INTEGRATED TWO-DIMENSIONAL MODEL AND GEOSPATIAL-BASED APPROACH FOR NATIONAL RISK MANAGEMENT AND EMERGENCY ACTION PLAN

10th July 2018

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PRESENTATION OUTLINE

Introduction  Methodology  Use Case

Geospatial Based Approach  Emergency Action Plan  Opportunity & Way Forward
### Relative Frequency of Disaster Hazards in Malaysia

<table>
<thead>
<tr>
<th>Disaster Hazard</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood</td>
<td>High</td>
</tr>
<tr>
<td>Forest Fire</td>
<td>Medium</td>
</tr>
<tr>
<td>Landslide</td>
<td>Medium</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Low</td>
</tr>
<tr>
<td>Tsunami</td>
<td>Low</td>
</tr>
<tr>
<td>Drought</td>
<td>Low</td>
</tr>
<tr>
<td>Storm</td>
<td>Low</td>
</tr>
<tr>
<td>Haze</td>
<td>Low</td>
</tr>
</tbody>
</table>

*Relief Men of Disasters in Malaysia*
DISASTER HAZARDS IN MALAYSIA

Hazard Disaster Hazard In Malaysia

Malaysia’s Reported Losses (1990-2014 record)
Malaysia’s Disaster Risk Reduction Cycle
What is EAP?

Emergency Action Plan (EAP) is a formal document that identifies potential emergency conditions and specifies pre-planned actions to be followed so as to minimize loss of life and property damage in the event of any possible situation.
EMERGENCY ACTION PLAN

1. To pre-plan the coordination of necessary actions by the responsible Local, State, and/or Federal authorities and officials so as to provide timely notification, warning and evacuation in the event of an emergency.

2. To reduce the risk of loss of life and property damage, particularly in the impacted hazard areas, resulting from an emergency situation.
Objective of the Integrated Two-dimensional Model and Geospatial-based approach

- To attain parameter of the natural disaster;
- To document the results of hydrodynamic model or thematic model;
- To prepare hazard maps with classification of related parameters;
- To identify affected areas when the hazard occurs;
- To obtain the travel time or time series of the parameters at specified locations and the maximum values;
- To assist in identifying safe areas and better documentation of the Emergency Action Plan (EAP)
- To enhance effectiveness of Risk Management
One and Two-dimensional Flood Model
Geospatial-based Model

Preparation of EAP Document

1. INTERCHANGE
   - PRE-PROCESS
   - PROCESS
   - POST-PROCESS

2. INTERFACE
   - PRE-PROCESS
   - POST-PROCESS

3. INTEGRATION
   - DECISION SUPPORT SYSTEM

METHODOLOGY
Approach

Geographic Input

Engineering Input

Planning and Design

Engineering and Spatial Analysis

Construction, Maintenance and Monitoring Phases

Risk Management Plan

- Street data
- Buildings data
- Vegetation data
3

USE CASE
NINE (9) STEPS TO PREPARE AN EAP

**Step 1**
Determine the potential emergency conditions and inundated area

**Step 2**
Prepare Inundation Maps

**Step 3**
Identify the triggering events and specify actions to be taken

**Step 4**
Identify all jurisdictions, agencies and individual

**Step 5**
Identify primary and auxiliary communication systems

**Step 6**
List of prioritize persons and produce Notification Flowchart

**Step 7**
Produce the Draft EAP

**Step 8**
Hold meeting for approval of The Plan

**Step 9**
Revision, endorsement and dissemination

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**Required Geospatial-based Approach**
Use Case

Flood and Dam Break

The overall methodology of the 2D and geospatial-based model for preparation of an EAP

1. Flood Map
2. Notification Charts
3. Emergency Procedures
4. Draft EAP
5. Approval of Plan
6. Final EAP
Examples of 1D, 2D and 3D Modelling Result

1D MODELLING

2D MODELLING
(with hydro parameter)

2D MODELLING

3D MODELLING
Geospatial-based Model

1. Exported Dambreak Modelling Simulation Result to Grid Format (*.ASCII)
2. ASCII file to Raster
3. Inundation Depth Classification
4. Convert Raster To Polygon (*.shp)
5. Inundation Layer Depth Classification
6. Overlaid with GIS Base Map
7. Inundation and Evacuation Map produced based on the case conditions in the hydrodynamic simulation results
8. Flood Hazard and Evacuation Mapping
Involves processes from storing and managing data to analysing disaster impacts and generating *hazard maps* and *evacuation maps* with information of:

- Inundation area
- Flood depth
- Flood flow velocity
- Flood flow arriving time
- Flood inundation duration
Extracted Information

**Flood Depth Classification (meter)**
- 0 - 0.5 m
- 0.5 - 1.2 m
- 1.2 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- >5.0 m

**Evacuation Zones Classification**
- Evacuation Zone 1
- Evacuation Zone 2
- Evacuation Zone 3
- Evacuation Zone 4
- Evacuation Zone 5
- Evacuation Zone 6
- Evacuation Zone 7

**Degree of Flood Risk**
- Very Low Risk
- Low Risk
- Medium Risk
- High Risk
- Very High Risk

**Information at Areas Expected to be Inundated**

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Distance from Batu Dam (km)</th>
<th>Max. Flood Depth (m)</th>
<th>Max. Flood Flow Velocity (m/s)</th>
<th>Flood Wave Arriving Time (hrs)</th>
<th>Time to Peak Water Level / Discharge (hrs)</th>
<th>Flood Inundation Duration (hrs)</th>
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<tr>
<td></td>
<td></td>
<td>26.80</td>
<td>Not Flooded</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32.24</td>
<td>1.23</td>
<td>0.31</td>
<td>6.86</td>
<td>15.08</td>
<td>37.15</td>
</tr>
<tr>
<td></td>
<td></td>
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FLOOD AND DAM BREACH SIMULATION FOR SCENARIOS
SCENARIO 1

Flood Hazard

Flood Depth Classification (meter)

- 0 - 0.5 m
- 0.5 - 1.2 m
- 1.2 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- >5.0 m

Cadastral Lot
District
SCENARIO 3

Flood Hazard

Flood Depth Classification (meter)

- 0 - 0.5 m
- 0.5 - 1.2 m
- 1.2 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 - 5.0 m
- >5.0 m

Cadastral Lot
District

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## Flood Hazard

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<td></td>
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<td>Not Flooded</td>
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<td>-</td>
<td>-</td>
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*0% - 50% Delineation of 10-Year Annual Discharge at Batu Dam Level (50% Discharge)*

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Flood Risk

Legend
- Flood Evacuation Centres
- Attractions
- Police Station
- Petrol Station
- Hospital / Clinic
- Hotel
- Government Agency
- Bank
- Town

Transportation
- Highways
- Main Road
- Rail Road

Hydrography
- River

Degree of Flood Risk
- Very Low Risk
- Low Risk
- Medium Risk
- High Risk
- Very High Risk

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Emergency Action Plan
5-STEPS OF EAP PROCESSES

Examples of Flood and Dam Break

STEP 1: Event Detection
- Detect Event

STEP 2: Emergency Level Determination
- Level 1: Unusual Event; Slowly Developing
- Level 2: Potential Dam Failure Situation; Rapidly Developing
- Level 3: Urgent; Dam Failure is Imminent or in Progress

STEP 3: Notification and Communication
- Notify Level 1
- Notify Level 2
- Notify Level 3

STEP 4: Expected Action
- Monitor & Record Procedures
- Save Dam Emergency Actions, Preventive Actions
- Save People Evacuation Management

STEP 5: Termination and Follow-up
- Termination Responsibility Follow Up

Responsibilities
- Dam Operator
- Dam Technical Centre
- Dam Custodian
- Response Agencies

Potential Emergency Situation
- Overtopping
- Seepage or Piping
- Major Structural Failure
- Earthquake
- Security Threat
The added-value of geospatial information will enhance efficiency of emergency management authorities to work together in response to safety emergencies through the evaluation on:

- Prevention
- Mitigation
- Responsibility & Preparedness
- Response
- Recovery
OPPORTUNITY AND WAY FORWARD
How National Geospatial Master Plan can be useful for Environmental Sustainability and National Risk Management?

- Promotes a comprehensive, multi-sectoral collaborative approach.
- Strengthening National Spatial Data Infrastructure.
- Support Sustainability Development.
- Better management through Spatially enabled Government and Society in both national environmental sustainability and risk management.
NATIONAL GEOSPATIAL MASTER PLAN

How National Geospatial Master Plan can be useful for Environmental Sustainability and National Risk Management?

POLICY OBJECTIVE 6

Encourage research and development through academic network, promote innovation and support commercialisation for private sector opportunities.
INNOVATIVE SPATIAL-BASED PRODUCTS FOR BETTER RISK MANAGEMENT

INNOVATION INDEX FOR MALAYSIA

QA/QC
- 2D MODELS
- SPATIAL ANALYST

DMSS

Real Data
Forecast Data
Added Value Data

NGMP
BETTER MANAGEMENT FOR FUTURE

Providing Data Availability for National Malaysian Geospatial Assets

1. Providing subscription to data services for agencies for data generation, data value-adding and data integration activities
2. Providing Technical expertise to ensure reusability of geospatial data that are produced in data generation activities
3. Providing marketing channel for output produced via data directory in data generation activities to be used by application systems
4. Providing channel for high quality geospatial products that conform to standards including accuracy, timeliness and consistency of data
5. Providing Geospatial Standards Benchmarking on spatial data quality for data products
6. Providing policy implementation and communication programs
7. Providing services for national geospatial data sharing and discovery

Establishing And Ensuring The Centralized Data Provision And Systematic Sharing Of Geospatial Data
Secured Geospatial Infrastructures and Innovation

Providing Secured Platform For Geospatial Infrastructures and Innovation

1. Providing platform and technical services to update data to be embedded in work processes of the agencies and that the output can be used by systems and applications.
2. Providing capability for output to be produced by data services in data generation and data integration activities, and that the output can be used by application systems.
3. Providing collaborative platform of software and applications for continuity in data development.
4. Providing high level and performance of data infrastructure: hardware, software and data security.
Special thanks to

- Kementerian Air, Tanah dan Sumber Asli (formerly, Kementerian Sumber Asli dan Alam Sekitar)

for their support