Regional Workshop: Pathway Towards Improved Water Education Curricula
27-28 November 2017
Penang, Malaysia

VOLUME [1]

WATER MANAGEMENT CURRICULA USING ECOHYDROLOGY AND INTEGRATED WATER RESOURCES MANAGEMENT

[Understanding Lake Environmental Management and Expert System Monitoring]

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Presentation Outline

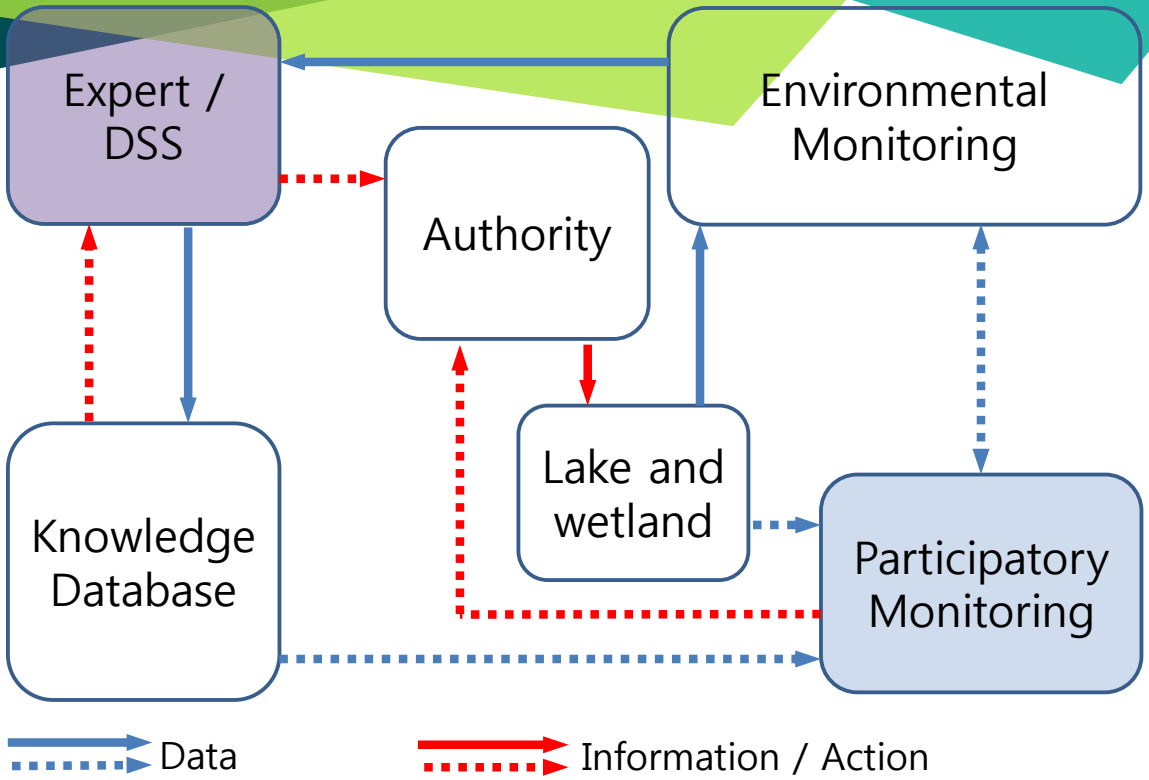
1. GENERAL BACKGROUND
2. MODULE OBJECTIVE
3. LEARNING OUTCOME
4. COURSE DURATION
5. MODULE ACTIVITIES AND PROCEDURES

GENERAL BACKGROUND

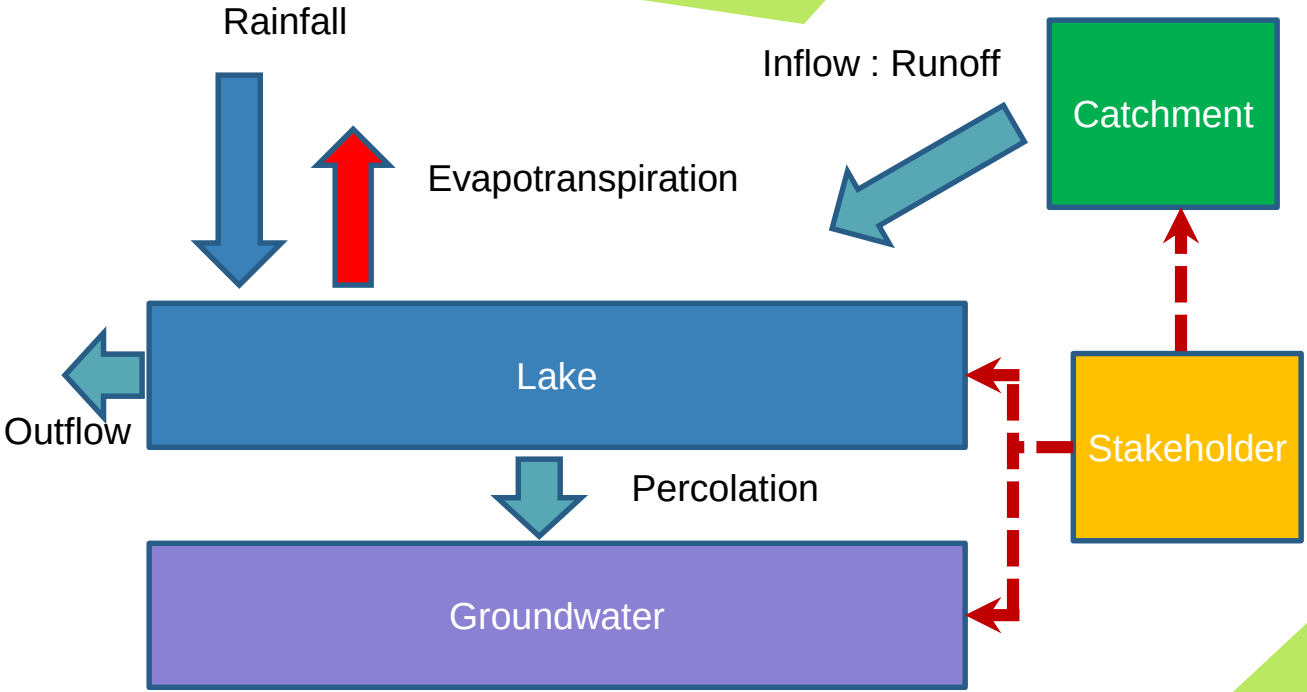
- Urban catchment requires a good lake and effective wetland management.
- That lake at urban area has multi-functional uses such as boating, fishing, recreational and water sports
- The Acceptable water quality level for them are higher
- The wetland area will be the last treatment for water purification

- Expert system and real time monitoring of certain main indicators on ecological succession are important
- The environmental programs already implemented, but lack of support from other stake holder, especially from local community
- Therefore, environmental practitioners of local community were assumed to be the key for successful environmental program.

Lake Environmental Management



RELATED PHYSICAL ECO-HYDROLOGICAL PROCESSES



ALTERNATIVE ENVIRONMENTAL MONITORING

Sensor

Data Logger / Transmitter (Raspberry Pi)

Microcontroller (Arduino + Software)

Communication Network

Server / HQ

Expert System

- Expert systems is a computer system that emulates the decision-making ability of a human expert.
- An expert system is divided into two sub-systems: the inference engine and the knowledge base.
- The goal of knowledge-based systems is to make the critical information required for the system to work explicit rather than implicit.
- The most common disadvantage cited for expert systems in the academic literature is the knowledge acquisition problem.
- It is necessary for improving knowledge database, as well as historical event, model simulation, and expert opinion

MODULE OBJECTIVE

The report explains the proposed public teaching about Lake Environmental Management and related aspects. This information is important for sustainable and participatory lake environmental management.

- To expose the simplified eco-hydrological processes for stake holder
- To increase eco-hydrology management awareness among the stake holder

THE OUTCOMES

- Ability to acquire knowledge from science principles and other relevant information (MO-1);
- Ability to analyze, interpret, and understand the processes (MO-2);
- Ability to function effectively as an individual in a team to achieve conservation goals (MO-3);
- Ability to apply high ethical standards in social interactions for sustainable development (MO-4).

Module Learning Outcome

Program Outcome	MO-1	MO-2	MO-3	MO-4
To describe the basic concepts and function of Lake Environment	C2, A2	-	-	-
To identify the related physical hydrological processes	-	C1, A1	-	-
To understand the related lake management activity	-	-	C2, A2	-
To recognize the importance of Environmental Monitoring and its interface for ecohydrology based lake management	-	-	-	C1, A1
To expose the Collective Knowledge and Expert System of ecohydrology based lake management	-	-	-	C2, A2, P2

*Note: C2 is **Cognitive** level 2 of bloom taxonomy; A2 is **Affective** level 2 of bloom taxonomy; and P2 is **Phycomotoric** level 2 of bloom taxonomy*

COURSE DURATION

- Lake Environment and Management (**3 days**)
- Environmental Monitoring and its interface (**4 days**)
- Collective Knowledge and Expert System (**1 days**)

MODULE ACTIVITIES AND PROCEDURES (Lake awareness activity)

Title	Objective	Method
The hydrological processes of the lake	To list the processes	Go around the lake, and identify the water source of the lake
The Stake Holder	List and explain the stake holders of the lake	Go to the authority of the lake, and then identify the stake holder with their role on the lake system
The Lake Purpose	To contrast the different recreational activity within the lake	Go to the library, and then write down all possible recreational activity in the lake system
The preservation	To point out the environmental problems within the lake	Go to the library, and then list all health indicators of the lake system. Go around the lake then compare it with the real lake condition.
The Water Quality Treatment	To demonstrate the local wisdom of water quality treatment.	Go to the Lake Inlet and outlet, and then take water sample. Analyze the water sample, and then explain the different.
The Vegetation and Algae control	To identify the lake surface condition	Go to authority office, and then study the maintenance schedule of the lake.
The Aquatic Harvesting	To identify the possible aquatic life of the lake.	Go to library, and then differentiate the local and alien aquatic life.
The Construction	To list the Construction plan of the lake	Go to authority office, and then identify the cause of the construction plan

MODULE ACTIVITIES AND PROCEDURES
(Environmental monitoring awareness activity)

Title	Objective	Method
The Indicator	To collect the information about environmental indicator	Go to library, and then list the type and measurement procedure of important environmental indicator
The data transmission	To survey the communication coverage of the lake system.	Go to lake system, and then survey the communication network and the power source within the lake system.
The Monitoring location	To identify the best location for monitor the environmental indicator	Go to library, and then study the hydrological cycle and ecological function of the lake system. After that plot suitable location on the lake system map.
The Water Quality Standard	To categorize the water quality data based on standard	Go to authority office, and then collect water quality data. Compare the value with the standard
The User Interface	To select the simple and suitable user interface for publishing the data	Show the analyzed data using simple user interface
The Monitoring Station	To assembly the monitoring equipment	Select and connect the sensor into Arduino and Raspberry Pi, and then test it

MODULE ACTIVITIES AND PROCEDURES (Expert system awareness activity)

Title	Objective	Method
The Automatic Environment Status	To write the flow chart to categorize the monitoring data	Collect the environmental indicators, the build the flow chart to interpret the status.
The Response	To connect the historical action with the environmental data / status	List the possible action to reduce the impact of environmental indicators based on the historical data

ACKNOWLEDGEMENT

This document is produced through funding support from the Government of Malaysia via the Malaysia Funds-in-Trust (MFIT) under the Malaysia - UNESCO Cooperation Programme (MUCP).

UNESCO JAKARTA OFFICE

River Engineering and Urban Drainage Research Centre (REDAC) Universiti Sains Malaysia

Thank You