

WATER SURFACE PLATFORM FOR INTERNET-BASED ENVIRONMENTAL  
MONITORING SYSTEM

NURLIYANA KAFLI

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**DEDICATION**

*Alhamdulillah, all praises to Allah,  
for giving me good health and strength while doing this thesis.*

*For my husband, my mother and my late father,*

*For the sake of raising me up and loving me;*

*to more that I can be*

*For the love and the care*

*I just want you to know that I LOVE YOU;*

*you have my words.*

*The person who has been very understanding and helpful,*

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*For the noble guidance and valuable advice;*

**THANK YOU.**



PTTA UTHM  
PERPUSTAKAAN TUNJUNGAN AMINAH

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## ABSTRACT

Currently, environmental monitoring plays such an important role in human life. This research work was carried out to monitor the environment of air and water quality that displayed the data through the mobile phone or computer. This is due to several challenges while monitoring the environment such as accessibility to a site and the safety of the workers. This research work consists of several sensors that were attached to the water surface platform (WSP); carbon monoxide sensor, temperature and humidity sensor, pH sensor, and depth sensor that acts as an input. Besides that, a GPS module also attached to the platform to track down the position of the platform in terms of latitude and longitude. Through this input, the WSP also collects the data of the carbon monoxide released to determine the quality of air, while the data on the pH value and the value of temperature and humidity were collected to determine the quality of water based on Class IV- irrigation. This research work also detects the water level for flood warning and sends a warning to the authorities through Short Message Service (SMS). As a result, all the data from the sensors were successfully sent to the ThingSpeak IoT platform to be monitored by the authorities. The graph for each sensor was generated in the ThingSpeak channel to easier the authorities. The SMS of the parameters' value also sent to the mobile phone. The power load of the WSP is 10.84W with the total time consumed of one hour and 36 seconds by using Li-ion battery. There is a slightly difference in transferring the data to the ThingSpeak channel and sending SMS due to some delays in coding part. Based on the results obtained when the WSP was deployed at FKAAS Lake in UTHM, the lake can be classified as class IV type. The long-term goal of this research is to ensure that the authorities can monitor the changes that happened on the website without the needs to be at the site.

## ABSTRAK

Dewasa ini, pemantauan alam sekitar memainkan peranan penting dalam kehidupan manusia. Kerja penyelidikan ini dijalankan untuk memantau persekitaran udara dan kualiti air yang memaparkan data melalui telefon bimbit atau komputer. Hal ini disebabkan beberapa cabaran semasa memantau persekitaran seperti akses ke lokasi dan keselamatan para pekerja. Kerja penyelidikan ini terdiri daripada beberapa sensor yang diletakkan pada platform permukaan air (WSP); sensor karbon monoksida, sensor suhu dan kelembapan, sensor pH, dan sensor kedalaman yang bertindak sebagai input. Selain itu, modul GPS juga dipasang pada platform untuk memudahkan mengesan kedudukan platform dari segi latitud dan longitud. Melalui input ini, WSP juga mengumpul data karbon monoksida yang dilepaskan untuk menentukan kualiti udara, manakala data nilai pH dan nilai suhu serta kelembapan dikumpul bagi menentukan kualiti air berdasarkan Kelas IV; pengairan. Kerja penyelidikan ini juga mengesan paras air untuk amaran banjir dan menghantar amaran kepada pihak berkuasa melalui perkhidmatan pesanan ringkas (SMS). Hasilnya, kesemua data dari sensor berjaya dihantar ke platform ThingSpeak IoT untuk dipantau oleh pihak berkuasa. Graf untuk setiap sensor telah dibuat dalam saluran ThingSpeak bagi memudahkan pihak berkuasa. SMS nilai parameter juga di hantar ke telefon bimbit. Beban kuasa WSP adalah 10.84W dengan jumlah masa yang digunakan ialah selama satu jam dan 36 saat dengan menggunakan bateri Li-ion. Terdapat sedikit perbezaan dalam memindahkan data ke saluran ThingSpeak dan penghantaran SMS yang disebabkan oleh beberapa kelewatan di dalam kod. Berdasarkan hasil yang diperolehi ketika WSP diletakkan di Tasik FKAAS di UTHM, tasik itu dapat diklasifikasikan sebagai jenis IV. Matlamat jangka panjang penyelidikan ini adalah untuk memastikan pihak berkuasa dapat memantau perubahan yang berlaku di laman web tanpa perlu berada di lokasi itu sendiri.

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**LIST OF SYMBOLS AND ABBREVIATIONS**

$\rho$	- Density of fluid
$^{\circ}\text{C}$	- Degree Celsius
<i>AMV</i>	- Autonomous marine vehicle
<i>API</i>	- Air Pollutant Index
<i>APIMS</i>	- Air Pollutant Index Malaysia
<i>AQI</i>	- Air Quality Index
<i>ASV</i>	- Autonomous Surface Vehicle
<i>AT</i>	- ATtention
<i>BNC</i>	- Bayonet Neill-Concelman
<i>BOD</i>	- Biochemical Oxygen Demand
<i>CAQM</i>	- Continuous Air Quality Monitoring
<i>CO</i>	- Carbon monoxide
<i>COD</i>	- Chemical Oxygen Demand
<i>CSV</i>	- Comma-separated Values
<i>DID</i>	- Department of Irrigation and Drainage
<i>DO</i>	- Dissolved Oxygen
<i>DOE</i>	- Department of Environment

<i>EPA</i>	- Environmental Protection Agency
<i>FTP</i>	- File Transfer Protocol
<i>F<sub>w</sub></i>	- Buoyancy force
<i>g</i>	- Standard gravity
<i>GIS</i>	- Geographic Information System
<i>GPRS</i>	- General Packet Radio Service
<i>GPS</i>	- Global Positioning System
<i>GSM</i>	- Global System for Mobile communications
<i>h</i>	- Height of fluid
<i>HTTP</i>	- Hypertext Transfer Protocol
<i>I2C</i>	- Inter-integrated Circuit
<i>IaaS</i>	- Infrastructure as a Service
<i>ID</i>	- Device Identity
<i>INWQS</i>	- Interim National Water Quality Standards for Malaysia
<i>IoT</i>	- Internet of Things
<i>IT</i>	- Information Technology
<i>KBbytes</i>	- kilobyte
<i>km</i>	- kilometer
<i>LCD</i>	- Liquid Crystal Display
<i>LED</i>	- Light-emitting diode
<i>Li-ion</i>	- Lithium ion

<i>M2M</i>	- Machine to Machine
<i>mA</i>	- milliamps
<i>mbar</i>	- millibar
<i>mm</i>	- Millimeter
<i>MU</i>	- Mobile Unit
<i>NH<sub>3</sub></i>	- Nitrogen
<i>NH<sub>3</sub>-N</i>	Ammoniacal Nitrogen
<i>NMEA</i>	- National Marine Electronics Association
<i>NO<sub>3</sub></i>	- Nitrogen Dioxide
<i>NWQS</i>	- National Water Quality Standard
<i>O</i>	- Oxygen
<i>O<sub>2</sub></i>	- Oxygen
<i>O<sub>3</sub></i>	- Ozone
<i>ODAS</i>	- Oceanographic Data-Acquisition System
<i>P</i>	- Pressure
<i>PaaS</i>	- Platform as a Service
<i>PC</i>	- Personal Computer
<i>PCB</i>	- Printed Circuit Board
<i>PDU</i>	- Protocol Description Unit
<i>pH</i>	- potential of Hydrogen
<i>PM<sub>10</sub></i>	- Particulate Matter

<i>ppm</i>	-	Parts Per Million
<i>PSI</i>	-	Pollutant Standard Index
<i>PTFE</i>	-	Polytetrafluoroethylene
<i>PWM</i>	-	Pulse-Width Modulation
<i>QoS</i>	-	Quality of Services
<i>RAS</i>	-	Real-time Air Sense
<i>RH</i>	-	Relative Humidity
<i>RL</i>	-	Load Resistance
<i>Rs</i>	-	Surface resistance
<i>SaaS</i>	-	Software as a Service
<i>SIM</i>	-	Subscriber Identity Module
<i>SMS</i>	-	Short Message Service
<i>SPI</i>	-	Serial Peripheral Interface
<i>SS</i>	-	Suspended Solids
<i>TTL</i>	-	Transistor-transistor logic
<i>TWA</i>	-	Time-Weighted Average
<i>UART</i>	-	Universal Asynchronous Receiver-Transmitter
<i>URL</i>	-	Uniform Resource Locator
<i>USB</i>	-	Universal Serial Bus
<i>USV</i>	-	Unmanned Surface Vehicle
<i>UTC</i>	-	Universal Time Coordinated



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