



Malaysia
Hands on Trust

**Regional Workshop: Pathway Towards Improved
Water Education Curricula
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VOLUME 2

WATER MANAGEMENT CURRICULA USING ECOHYDROLOGY AND INTEGRATED WATER RESOURCES MANAGEMENT

“Erosion and its Effect”

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Presentation Outline

1

GENERAL BACKGROUND

2

MODULE OBJECTIVE

3

LEARNING OUTCOME

4

COURSE DURATION

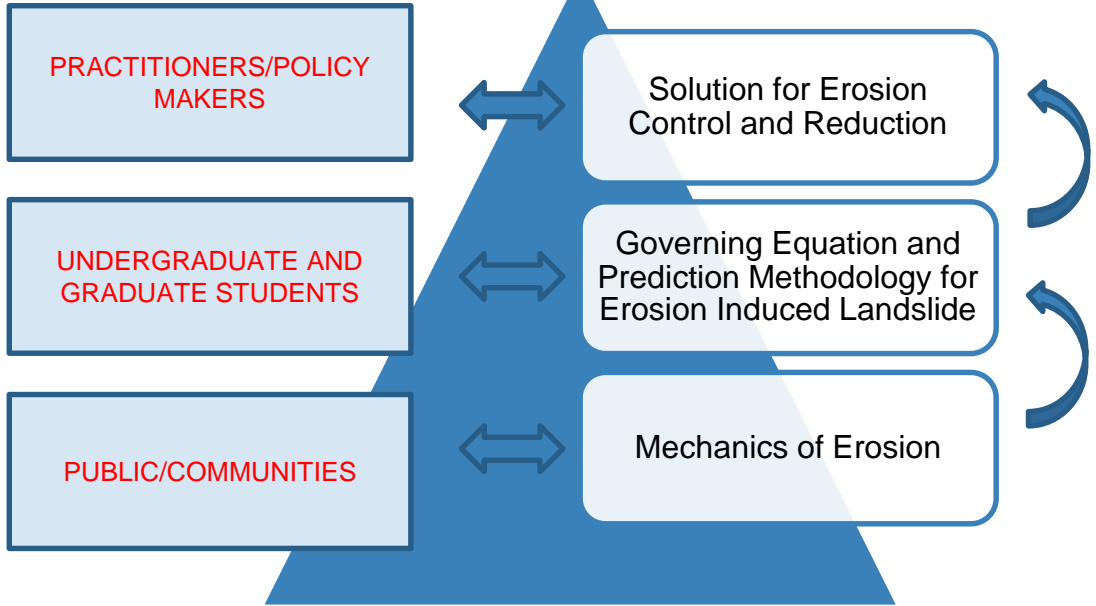
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MODULE ACTIVITIES AND PROCEDURES



1

GENERAL BACKGROUND



2

MODULE OBJECTIVE

1

- To expand knowledge on erosion by producing holistic solutions towards landslide forecasting and erosion identification

2

- To share experience in solving issues related to erosion in Malaysia by emulating local formulation and equation

3

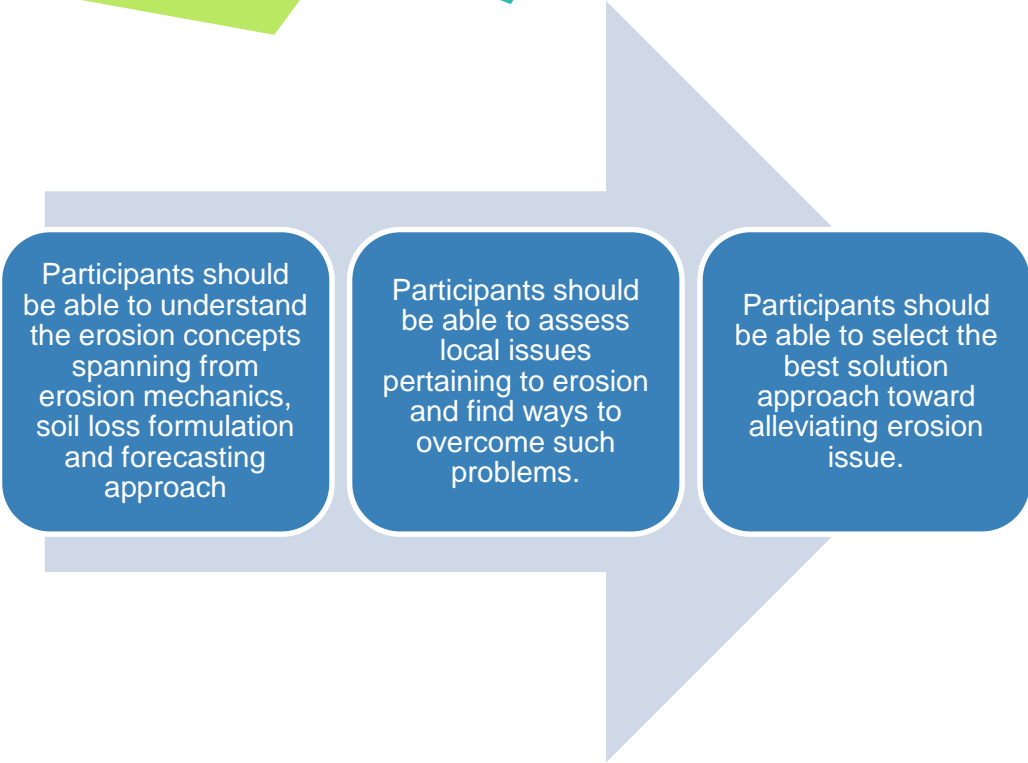
- To provide guidelines and state of the art to policy makers towards solving erosion issues.

4

- To equip higher undergraduate and graduate students with the fundamentals and literature pertaining to erosion formulation.

3

LEARNING OUTCOME



4

COURSE DURATION



MODULE ACTIVITIES AND PROCEDURES

Mechanics of Erosion

Introduction

- Agents of Erosion
- Threshold of motion

Erosion Induced Tragedies in Malaysia

- Past landslide events in Malaysia

Erosion Processes

- Direct erosion
- Indirect erosion

Erosion Types and Features

- Sheet erosion
- Rill erosion
- Gully erosion

Landslides

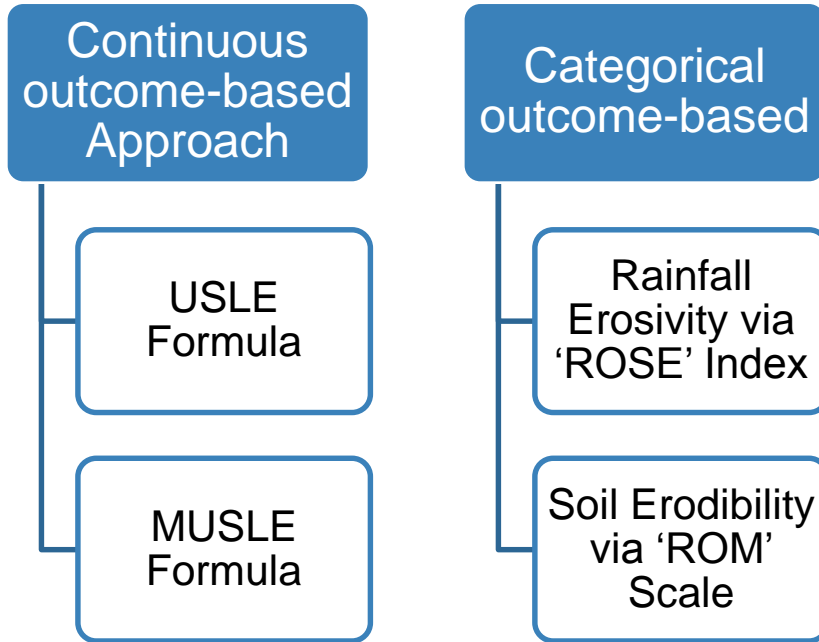
- Types slides phenomenon

Factors Influencing Erosion

- Soil Characteristics
- Topography
- Ground cover
- Climate



MODULE ACTIVITIES AND PROCEDURES



Governing Equation and Prediction Methodology for Erosion Induced Landslide



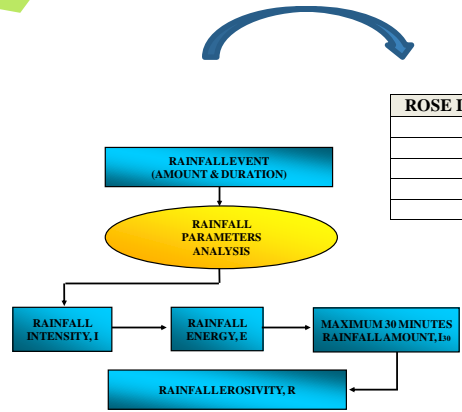
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MODULE ACTIVITIES AND PROCEDURES

Categorical outcome-based

Rainfall Erosivity via 'ROSE' Index

Soil Erodibility via 'ROM' Scale



ROSE Index (MJ.mm/ha.hr)	Category
<500	Low
500-1000	Moderate
1000-1500	High
1500-2000	Very High
>2000	Critical

$$EI_{Rom} = \frac{(\% \text{ of Sand} + \% \text{ of Silt})}{2(\% \text{ of Clay})}$$

'ROM' Scale	Soil Erodibility Category
< 1.5	Low
1.5 ~ 4.0	Moderate
4.0 ~ 8.0	High
8.0 ~ 12.0	Very High
> 12.0	Critical



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MODULE ACTIVITIES AND PROCEDURES

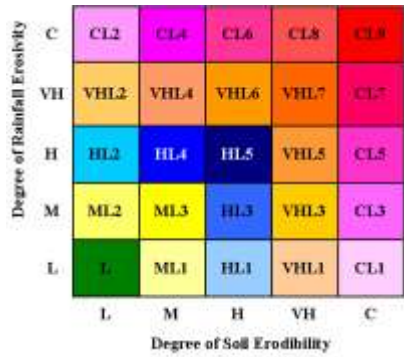
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Erosion Induced Landslide

Mass wasting at river bank



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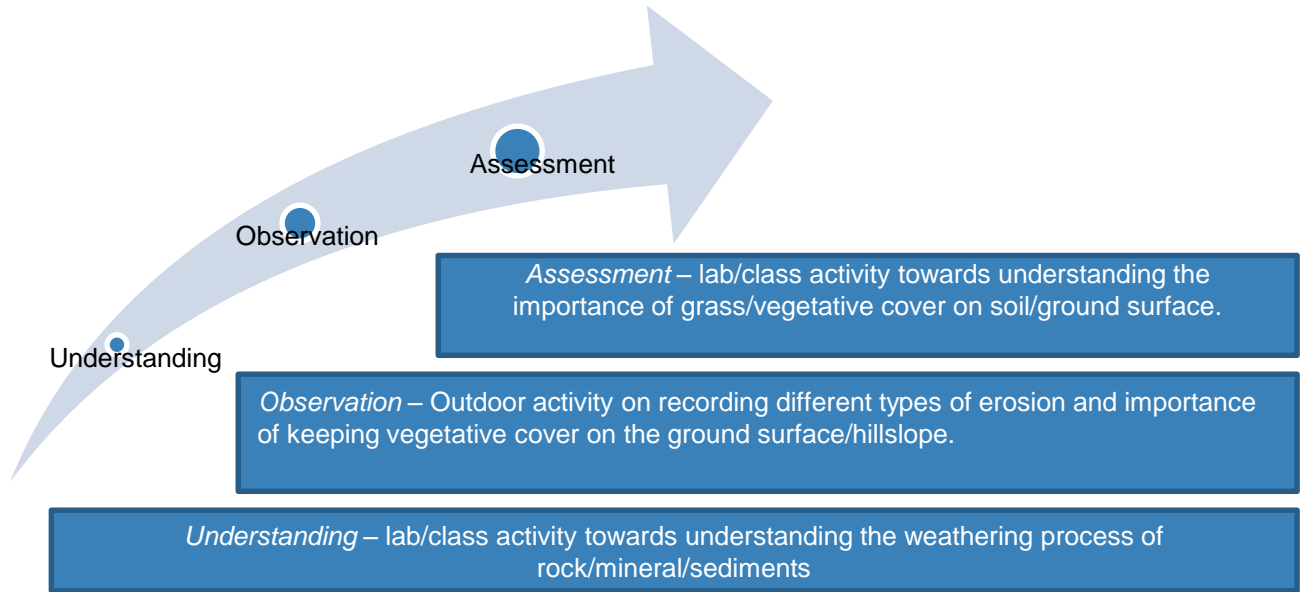
MODULE ACTIVITIES AND PROCEDURES

- Minimizing Soil Erosion
- Preserving Top Soils
- Access Routes & Site Management
- Drainage Control/ Runoff Management
- Earthwork & Erosion Control
- Sediment Prevention & Control
- Slope Stabilization

Solution for
Erosion Control
and Reduction

5

MODULE ACTIVITIES AND PROCEDURES



5

MODULE ACTIVITIES AND PROCEDURES



These activities will take time to carry out.



Recording in your notebook



Group discussion



Image capturing symbol

Understanding Theme – Activity 1

Learning Outcome

At the end of this activity, participants should be able to:




1. Understand the concept of mechanical and chemical weathering
2. Observe the influence of water drop to wear-off/erosion

Materials

- Pipette (water dropper)
- M&Ms
- Pan (shallow container)
- Cylinder with 50-100 mL of water



Methods

1. Use the pipette (water dropper) to squeeze 10 drops of water onto your M&Ms from a distance of roughly 6 inches.
2. Record your results in visual format 
3. Record your results in written format (describe what is happening) 
4. Repeat steps 2 and 3 after 20, 30, 40, and 50 drops 

Results



10 Drops

20 Drops

30 Drops

40 Drops

50 Drops

Discussion



- When did mechanical weathering occur during this activity?
- When did chemical weathering occur during this activity?
- When did erosion take place during this activity?
- What did the water represent in this activity?
- What did the Skittle represent in this activity?
- What did the color on the Skittle represent in this activity?
- What did the tin pan represent in this activity?

Observation Theme – Activity 2

Learning Outcome

At the end of this activity, participants should be able to:

1. Identify different type of erosion
2. Observe the importance of grass/vegetation on the hillslopes

Device

- Hand-held camera



Methods

- Use the handheld camera and capture the following image:
 - Sheet erosion
 - Rill erosion
 - Gully erosion
- Identify and capture the image of hillslope with and without vegetation
- Record your image in the sorted table



Results






Sheet erosion	Rill erosion	Gully erosion	Hillslope with vegetation	Hillslope w/out vegetation
				

Image Guidance



Sheet erosion Rill to Gully erosion Hillslope with and without vegetation

Discussion



Which type of erosion is more severe?
 What is the importance of keeping cover/vegetation on the hillslope?

Assessment Theme – Activity 3

Learning Outcome

At the end of this activity, participants should be able to:

1. Observe the effect of rainfall-induced erosion on bare soil versus vegetated soil.
2. Assess the importance of grass cover on soil

Device

- Aluminum pans (2)
- Block or book to raise pans (5-6cm)
- Loose soil
- Groundcover plants
- Paper cup
- Sharp pencil
- 100 mL beaker
- Water



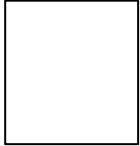
Methods

1. Set up the experiment in two aluminum pans. One pan contains loose soil whereas the other contains soil with plants and roots.
2. Pans are raised several cm (raised at end) to make a sloping pan
3. Use a paper cup with holes in the bottom to create “rain” on each of the soil types
4. Observe the bottom end of the pan



Results

Pan with grass Pan without grass



Discussion



Which trays wash the most of soils to the bottom of pan?
 What are the variables control the erosion rate?

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**River Engineering and Urban Drainage
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Thank You



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