainability. Relevant authorities and wildlife conservationists around the world have turned to this technology to tackle major global environmental problems such as deforestation, pollution, climate change and species extinction.

IoT is taking centre stage as it involves data analytics, wireless connectivity and sensor technology. Simply put, it has the ability to gather, analyse and transmit data which can help improve decision making.

MIMOS has been generating technology solutions to meet strategic national needs including environmental sustainability. The centre has developed and deployed several IoT solutions to protect the Mother Nature, one of which includes peatland monitoring at Raja Musa Forest Reserve (RMFR) in Kuala Selangor.

RMFR is one of the country's most notable peat swamp forests that acts as carbon storage, biodiversity conservation; as well as a source of freshwater supply and natural products.

Unfortunately, the forest has recorded many fire incidents due to drought, land clearing for agricultural purposes, illegal encroachment and human negligence, among others.

Peat swamp forests are made of accumulated dead leaves and plants within a water-saturated environment which make them prone to burning in hot weather. The soil substrate is so flammable when dry that to some extent, it can cause an inferno.

To address this issue, MIMOS has built an IoT-based early warning system in RMFR that provides real-time data on temperature, ground water level and surveillance system for round-the-clock monitoring to prevent fire flashovers.

## How does the technology work?

Several sensor nodes have been installed at one of the high-risk areas in RMFR, where they collect information on the surrounding environment and peat condition.

Trends on climate and environment are monitored by gathering parameters such as air temperature, humidity and pressure; precipitation intensity, ultraviolet index, radiation illuminance, solar radiation power, wind direction and wind speed.

For peat condition, the sensors for soil temperature and humidity have been placed together with an electronic piezometer which is used to measure peat's water level. A wireless gateway has been set up at a nearby lookout tower to collect all data from the sensor nodes using LoRa (Long Range) technology.

The gateway is connected to the internet and the data will be transferred to MIMOS Internet Services of Things (Mi-MIST) platform.

Mi-MIST is a middleware with integrated services to manage smart devices and sensors to enable applications in IoT solutions. This application-enablement platform integrates intelligent devices in a simple and standardised way to provide smart services.



Adding value to the solution is the surveillance camera installed at the lookout tower where forestry officials can monitor and detect smokes or fire. The lookout tower is also equipped with light intensity and weather station. In addition, the system collects microclimate data on peat forests which create useful database for researchers and stakeholders to conduct relevant studies.

### Partnership with academia

The IoT solution for peat forest management project would have not been possible without the successful partnership with Universiti Putra Malaysia (UPM).

As project leader, UPM contributes its expertise in wireless communication and forestry research through its Wireless and Photonics Network Research Centre of Excellence; and Institute of Tropical Forestry and Forest Products.

Funded by Japan's National Institute of Information and Communications Technology (NICT); and ICT Virtual Organisation of ASEAN Institutes, the project is organised under the banner of Networked ASEAN Peat Swamp Forest Communities, which is also participated by Brunei and Indonesia.

The project enables connectivity for IoT-based monitoring system in peat swamp forest areas in the participating ASEAN countries.

It also allows forest management community and researchers to further understand peat swamp forest ecosystem by analysing the collected microclimate data.

The collaboration signifies MIMOS and UPM's efforts in creating a more sustainable peat swamp forest management and address the issues of forest degradation in the country.

It facilitates IoT deployment by eliminating the complexity in integrating devices and creating rapid new context-aware IoT services.

Data on temperature, humidity, soil moisture and water level will be sent to a mobile app, where forest rangers can monitor the situation via a dashboard.

These important parameters can also be viewed on laptops and computers anytime, anywhere. If the dashboard shows that the temperature is too hot and water level plunged drastically, the system will immediately send an alert for human intervention.





# System Overview



Internet



Server



Data is shown on dashboard, which can be viewed on mobile app

Weather station, light intensity & camera



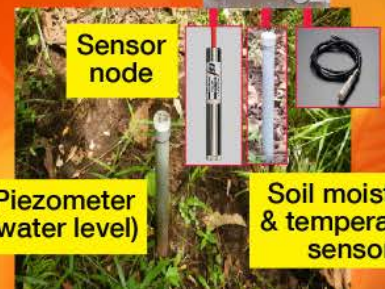
Wireless Gateway

Gateway is connected to the internet. Data will be transferred to MIMOS Internet Services of Things (Mi-MIST) platform.

## Lookout Tower

## LoRa

Data on temperature, humidity, soil moisture and water level will be sent to wireless gateway at the lookout tower.



Sensor node

Piezometer (water level)

Soil moisture & temperature sensor