

# THE INTEGRATION OF GEOINFORMATION TECHNOLOGIES IN CIVIL ENGINEERING : FROM CLOUD TO COAST

*Presented for:*

*Simposium Maklumat Geospasial Kebangsaan ke 6: Fostering the Potential of Geospasial  
Technology in Facing National Challenges*

*18 March 2014*



*Presented by:*

*Dato' Ir. Dr. Nik Mohd Kamel bin Nik Hassan  
Ir. Hjh. Mazura Nor binti Zulkifli  
Dr. Nik & Associates Sdn. Bhd.*

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## INTRODUCTION

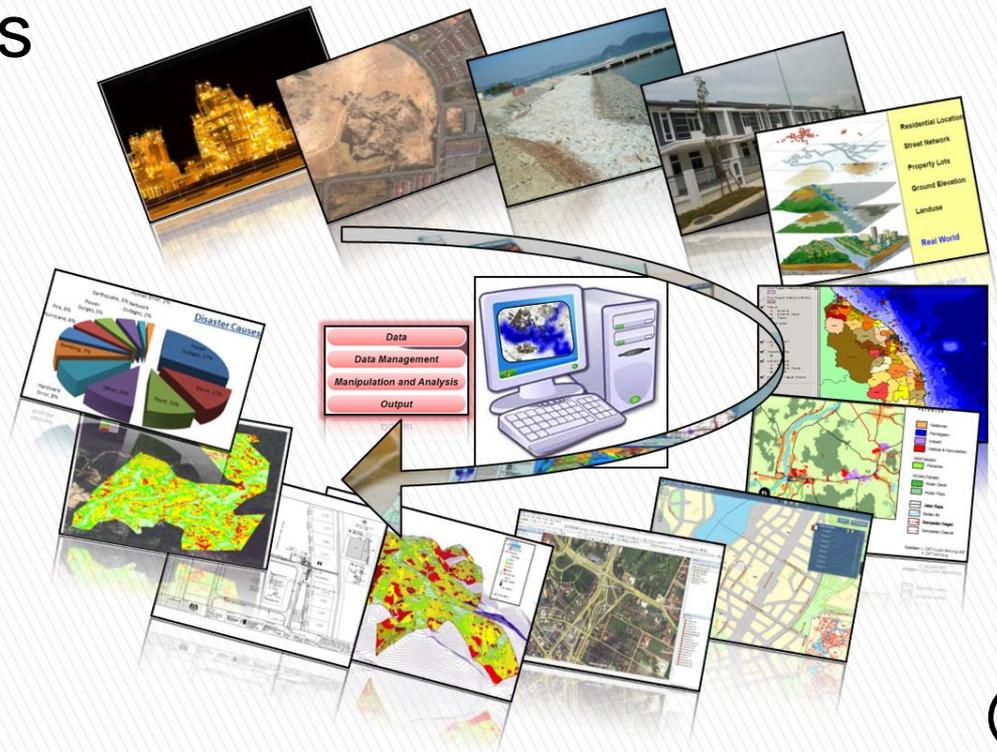
# FOCUS

- To present in a macro scale regarding the integrated approach using Geospatial Technologies for multi-disciplines of Civil Engineering



# CIVIL ENGINEERING

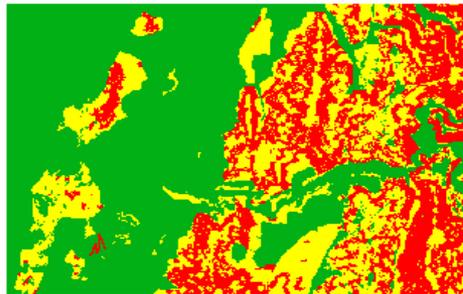
- Civil engineering comprises of the design, construction, and maintenance of the physical and natural-built environments for;
  - Hydrology
  - Water resources
  - Geotechnical
  - Structural
  - Transportation
  - Environmental
  - Coastal



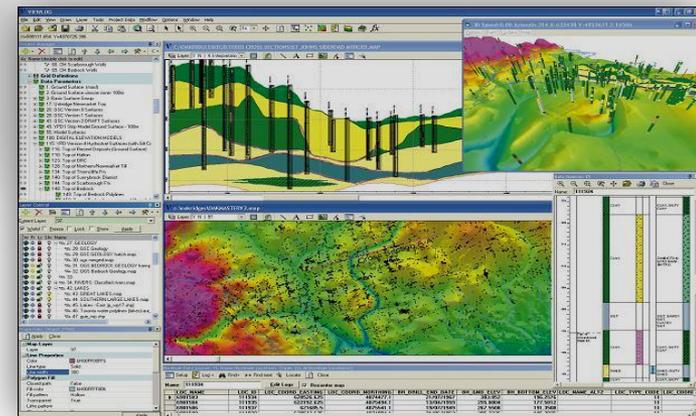
# WHY ENGINEERING NEEDS GIS

- To integrate engineering desktop analysis and fieldwork with geographical information technology in enhancing productivity and optimize performance with GIS analysis and visualization.

Landslide hazard map

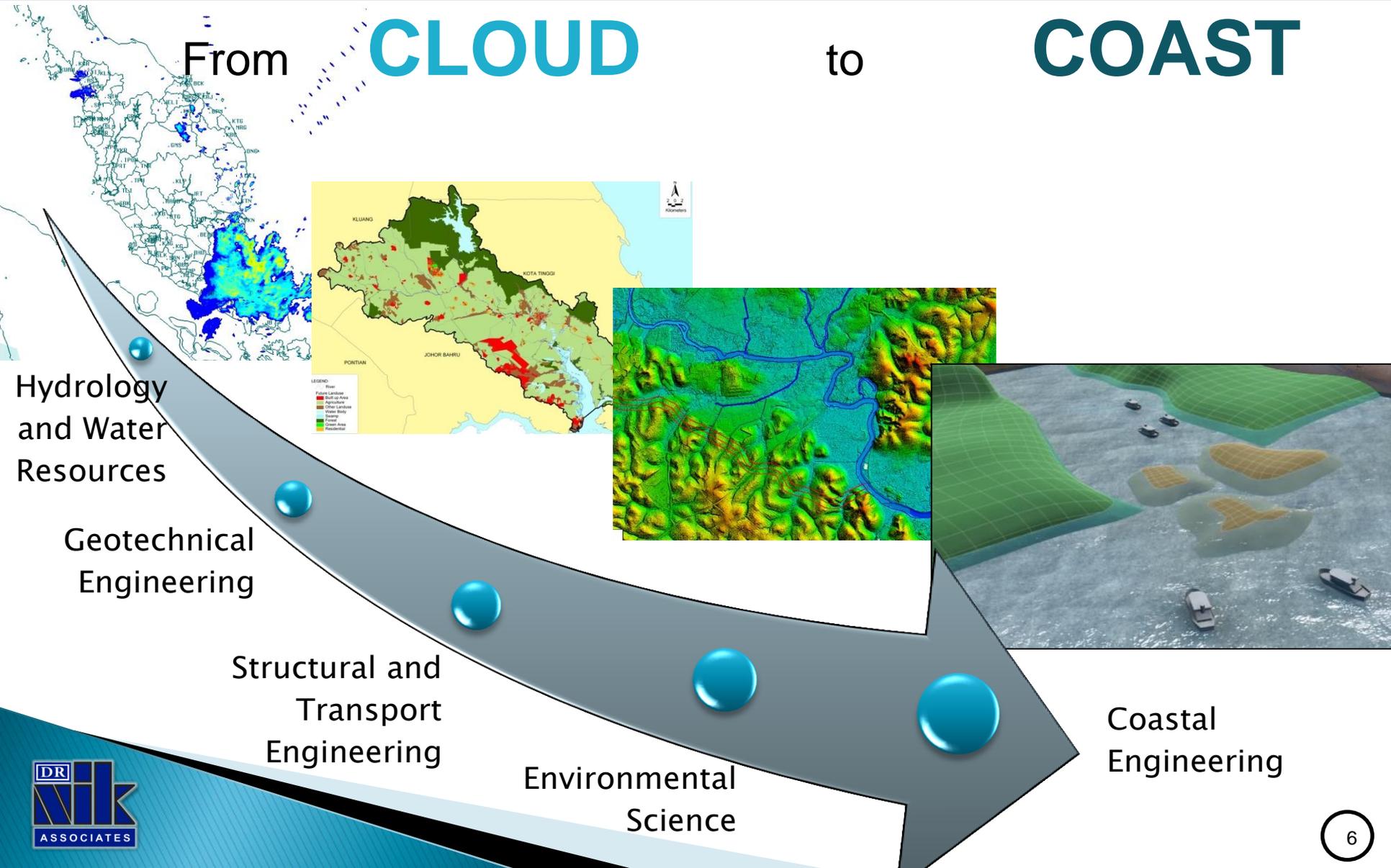


High hazard  
Moderate hazard  
Low hazard

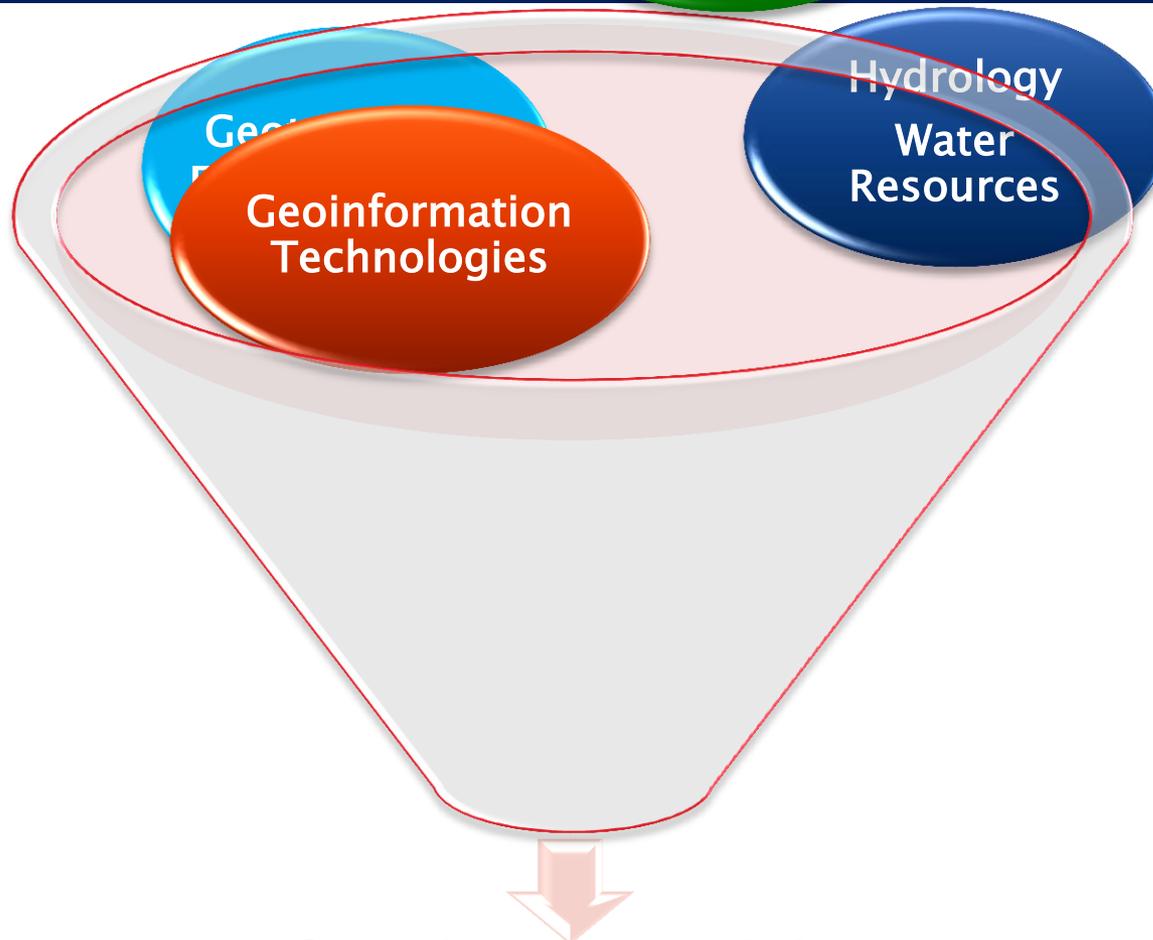


# GIS IN CIVIL ENGINEERING

From **CLOUD** to **COAST**



# APPROXIMATING GEOINFORMATICS TECHNOLOGIES



Enhancement of productivity and the optimisation of performance in Civil Engineering practices, planning and management

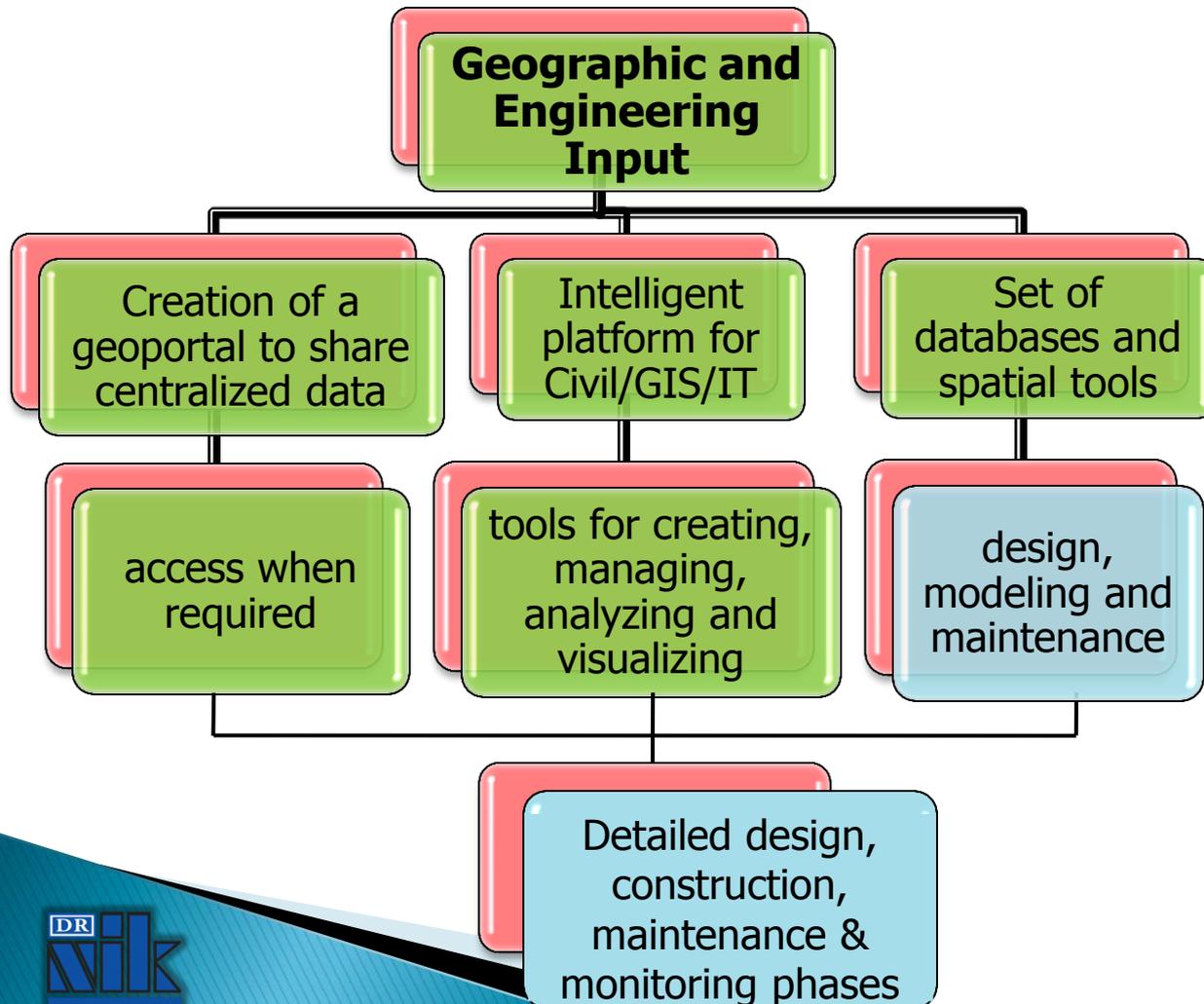
# BETTER APPROACH WITH GEOSPATIAL TECHNOLOGIES

The application of advanced functions of GIS in replacing manual methods in planning, developing and managing the Civil Engineering project

1. To provide a holistic approach and methodology in addressing assorted scientific and issues to be studied
2. To provide a better platform for planning and management

# BETTER APPROACH WITH GEOSPATIAL TECHNOLOGIES

## Adding Value to Engineering



Efficient  
Planning  
and  
Management

- Overall picture
- Integrated
- Less conflict
- Accuracy

# CHALLENGES AND OPPORTUNITIES

There are many factors that will affect the direction of GIS application in Civil Engineering for the coming years in Malaysia

The factors can generally be classified as

- i. Global challenges, Global opportunities,
- ii. National challenges, National opportunities,
- iii. Professional challenges, Professional opportunities.

*Advanced Integrated Support System*

*Data Accuracy*

*New Technologies*

*Rapid Urbanization*

*Integrated decision-making tools*

*Environmental Friendly Approach*

*Climate Variability and Change*

*Awareness*

*Collaborative management*

*Linking Technologies*

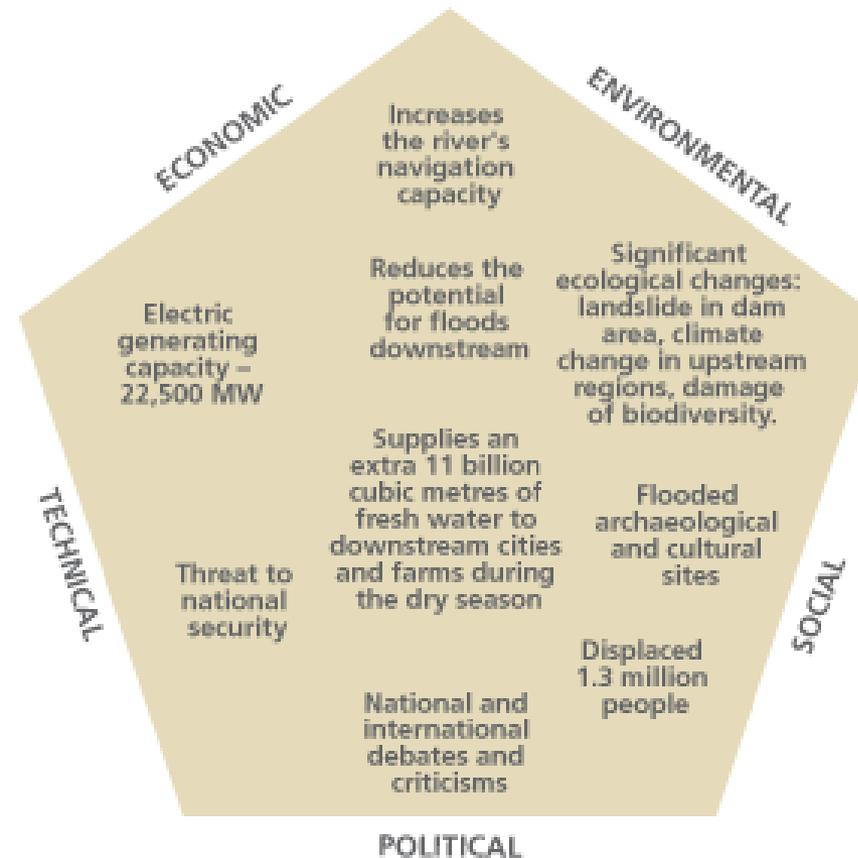
*3-D Modelling*

*Securing Livelihoods*

# BETTER DECISION MAKING WITH GEOSPATIAL TECHNOLOGIES

Support decision making regarding the influences and implications due to implementation of a project

- i. Technical
- ii. Economic
- iii. Environmental
- iv. Social
- v. Politics



*Example: Hydropower project*

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## AREA OF GIS APPLICATION FOR CIVIL ENGINEERING

# BETTER PROJECT MANAGEMENT WITH GEOSPATIAL TECHNOLOGIES

To improve project management and implementation, a decision support system need to capitalize on the latest advances of

- i. Unmanned Aerial Vehicle (UAV)
- ii. Remote Sensing
- iii. Geographic Information Systems
- iv. GIS-based Engineering Software
- v. Information Technology
- vi. Decision Theory.

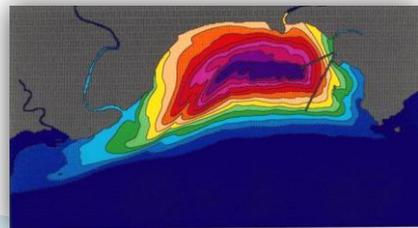
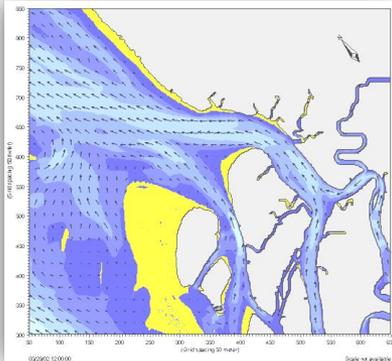
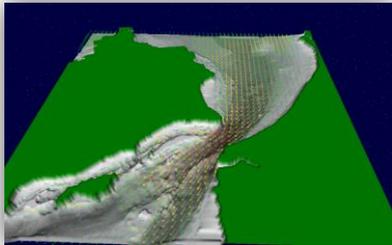
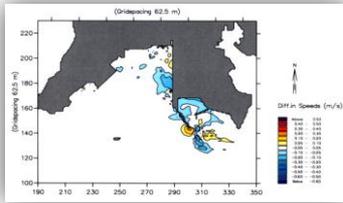
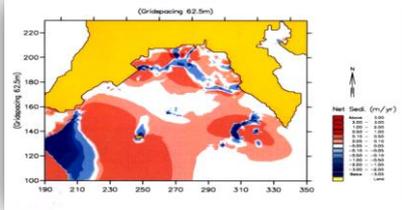
# GEOSPATIAL DATA TECHNOLOGIES

AERODYNE GEOSPATIAL

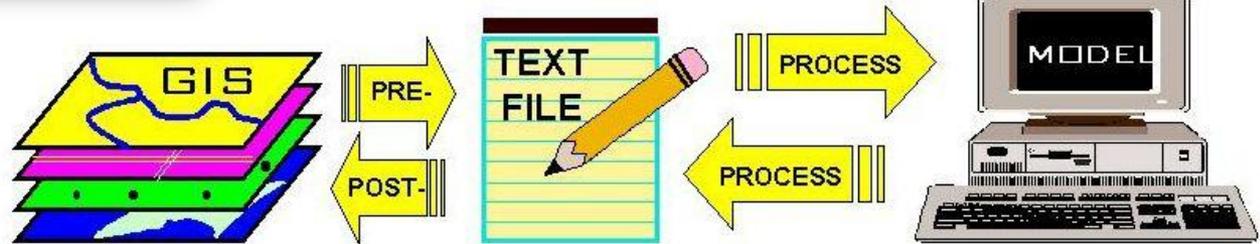


**urban survey**  
**30 hectares in 20 mins**  
**5 cm orthomosaic and DSM**

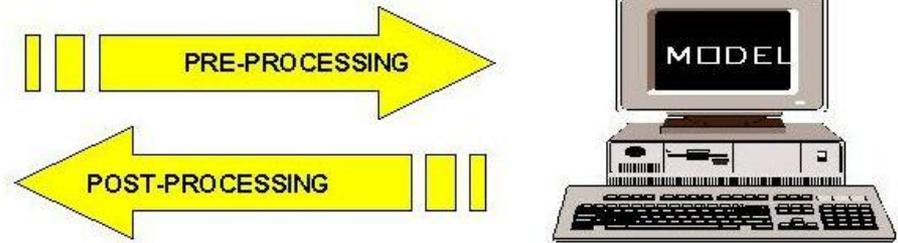
# GIS-BASED ENGINEERING MODEL



## 1. INTERCHANGE



## 2. INTERFACE

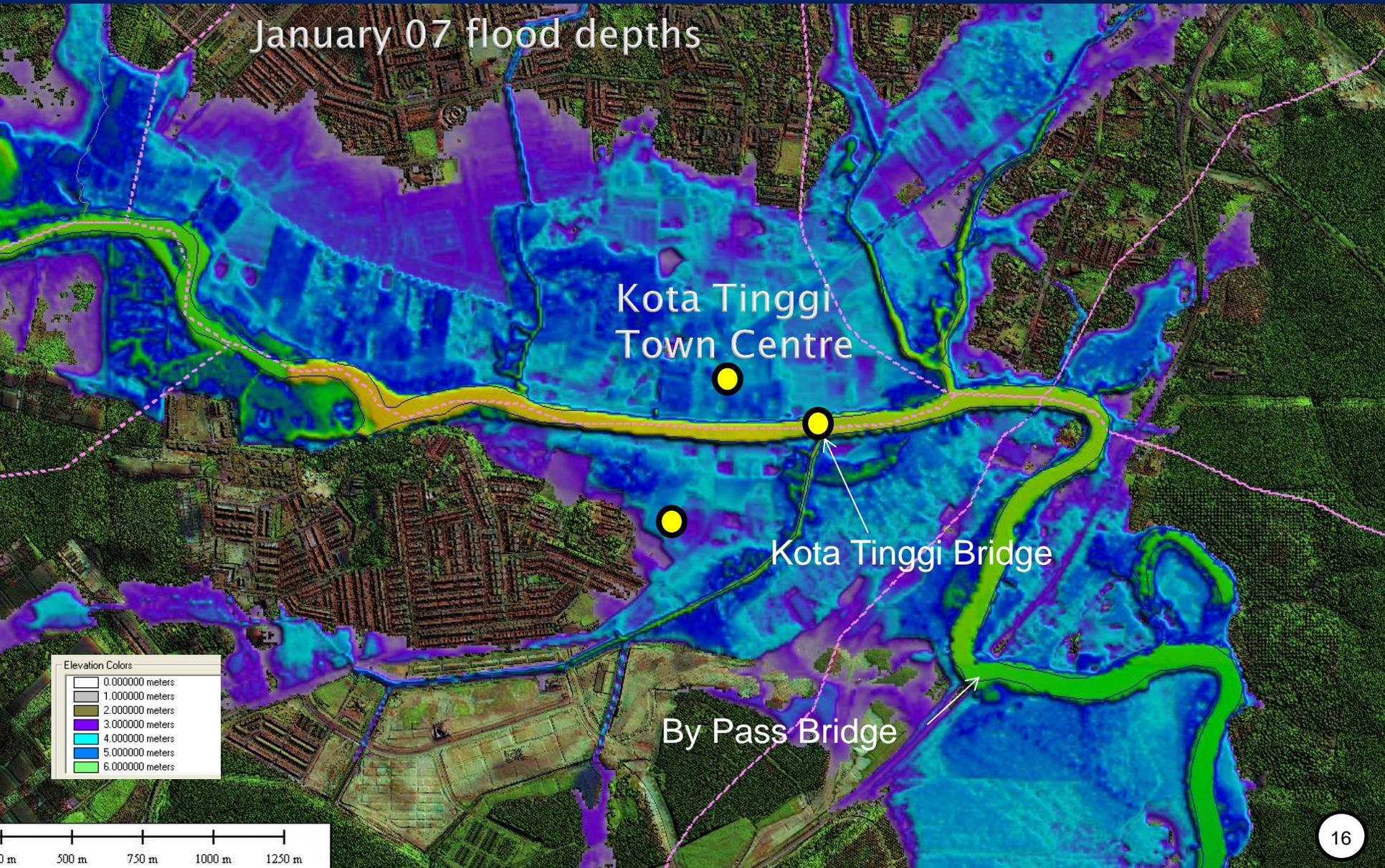


## 3. INTEGRATION



Source: ESRI

# RIVER FLOOD MODELLING IN 2D VIEW



# RIVER FLOOD MODELLING IN 2D VIEW

January 07 flood depths

Kota Tinggi  
Town Centre

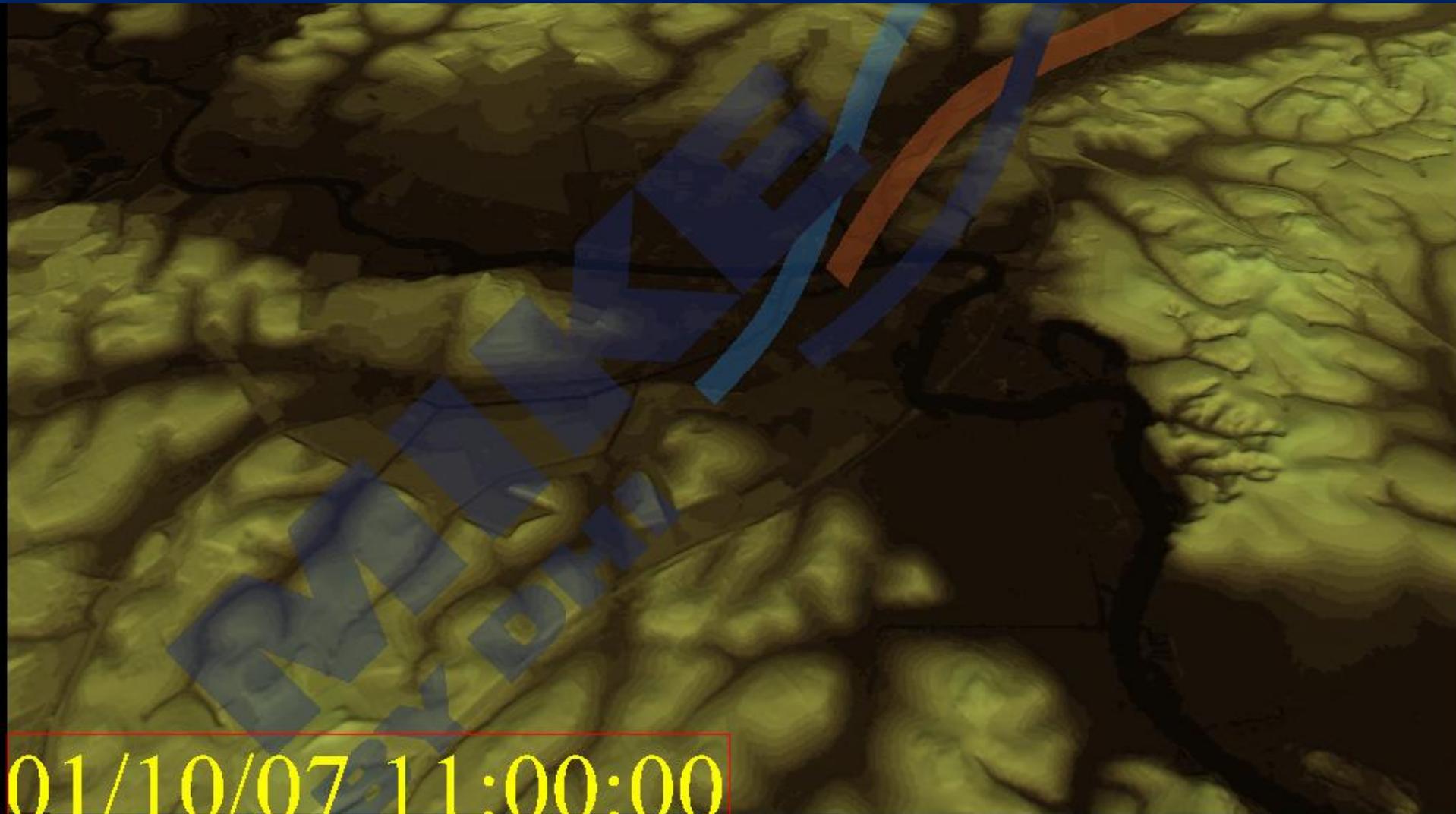


Kota Tinggi Bridge

By Pass Bridge



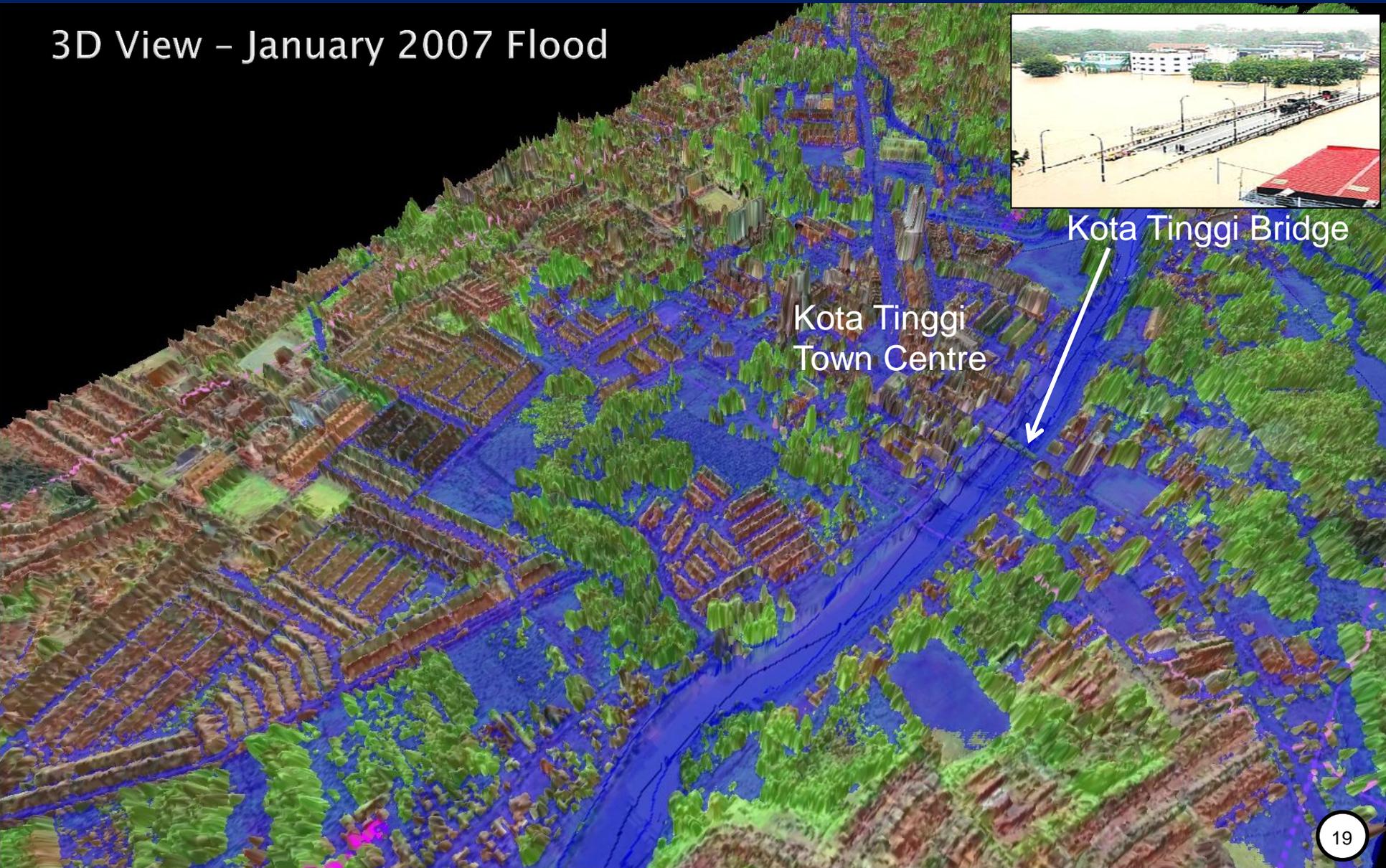
# RIVER FLOOD MODELLING IN 3D VIEW



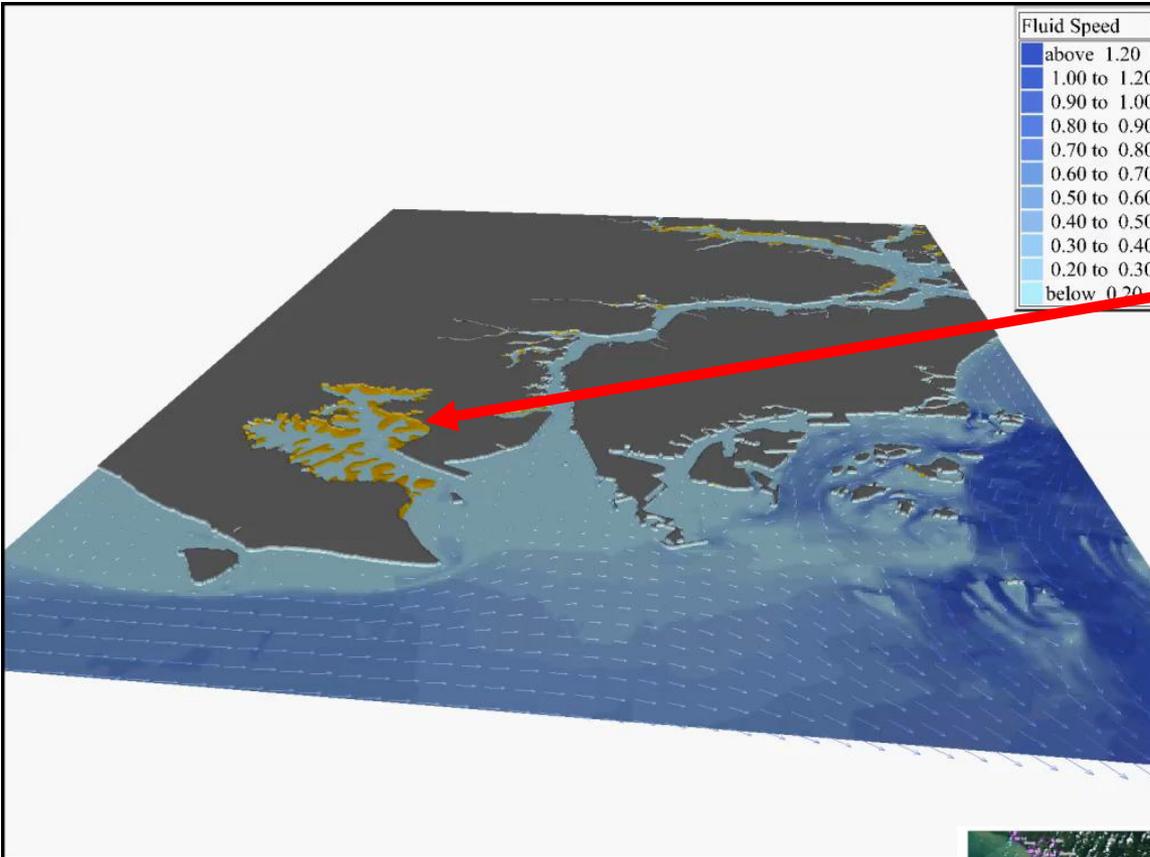
01/10/07 11:00:00

# RIVER FLOOD MODELLING IN 3D VIEW

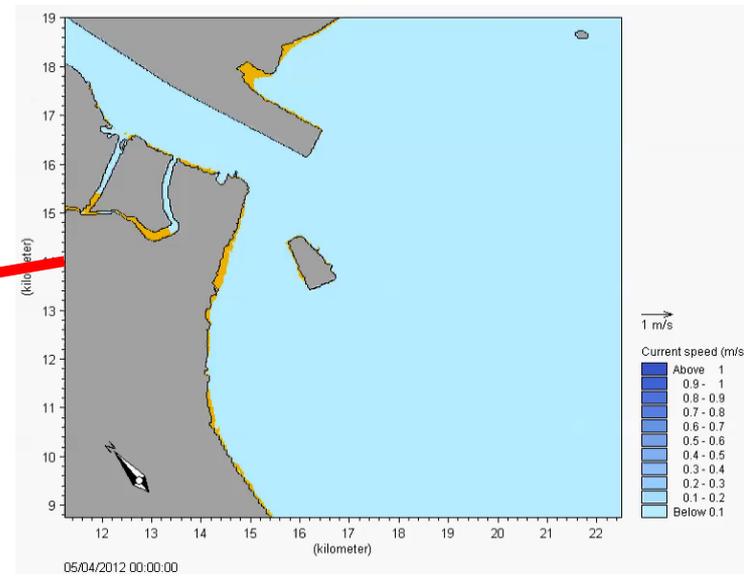
3D View – January 2007 Flood



# COASTAL FLOOD MODELLING IN 2D VIEW



Fluid Speed	
above 1.20	
1.00 to 1.20	
0.90 to 1.00	
0.80 to 0.90	
0.70 to 0.80	
0.60 to 0.70	
0.50 to 0.60	
0.40 to 0.50	
0.30 to 0.40	
0.20 to 0.30	
below 0.20	



# GEOTECHNICAL ANALYSIS IN 2D/3D VIEW

The screenshot displays the ArcMap interface with a 3D Analyst extension. The main window shows a 3D view of a terrain model with a red boundary and a grayscale slope analysis overlay. A dialog box titled "Slope" is open, showing the execution command and start time.

**Slope Dialog Box Content:**

```
Executing Slope...  
Close this dialog when completed successfully  
Executing: Slope kemensah_clip  
"\\eyusniza\D_ERNI\SELANGOR\kemensah  
\Kemensah Slope\slope_degree2" DEGREE 1  
Start Time: Fri Mar 14 14:25:44 2014
```

**Table of Contents:**

- Grid\_Boundary\_500a
- TEMP
- cad1
- PolygonBoundary\_09012011
- Cadastral\_Lot
  - Lot
- PolygonBoundary1
- Project\_area
  - Project Area
- Topo.DWG Group Layer
  - Topo.DWG Annotation
  - Topo.DWG Point
  - Topo.DWG Polyline
  - Topo.DWG Polygon
  - Topo.DWG MultiPatch
- Drain\_SubCatchment\_UluKlang
- Lidar\_index3.dwg Group Layer
- River\_Rol\_Program
- RiversMain\_WQ\_KV\_20110628
- river\_lest11082011
- lot\_no.DWG Group Layer
- PolygonBoundary
- Project\_area\_iso
- kontur\_090112
- Contour
- slope\_degree
- 5METER
- 3METER
- 2METER
- 1METER
- kemensah\_clip
  - Value
  - High : 216.695
  - Low : 86.4412
- slope\_ke
- kemensah\_ra
- Kemensah\_ras
- Degree Slope
- Available\_Lidar\_Coverage

**Status Bar:** 9233.524 5115.518 Meters

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*Presented for:*

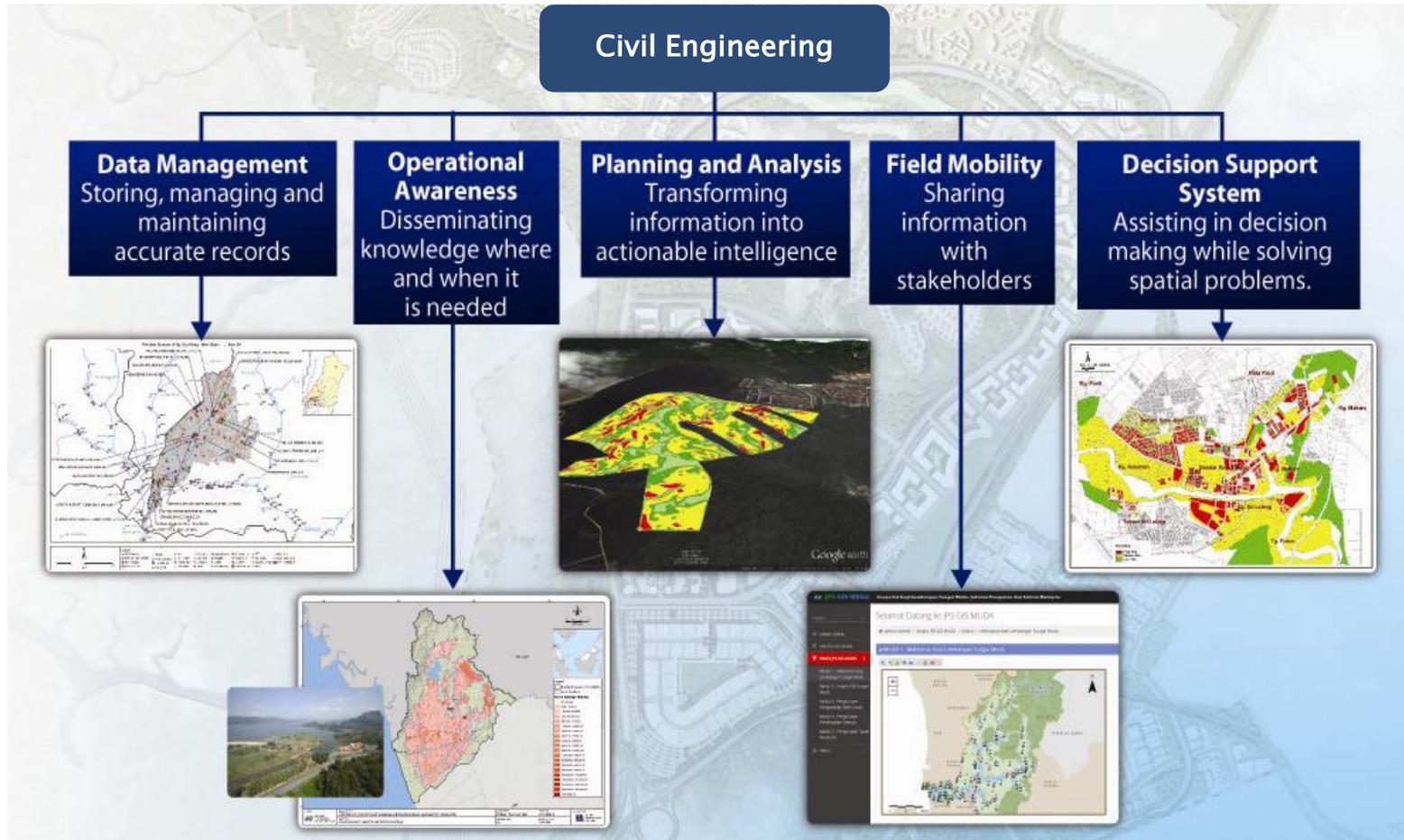
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*18 March 2014*



## **GEOINFORMATION TECHNOLOGIES TO SUPPORT COLLABORATIVE MANAGEMENT**

# BETTER PROJECT MANAGEMENT WITH GEOSPATIAL TECHNOLOGIES

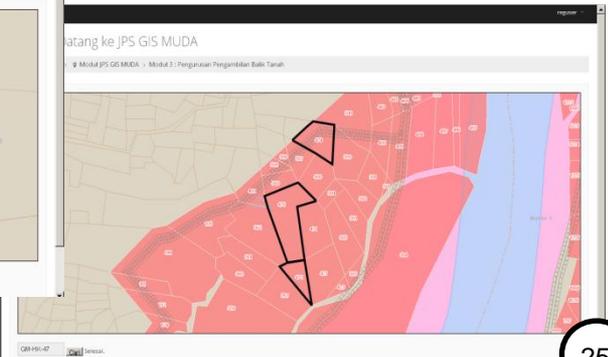
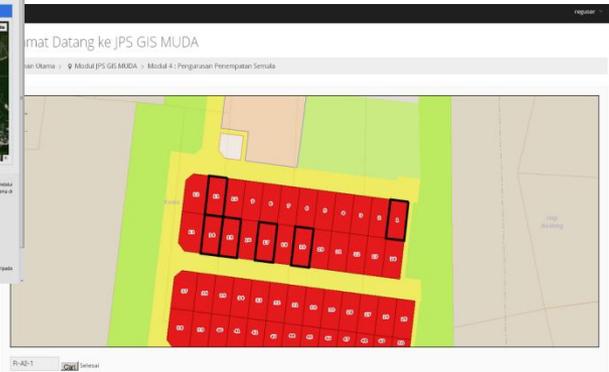
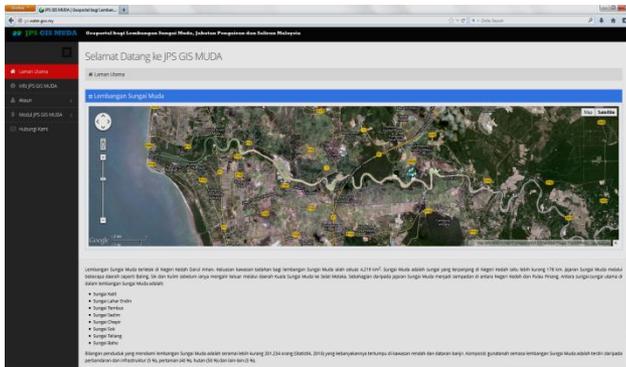
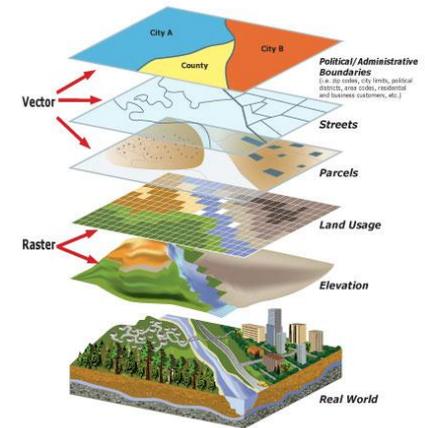
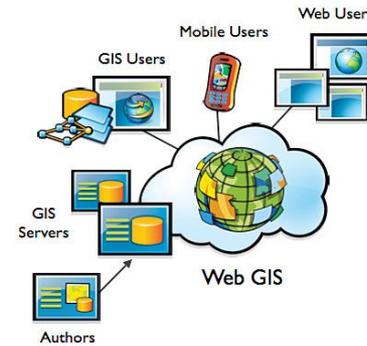
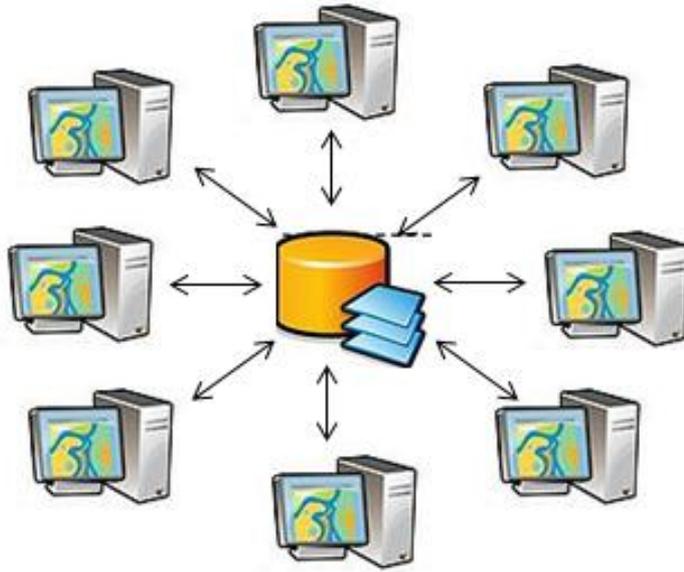


# WEB-BASED GIS FOR CIVIL ENGINEERING

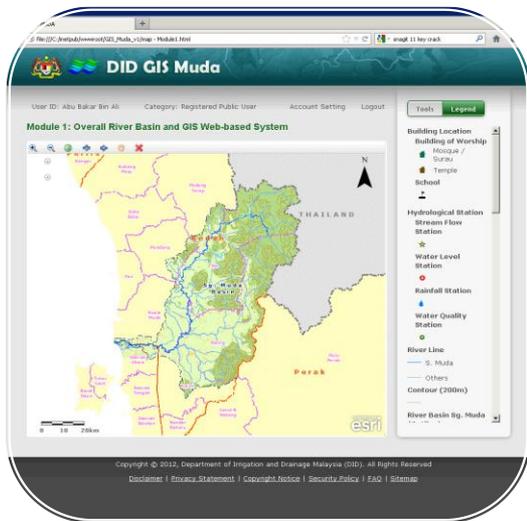


# DISSEMINATE INFORMATION TO EDUCATE PUBLIC

- Educating public by providing a web-based platform to sharing knowledge and geographic information



# DISSEMINATE INFORMATION TO EDUCATE PUBLIC ONLINE VIEWER ACCESSIBILITY



- Desktop



- Tablet

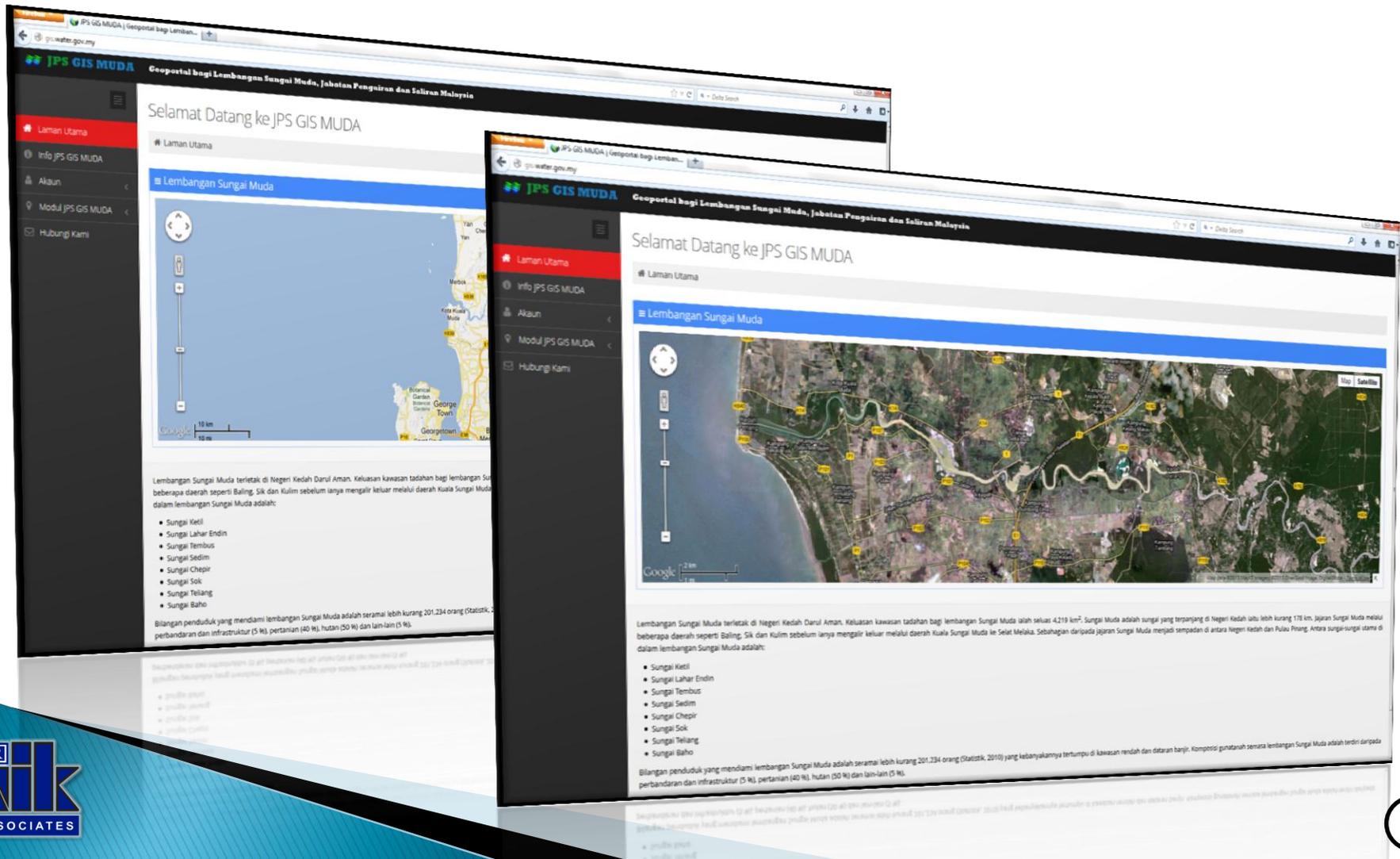


- Mobile

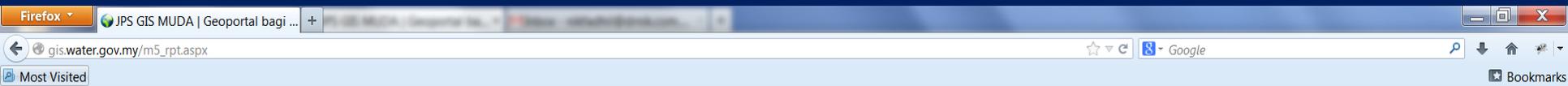
# EXAMPLE OF GEOPORTAL - RIVER BASIN MANAGEMENT -

Front Page of JPS GIS Muda

- Web Home Page - <http://gis.water.gov.my/gismuda/>



# EXAMPLE OF GEOPORTAL - RIVER BASIN MANAGEMENT -



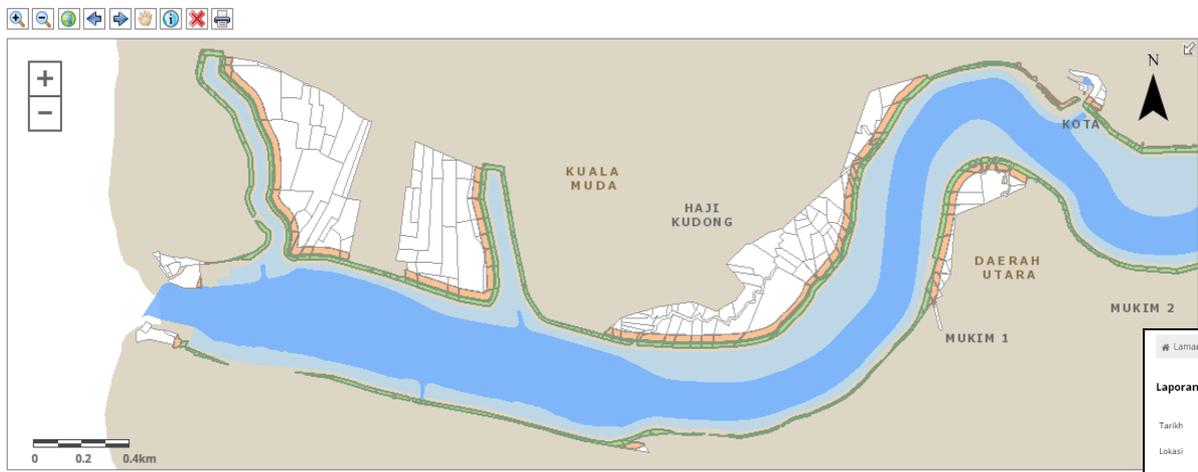
- Laman Utama
- Info JPS GIS MUDA
- Modul JPS GIS MUDA
- Modul 1 : Maklumat Asas Lembangan Sungai Muda
- Modul 2 : Projek RTB Sungai Muda
- Modul 3 : Pengurusan Pengambilan Balik Tanah
- Modul 4 : Pengurusan Penempatan Semula
- Modul 5 : Pengurusan Tanah Rezab JPS
- Hubungi Kami

Selamat Datang ke JPS GIS MUDA

Laman Utama > Modul JPS GIS MUDA > Module 5 : Pengurusan Tanah Rezab JPS

## Module 5 : Pengurusan Tanah Rezab JPS

Jadual Lokasi



- Carian
- Pengukuran
- Petunjuk GIS
- Lihat / Tutup Data GIS

### Hasil Carian

Module 3 : Pengurusan Pengambilan Balik Tanah

Tanah Persekitaran yang Diambil

Daerah: Kuala Muda

No.	No. Lot	No. Pn	No. Hakmilik	Luas Hakmilik (m <sup>2</sup> )	Statistik	Keputusan	Tarikh Berakhir #1	Tarikh Berakhir #2	Status
47	2881	080145	141020	141020	Hajj Kutang	habat	2011-08-15	2011-08-15	Selesai
48	2881	080145	141020	141020	Hajj Kutang	habat	2011-08-15	2011-08-15	Selesai
49	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
50	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
51	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
52	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
53	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
54	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
55	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
56	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
57	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
58	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
59	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai
60	2222	080176	141020	141020	Hajj Kutang	habat	2011-11-17	2011-11-17	Selesai



Laporan Pemantauan Tanah Rezab JPS

Tarikh: 18/03/2018 0:00:00

Lokasi: SJK (CH 2300 m -Ch 2950 m Ban/Kanan)

Tanaman pisang

Aktiviti Yang Dikesan

Status Tindakan: 1) Penceroboh masih belum dapat dikenal pasti

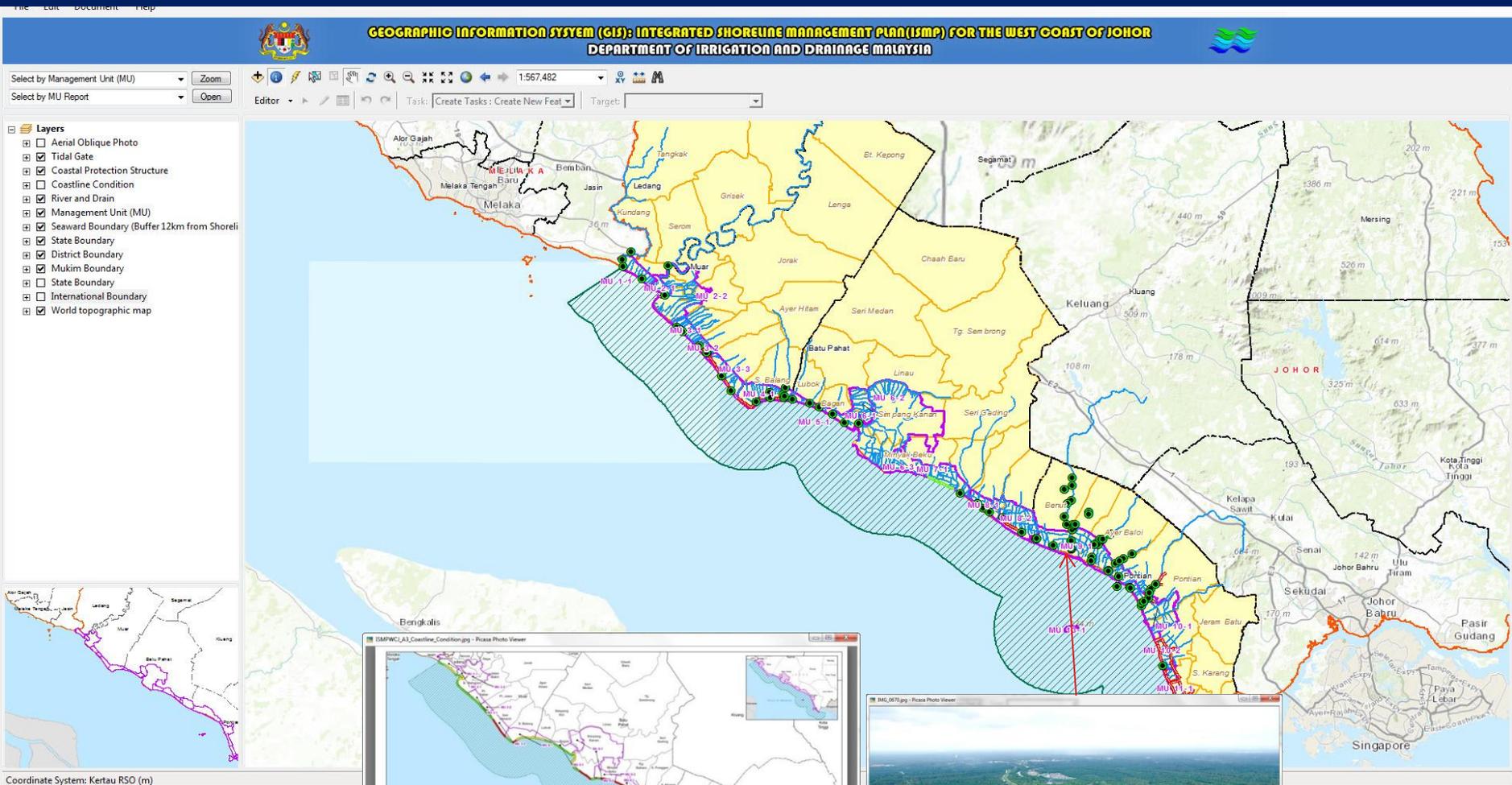
Status Semasa: 1) Siasatan di tapak 2) Mengenal pasti penceroboh

Tarikh Selesai

Catatan: 1) Dalam Perhalalan 2) Telah di bina pagar sempadan, penanda rizab dan papan tanda amaran 3) Telah Hantar surat ULANGAN 2 kepada PTD SJK bertarikh 21/5/2012 4) Telah hantar surat ULANGAN 3 kepada PTD SJK pada 18/10/2012



# EXAMPLE OF GEOPORTAL -SHORELINE MANAGEMENT-



# EXAMPLE OF GEOPORTAL -SHORELINE MANAGEMENT-

File Edit Document Help

**GEOGRAPHIC INFORMATION SYSTEM (GIS): INTEGRATED SHORELINE MANAGEMENT PLAN (ISMP) FOR THE WEST COAST OF JOHOR**  
DEPARTMENT OF IRRIGATION AND DRAINAGE MALAYSIA

Select by Management Unit (MU)  1:453,985

**MU 6-2: Bandar Penggaram**  Editor

Task: Create Tasks: Create New Feat Target:

- MU 1-1: Kesang
- MU 2-1: Tanjung Agas
- MU 2-2: Bandar Maharani
- MU 3-1: Pant Raja
- MU 3-2: Pant Jawa
- MU 3-3: Seri Menanti
- MU 4-1: Sungai Balang
- MU 5-1: Pant Simin
- MU 6-1: Pesera
- MU 6-2: Bandar Penggaram**
- MU 6-3: Sungai Suloh
- MU 7-1: Senggarang
- MU 8-1: Sungai Tongkang
- MU 9-2: Riangit
- MU 9-1: Benut
- MU 10-1: Pontian Kechil
- MU 10-2: Pontian Selatan
- MU 11-1: Penerok
- MU 11-2: Permas Kechil
- MU 11-3: Pekan Kukup
- MU 11-4: Kukup Straits
- MU 11-5: Serkat
- MU 11-6: Kukup Laut
- MU 11-7: Tanjung Piai
- MU 12-1: Pulau Kukup
- MU 13-1: Gugusan Kepulauan Pisang

Overlay with National Geographic World Map

**MU 6-2.pdf - Adobe Reader**

The Integrated Shoreline Management Plan for the West Coast of Johor

**MU 6-2: Bandar Penggaram**

**Description**

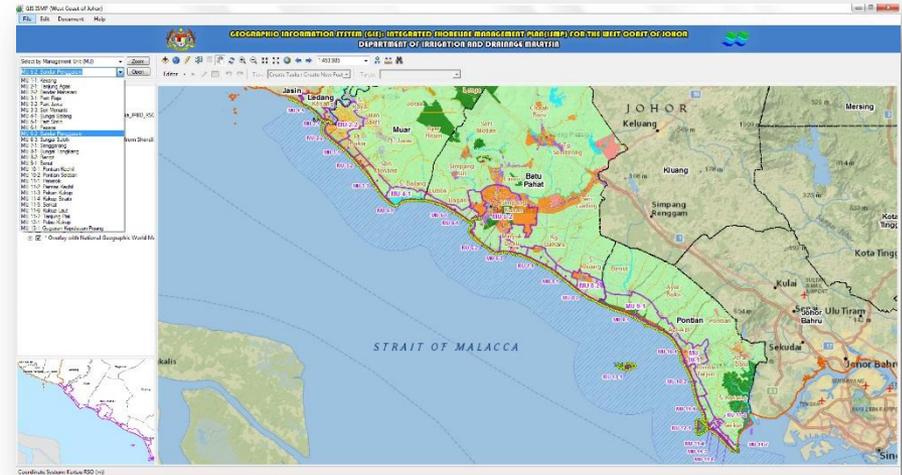
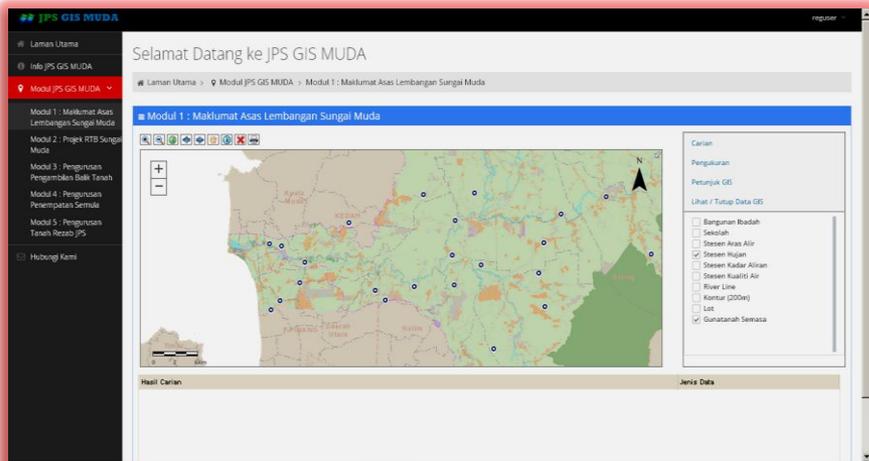
The MU covers Bandar Penggaram with an area of 17,204 ha between Sungai Suloh Besar (east) and Tanjung Api-Api (west). The shoreline length is 16 km. The western and northwestern coastline is accreting and stable respectively. The rest of the coastline experiences erosion. Agriculture accounts for about 69% of the MU's land use. Universiti Tun Hussein Onn will have its new campus at Tanjung Laboh located near the old airfield at Kemajuan Tanah Sungai Kelichap.

Thinning mangroves on western bank of Sungai Batu Pahat's entrance about 0.7 km upstream of Tanjung Api-Api

Coordinate Systems: Kertau RSO (m)

# EXAMPLE OF GEOPORTAL - DISASTER MANAGEMENT -

Interactive And Efficient Engineering-based Geospatial Platform  
For Engineers and Decision Makers



# GEOINFORMATION TECHNOLOGIES TO SUPPORT DECISION MAKERS

1. GIS potential has not been fully exploited for Civil Engineering in Malaysia.
2. A decision support system with direct and easy access to geoinformation data and analysis tool is a platform for combination of Engineering and GIS that support
  - a. planning, development and management.
  - b. group collaboration and allows synchronous and asynchronous collaboration between decision makers, support GIS users such as mobile GIS and provide open standards based web portal technologies.



**ISKANDAR**  
REGIONAL  
DEVELOPMENT  
AUTHORITY



# ACKNOWLEDGEMENTS

Special thanks to

- *Jabatan Pengairan dan Saliran Malaysia (JPS)*
- *Universiti Kebangsaan Malaysia (UKM)*
- *Iskandar Regional Development Authority (IRDA)*
- *DNASB's staff*
- *Majlis Keselamatan Negara*

*for their support*

THANK YOU