



July 7, 2017

Dr. Evizal Abdul Kadir,  
Islamic University of Riau

Notification of Acceptance to CEReS Overseas Joint Research Program 2017

Dear Dr. Evizal Abdul Kadir,

It is our pleasure to officially inform you of the acceptance of your application to the CEReS Overseas Joint Research Program 2017.

**Joint research ID: CI17-105**

**Subject field :** Innovative microwave remote sensing

**New/continuation :** New

**Title of the joint research :** Environmental Monitoring System Using Sensor and Remote Sensing in Pekanbaru City, Riau, Indonesia

**Corresponding staff of CEReS :** Assoc. Prof. Hitoshi Irie

**Total amount of research fund :** 250,000 yen

The budget can be used for supporting travel expenses as well as for purchasing consumables. When planning the budget spending, please have close communication with the corresponding CEReS staff so that the payment can be in line with accounting protocols of Chiba University. We sincerely hope that valuable outcomes are achieved through this joint research program.

Sincerely yours,

Prof. Yoshifumi Yasuoka,  
Director,  
Center for Environmental Remote Sensing,  
Chiba University



CHIBA  
UNIVERSITY

March 2, 2018

# Certificate of Appreciation

This is hereby granted to


**Dr. Evizal Abdul Kadir**

for international collaborative research of  
the CEReS Overseas Joint Research Program

Title of the joint research (CI17-105):

“Environmental Monitoring System Using Sensor and  
Remote Sensing in Pekanbaru City, Riau, Indonesia”

Corresponding staff of CEReS : Assoc. Prof. Hitoshi Irie

*Hitoshi Irie* 

Hitoshi Irie

Center for Environmental Remote Sensing (CEReS)

Chiba University

1-33 Yayoicho, Inage-ku

Chiba 263-8522, Japan



July 2, 2018

Dr. Evizal Abdul Kadir,  
Islamic University of Riau

Notification of Acceptance to CEReS Overseas Joint Research Program 2018

Dear Dr. Evizal Abdul Kadir,

It is our pleasure to officially inform you of the acceptance of your application to the CEReS Overseas Joint Research Program 2018.

**Joint research ID: CI18-105**

**Subject field :** Innovation in remote sensing technology and algorithm

**New/continuation :** Continuation

**Title of the joint research :** Development of Environmental Remote Sensing for  
Water Pollution Monitoring System;Case Study at Siak  
River,Indonesia

**Corresponding staff of CEReS :** Assoc. Prof. Hitoshi Irie

**Total amount of research fund :** 200,000 yen

The budget can be used for supporting travel expenses as well as for purchasing consumables. When planning the budget spending, please have close communication with the corresponding CEReS staff so that the payment can be in line with accounting protocols of Chiba University. We sincerely hope that valuable outcomes are achieved through this joint research program.

Sincerely yours,

---

Prof. Hiriroaki Kuze,  
Director,  
Center for Environmental Remote Sensing,  
Chiba University



国立大学法人千葉大学  
CHIBA UNIVERSITY

February 21, 2019

# Certificate of Appreciation

This is hereby granted to

**Dr. Evizal Abdul Kadir**

for international collaborative research of  
the CReReS Overseas Joint Research Program

Title of the joint research

"Development of Environmental Remote Sensing for Water Pollution Monitoring System; Case Study at Siak River, Indonesia"

Corresponding staff of CReReS : Assoc. Prof. Hitoshi Irie

*Hitoshi Irie*



Hitoshi Irie

Center for Environmental Remote Sensing (CReReS)

Chiba University

1-33 Yayoicho, Inage-ku

Chiba 263-8522, Japan



July 8, 2019

Dr. Evizal Abdul Kadir,  
Islamic University of Riau

Notification of Acceptance to CEReS Overseas Joint Research Program 2019

Dear Dr. Evizal Abdul Kadir,

It is our pleasure to officially inform you of the acceptance of your application to the CEReS Overseas Joint Research Program 2019.

**Joint research ID: CI19-106**

**Subject field :** Innovation in remote sensing technology and algorithm

**New/continuation :** Continuation

**Title of the joint research :** Environmental Remote Sensing for River Water  
Pollutant Monitoring System

**Corresponding faculty of CEReS :** Hitoshi Irie

**Total amount of research fund :** 250,000 yen

The budget can be used for supporting travel expenses as well as for purchasing consumables. When planning the budget spending, please have close communication with the corresponding CEReS staff so that the payment can be in line with accounting protocols of Chiba University. We sincerely hope that valuable outcomes are achieved through this joint research program.

Sincerely yours,

---

Hiroaki Kuze,  
Director/Professor  
Center for Environmental Remote Sensing,  
Chiba University

# Certificate of Appreciation

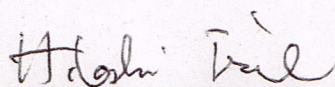
This is hereby granted to

**Dr. Evizal Abdul Kadir**

for international collaborative research of  
the CEReS Overseas Joint Research Program

Title of the joint research (CI19-106):  
“Environmental Remote Sensing for River Water Pollution  
Monitoring System”

Corresponding staff of CEReS : Assoc. Prof. Hitoshi Irie



---

Hitoshi Irie

Center for Environmental Remote Sensing (CEReS)  
Chiba University  
1-33 Yayoicho, Inage-ku  
Chiba 263-8522, Japan

# REMOTE MONITORING OF RIVER WATER POLLUTION USING MULTIPLE SENSOR SYSTEM OF WSNS AND IOT

## INTRODUCTION

This research aim to design and develop a system with multi-sensor to monitor river water pollution because most of the community members use river water in their daily activities. In this design and development of system, a Wireless Sensor Networks (WSNs) was applied because of the many advantages that can be use. Multi-sensor nodes were installed for the detection of water pollution parameters such as temperature, Electrical Conductivity (EC), water pH, and Dissolved Oxygen (DO).

## PROBLEM AND OBJECTIVE

The goal of this research is to develop water pollutant monitoring system by install several of sensors at a point of River, then all the information will share to the community, figure 1 shows Siak river.



Figure 1. Siak River, Riau Indonesia.

## SOLUTION AND INNOVATION

To collect common water quality parameters, some sensors related to parameters installed such as water temperature, pH electrical conductivity and dissolved oxygen. The distance from sensors point at river quite far to the monitoring center. Thus a communication system to transmit data of water information is developing for effective communication, figure 2 shows the design

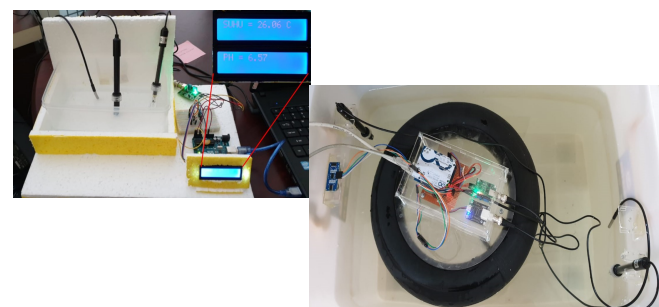
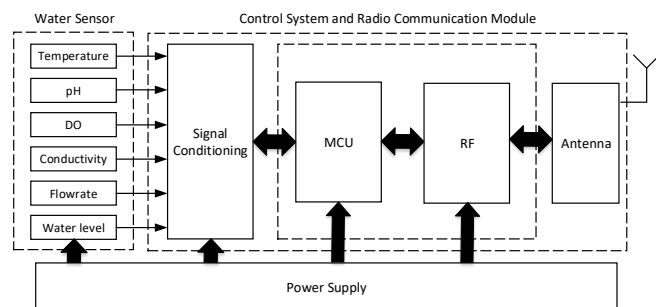


Figure 2. Water pollutant sensors design, testing, and calibration.

## RESULTS

This research gain knowledge and contribute new invention for water pollutant monitoring system, data collection and study of sensor placement location for effective sensing including design a new sensor that be able to collect accurate data. Development of a new method of communication system for effective data transmission and sharing is one of intention in this research. Figure 3 shows the system architecture.

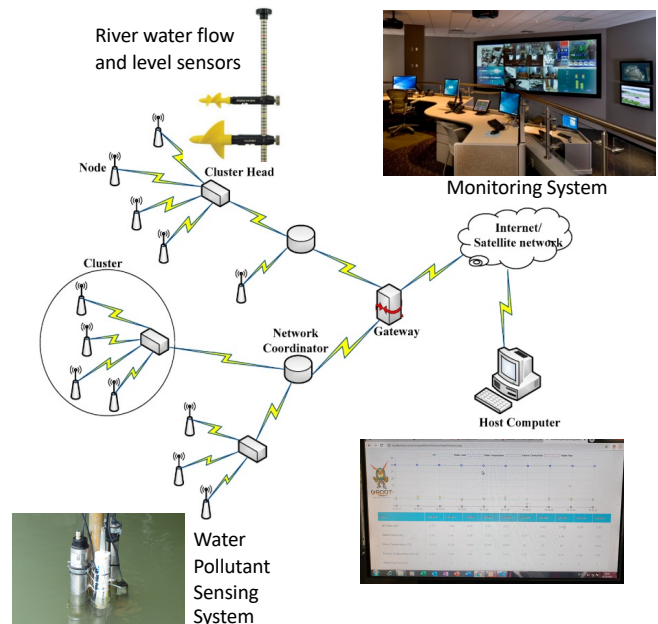


Figure 3. Architecture of WSNs monitoring system.

## NOVELTY

A smart system with intelligent detection of water pollutant is one of novelty, beside that system be able to analyze behavior of water pollutant data and send alert when major changes happen.

## BENEFITS AND COMMERCIALIZATION

Development and Innovation in the used of water pollutant monitoring system.

### Benefit

- Real-time water monitoring system.
- Multi parameter of water pollutant indicator.
- Data analyse and record for a few year.
- Mobile application for remote monitoring system.

### Commercialization

- Water supply industries.
- Environmental government agency.
- Industries with usage much water.
- Housing developer for residence water supply.



Evizal Abdul Kadir



Hitoshi Irie



Sri Listia Rosa



CHIBA UNIVERSITY



UNIVERSITAS ISLAM RIAU

DEPARTMENT OF INFORMATICS ENGINEERING, FACULTY OF ENGINEERING  
UNIVERSITAS ISLAM RIAU, PEKANBARU, RIAU, INDONESIA 28284

# DEVELOPMENT OF ENVIRONMENTAL REMOTE SENSING FOR WATER POLLUTION MONITORING SYSTEM CASE STUDY AT SIAK RIVER, INDONESIA

## INTRODUCTION

Water pollution is one of the causes that makes the environment unclean, and a river is one of the mediums used by many communities and industries in many countries including Indonesia. This research aims to develop a system that is able to monitor water quality at Siak River in Riau Province, Indonesia. Some sensors are installed at some points of the river, and then all the information is sent to the backend system for monitoring as well as to the CEReS data center for records. The information collection will help the community to know the quality of the water and for the respective government to take action in case of abnormal water quality.

## PROBLEM AND OBJECTIVE

The goal of this research is to develop a water pollutant monitoring system by installing several sensors at a point of Siak River, then all the information will be shared to the community. A display of information about water quality will be installed at the community center, and all the people will know the information including the river water level.



Figure 1. Siak River, Riau Indonesia.

## SOLUTION AND INNOVATION

To collect common water quality parameters, some sensors related to parameters are installed, such as water temperature, pH, electrical conductivity, and dissolved oxygen. The distance from the sensor point to the river is quite far, so the monitoring center then develops a communication system to transmit river water information for effective communication. WSNs technology is used in this system to collect data from sensor nodes and forward it to the sensor gateway, then to the monitoring center for analysis and forward the information to local government and the community.

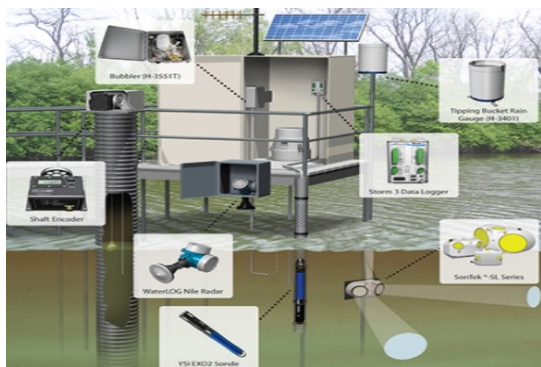


Figure 2. Water pollutant sensors installed in river area.

## RESULTS

This research gains knowledge and contributes a new invention for a water pollutant monitoring system, data collection, and study of sensor placement location for effective sensing, including the design of a new sensor that is able to collect accurate data. Development of a new method of communication system for effective data transmission and sharing is one of the intentions in this research.

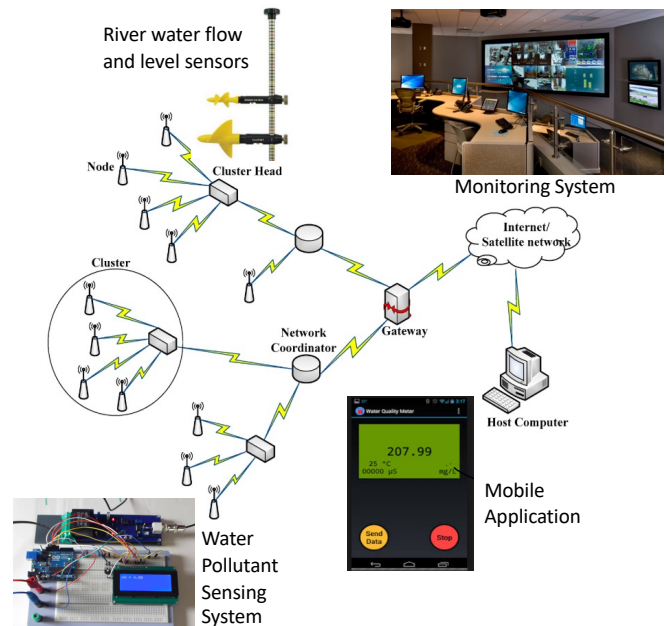


Figure 3. Architecture of WSNs monitoring system.

## NOVELTY

A smart system with intelligent detection of water pollutants is one of the novelties, besides that the system is able to analyze the behavior of water pollutant data and send alerts when major changes occur.

## BENEFITS AND COMMERCIALIZATION

Development and innovation in the use of water pollutant monitoring systems.

### Benefit

- Real-time water monitoring system.
- Multi-parameter water pollutant indicator.
- Data analysis and recording for a few years.
- Mobile application for remote monitoring system.

### Commercialization

- Water supply industries.
- Environmental government agency.
- Industries with high water usage.
- Housing developer for residential water supply.



Evizal Abdul Kadir



Hitoshi Irie



Sri Listia Rosa



DEPARTMENT OF INFORMATICS ENGINEERING, FACULTY OF ENGINEERING  
UNIVERSITAS ISLAM RIAU, PEKANBARU, RIAU, INDONESIA 28284

【Joint Research No. CI17-105】

**Title of Joint Research:** Environment Monitoring System Using Wireless Sensor Network and Remote Sensing in Pekanbaru City, Riau, Indonesia

**Name of Principal Investigator:**

Evizal Abdul Kadir (Islamic University of Riau)

【Abstract】

Forest fire is one of disaster that happen most in every year in Indonesia, Pekanbaru is capital city of Riau Province in Indonesia, this city one of area that very potential happen of forest fire because of the peat land. In summer session with dry peat land, fire can be happen accidentally without anyone knows. Based on that issue, proposed a system that can monitor environmental in Riau province very required to prevention of incident forest fire. Several sensors installed in forest and city such as temperature sensor, humidity, wind, etc. The entire data recorded send to data center and then analyze for the abnormality and sending an alert to respective department for further action.

1  
**Back-Ground**  
**Objective**  
**Methodology**

Indonesia is one of tropical country that risk for forest fire because of some area with typical peat land very potential for fire especially in summer session. This project is aim to monitor environment using sensors that install in several place then system will send alert signal if abnormal temperature (high temperature) happen. With data collected by sensors and recorded then all the data can be studied when is time and session very potential incident of forest fire then preventive action can be plan. In order the get accurate data, strategic to place and install sensors for collected the data in best location. A monitoring system in a room with wide display install to monitor and record all the data. Connection from every sensor to data center using wireless communication (point to point) or GPRS system. Alert system can be set by sending email or SMS to respective department if something happen. This project also to contribute data collection especially in Riau Province, Indonesia for world safety and environmental organization.

2  
**Conclusions**

**Conclusion1**  
Based on research have been done some of finding in monitoring environment using wireless sensor network (WSN) such as integration of a few sensors in a single node of WSN have to configure by circle in order to avoid confit of data node sensor send the data sensor node sink. Figure 1 shows a node connected to 3 sensors to monitor environment parameters which are temperature sensor, humidity and smoke sensor.

**Conclusion 2**  
In this stage of research because of limited funding, prototype only for one node and a gateway for data collection and database. Testing have done in laboratory environment as well as live around the city Pekanbaru, Riau, Indonesia. Next step is to develop more sensor node and testing in live environment and also in forest that very potential for forest fire. A mini data monitoring using LCD display shows in figure 2 to check status and record for environment monitoring, alert system will trigger an alarm if abnormality environment parameter detected.

3  
**Effect/Outcome**

The result of this study is applied for prevention system in environment and forest monitoring especially in tropical region with potential for forest fire such in Riau Province, Indonesia with most of land is pet type land that very risk for forest fire in summer session. The developed method is applied for teaching material for wireless sensor network protocol, configuration, setting, data collection, etc in monitoring environment.

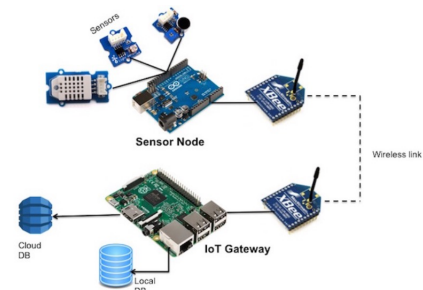


Fig.1 Wireless sensor network system

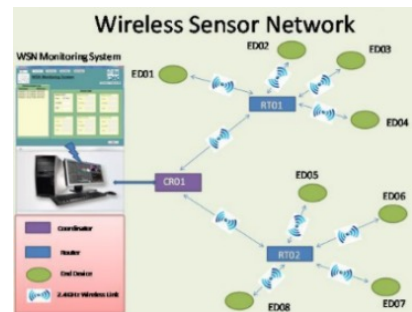


Fig.2 Remote sensing for forest monitoring