MALAYSIA GEOSPATIAL FORUM 2014

Fostering Domestic Capacity for Economic Growth

11-12 March 2014

The Magellan Sutera Harbour
Kota Kinabalu Sabah

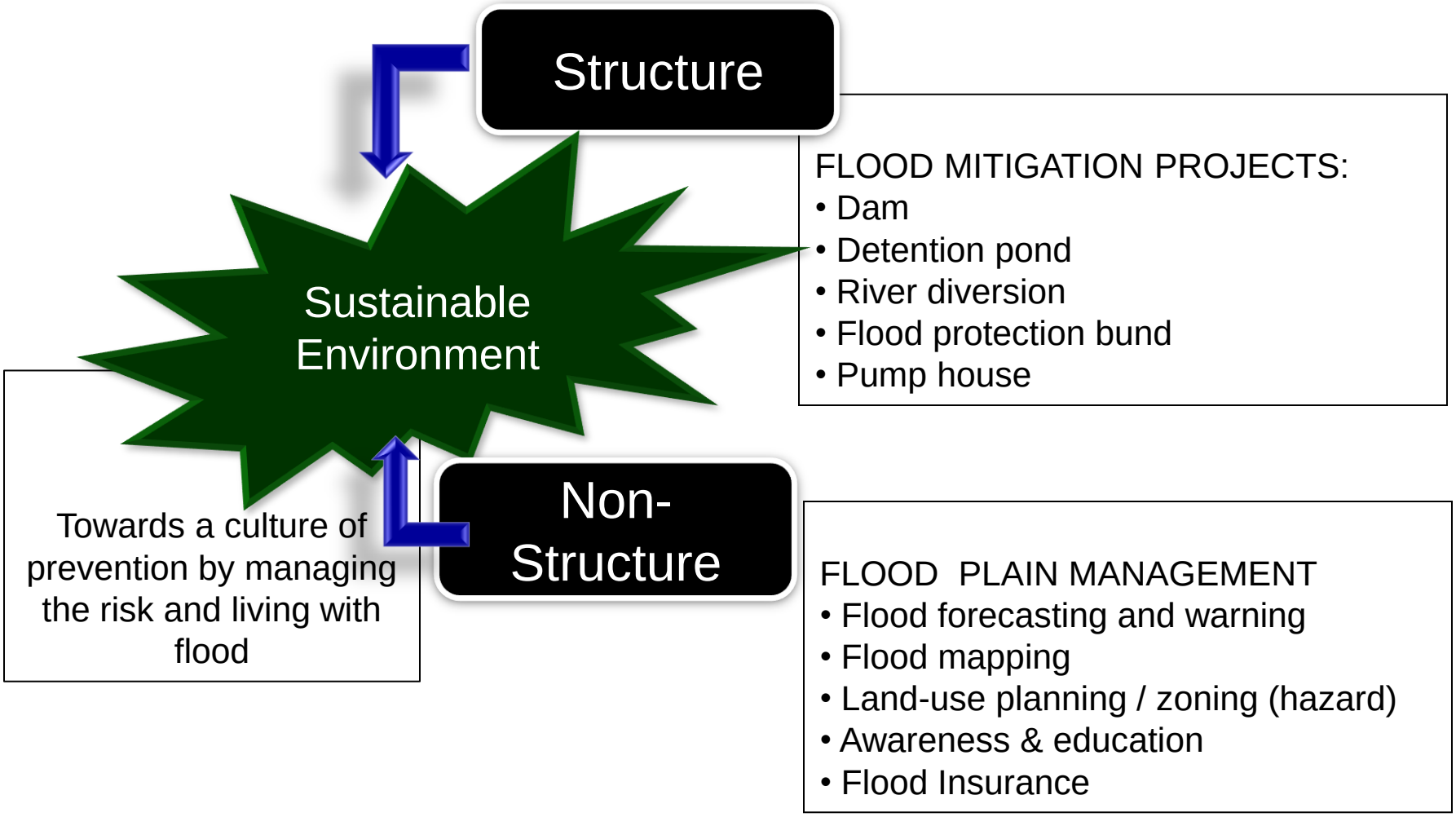
Flooding Condition in Malaysia

Flooding in Malaysia

- 26,700 sq.km (8%) of the total area in the country are flood affected area
- 5.7 million peoples live in flood risk area
- Annual Average Flood Damage – RM 1.0 billion.
- Retarding Impact on the Country's Economy, Infrastructure, Social Life and Environment

(Updated Record in 2012)

Mitigation Measures




Barrage
Flood Wall / Bund
Pump
Flood Mitigation Projects
Dam
River Diversion / Bypass
River improvement works
Pond

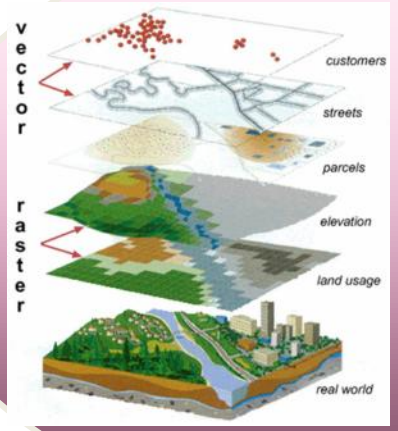
NON-STRUCTURAL MEASURE

FLOOD MANAGEMENT

Flood Hazard Mapping Using Geospatial Data

Flood Hazard Mapping

Geographic Information System



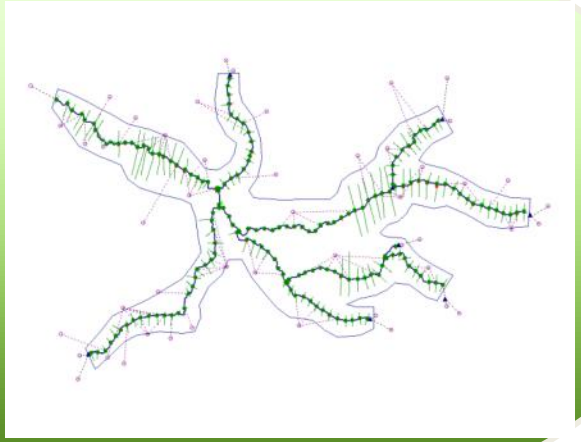
- Data
- Data Management
- Manipulation and Analysis
- Output

Integration

- Flood Mitigation Programmes
- Flood Hazard Map

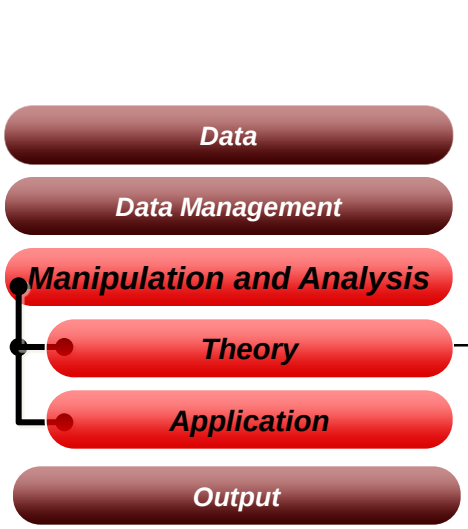
- Theory
- Application

Hydrodynamic Modelling



- Data collection
- River cross-section analysis
- Hydraulic & Hydrologic data
- Calibration
- Sensitivity analysis

GIS in Flood Management



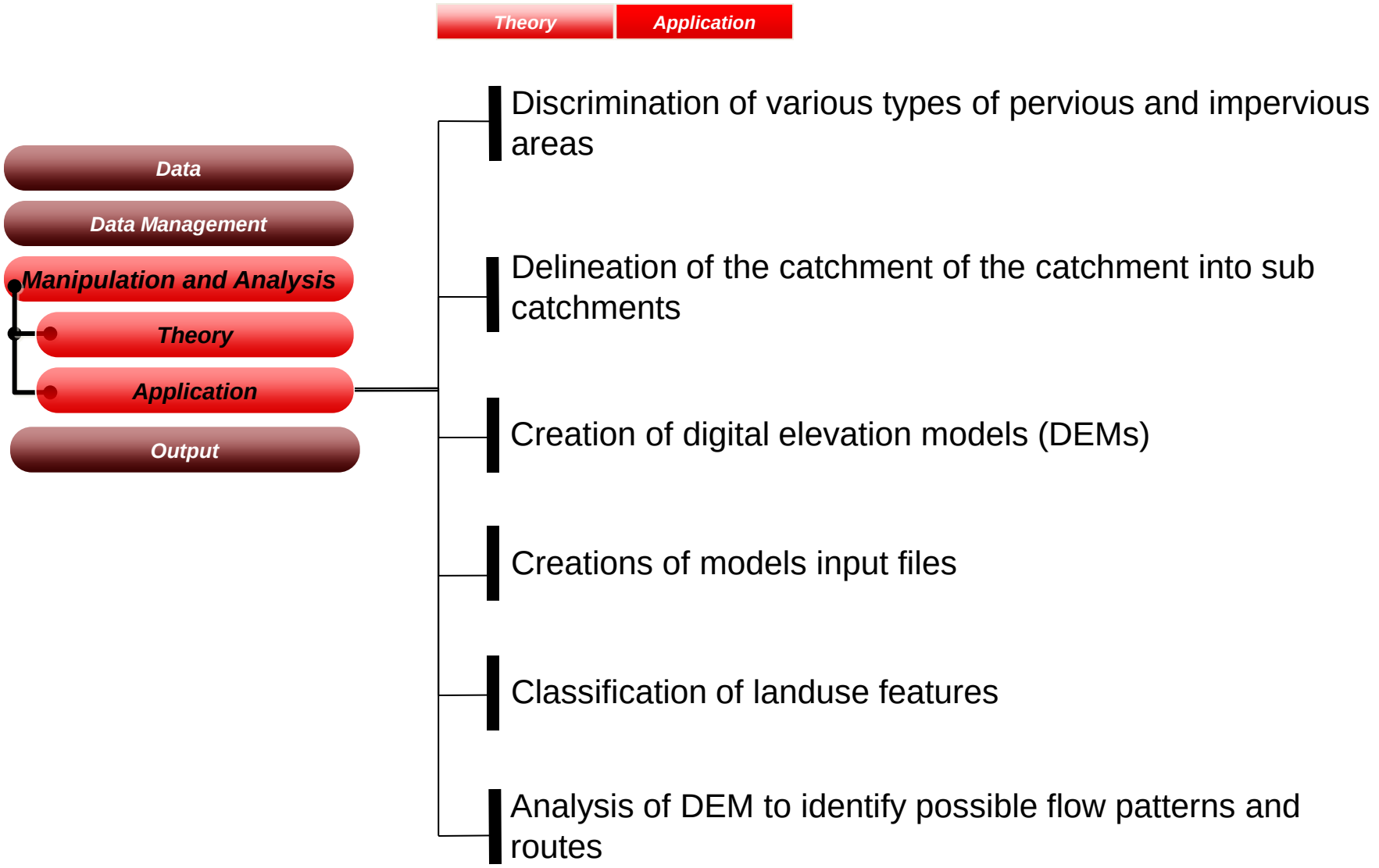
Combination of tools and methods those are useful for collection, storage, processing, and distribution of spatial data

Performing very important role in monitoring, controlling, relieving, and assessing natural disasters especially flood disaster

Extensive possibility for improving disaster management as they offer more efficiency and speed in the input, management, manipulation, analysis and output of data/information

The main advantage of using GIS for flood management is that it not only generates a visualization of flooding but also allows for practical estimation of the probable hazard due to flooding

GIS in Flood Management



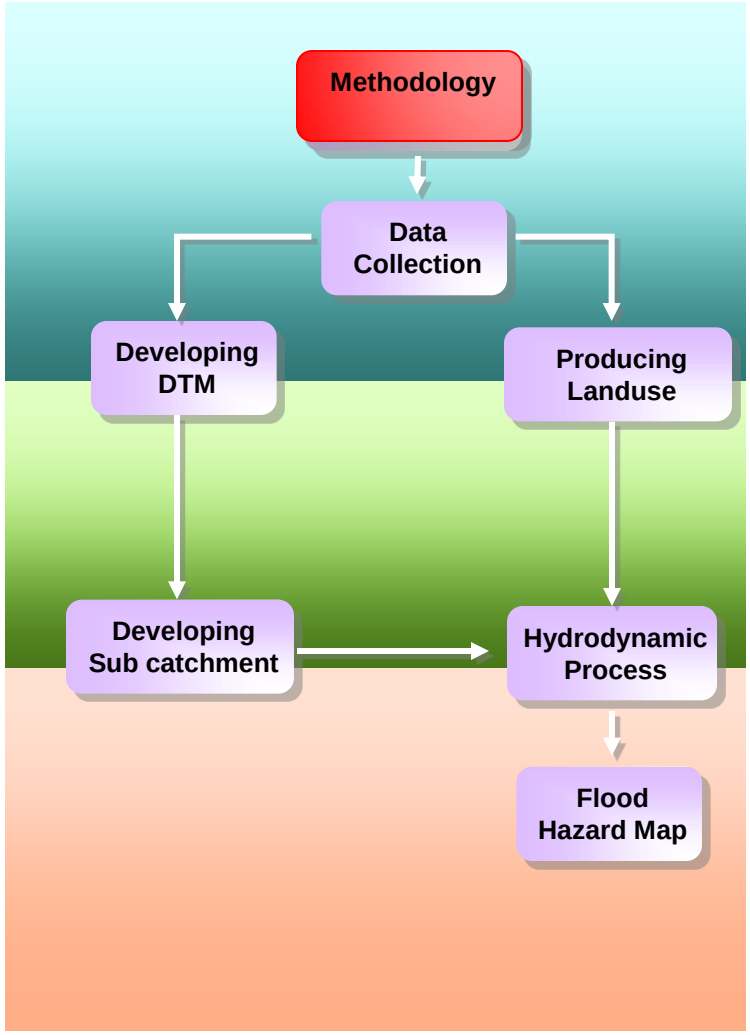
THE EXAMPLE

Sungai Buloh Hazard Flood Map

Sungai Buloh Catchment

- Located in middle of Selangor consisting of three (3) different Local Authorities i.e. Majlis Bandaraya Shah Alam (MBSA), Majlis Bandaraya Petaling Jaya (MBPJ), and Majlis Perbandaran Selayang (MPS)
- Overall area for Sungai Buloh considered a development area and with total area of 118 km^2
- The project area covers a selected stretch of 33.3 km length of 7 rivers
- Sungai Buloh - 11.6 km,
  Sungai Pelong - 3.2 km,
  Sungai Subang - 5.9 km,
  Sungai Kedondong - 2.4 km,
  Sungai Kembit - 1.8 km,
  Sungai Gasi - 3.2 km,
  Sungai Hampar - 5.2 km
- Sungai Buloh River is one of the most critical catchments which required serious attention from Department of Irrigation and Drainage (DID) to carry out a comprehensive flood mitigation works

Methodology

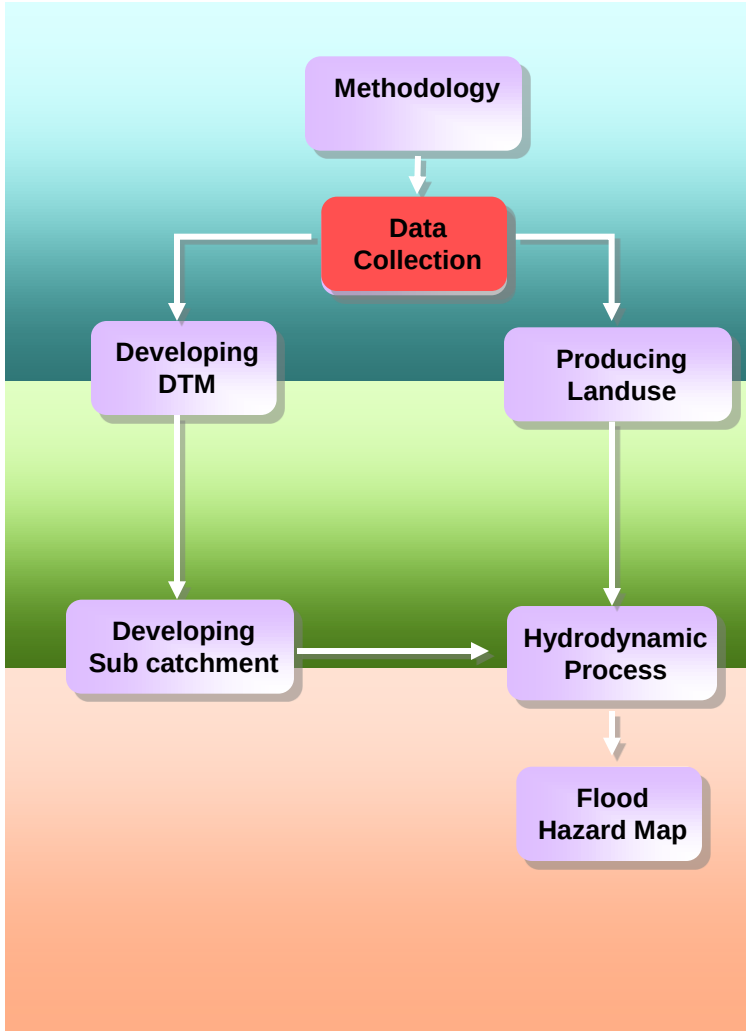


“Combination of hydraulic, hydrological and GIS tools has become a necessity in producing Flood Hazard Map”

The use of software in hydraulic and hydrologic modelling is capable to predict the discharge and water levels along the river and floodplain

The water level will then will be superimpose using GIS function in the hydrodynamic software to produce the extent of flood.

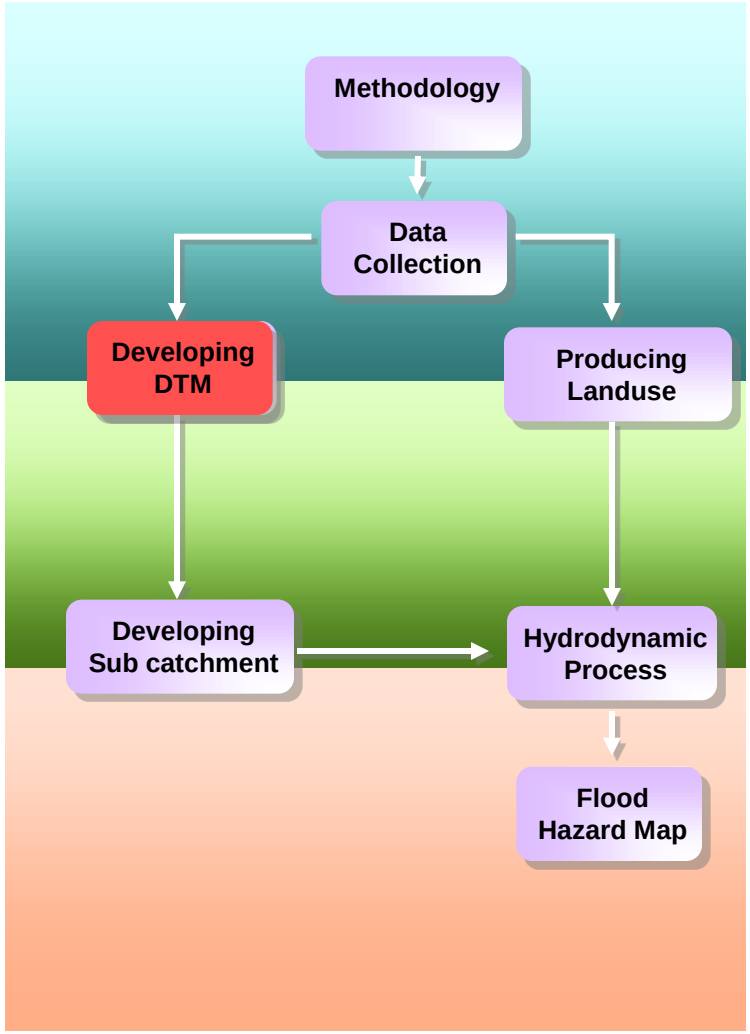
Data Collection



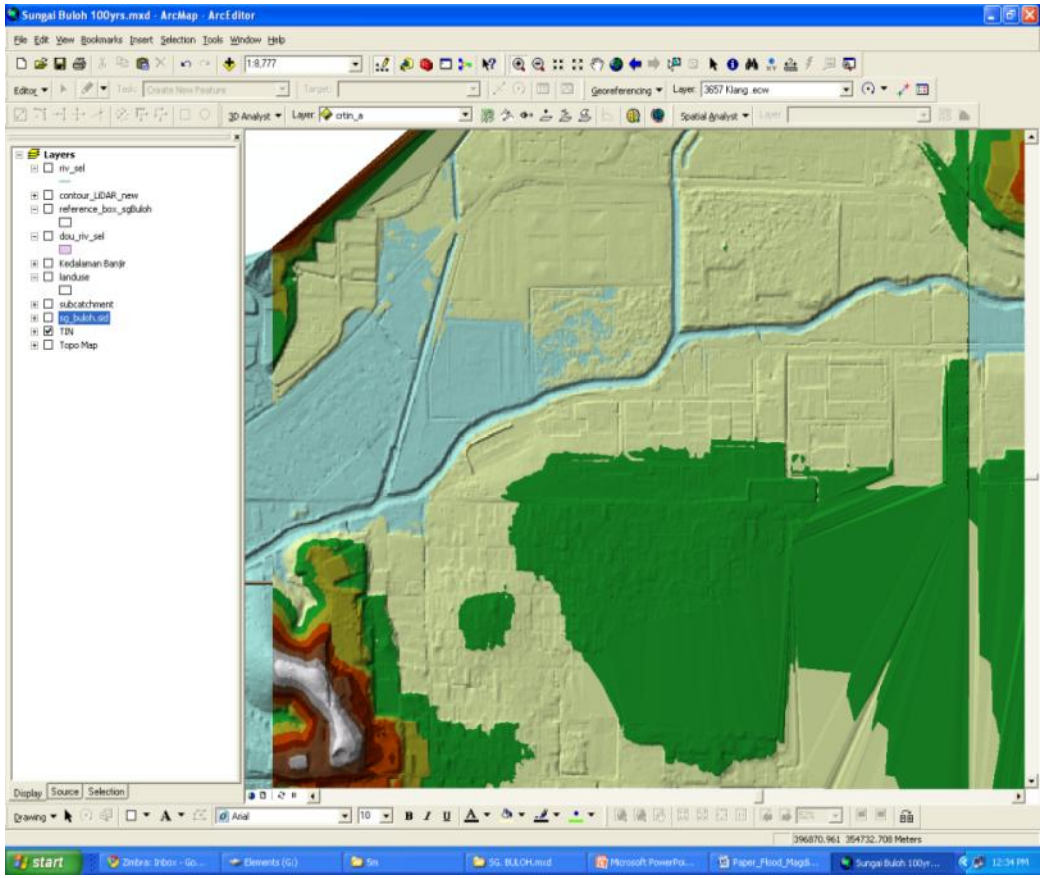
Data Used for Hydrodynamic Model Development

No	Type of data	Recommended Format	Purpose of Analysis
1	Sub-catchments	GIS	Rainfall runoff analysis
2	River alignment	GIS	Hydraulic analysis
3	River Cross section	AutoCAD / GIS	Hydraulic analysis
4	3D spot height	Text, shapefile	Flood plain analysis/ flood mapping
5	Satellite images	Imagine, MrSID	Background map
6	Structure detail	AutoCAD Drawing	Hydraulic analysis
7	Landuse	Shapefile	Rainfall runoff analysis/flood damage
8	Soil type	Shapefile	Rainfall runoff analysis
9	Rainfall data	Text/ spreadsheet	Rainfall runoff analysis
10	Road / building map etc	Shapefile	Flood plain analysis

Developing DTM

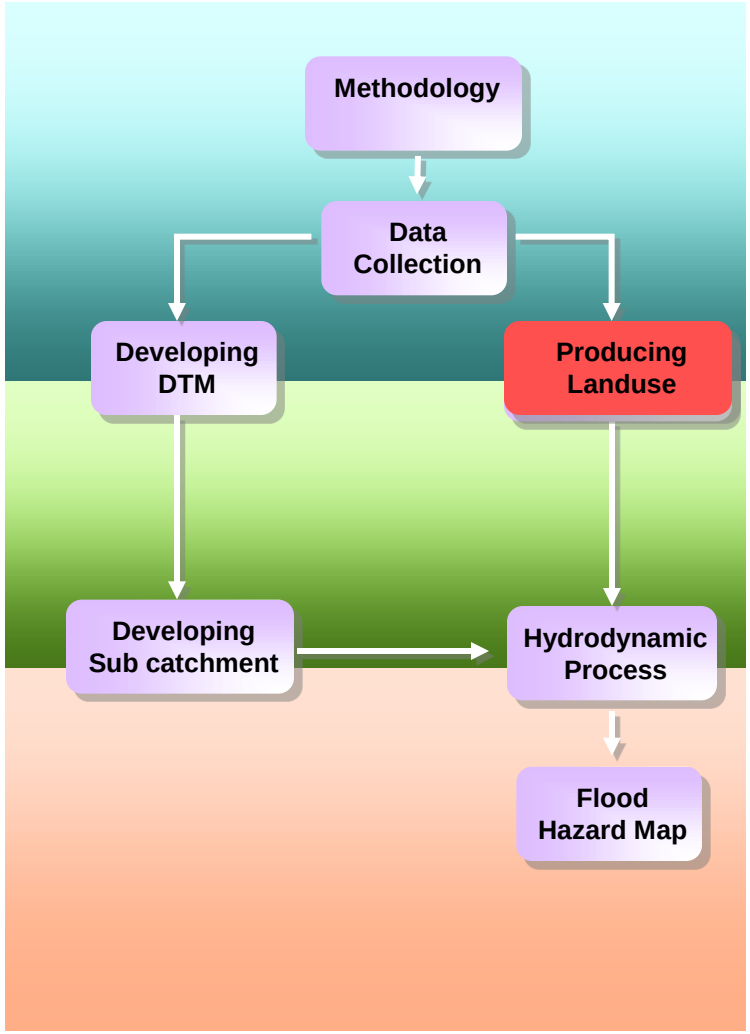


"The DTM was used to generate and display ground level contours, and forms the basis for dynamic flood mapping"

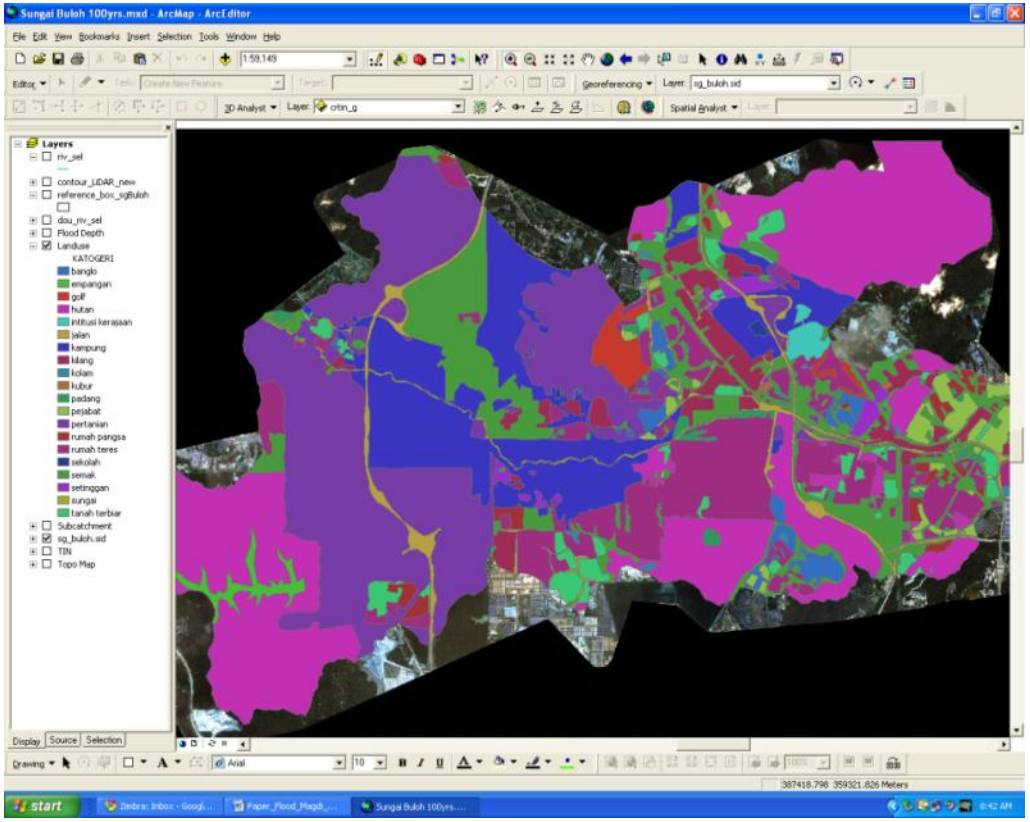


DTM generation from LIDAR Data

Land Use

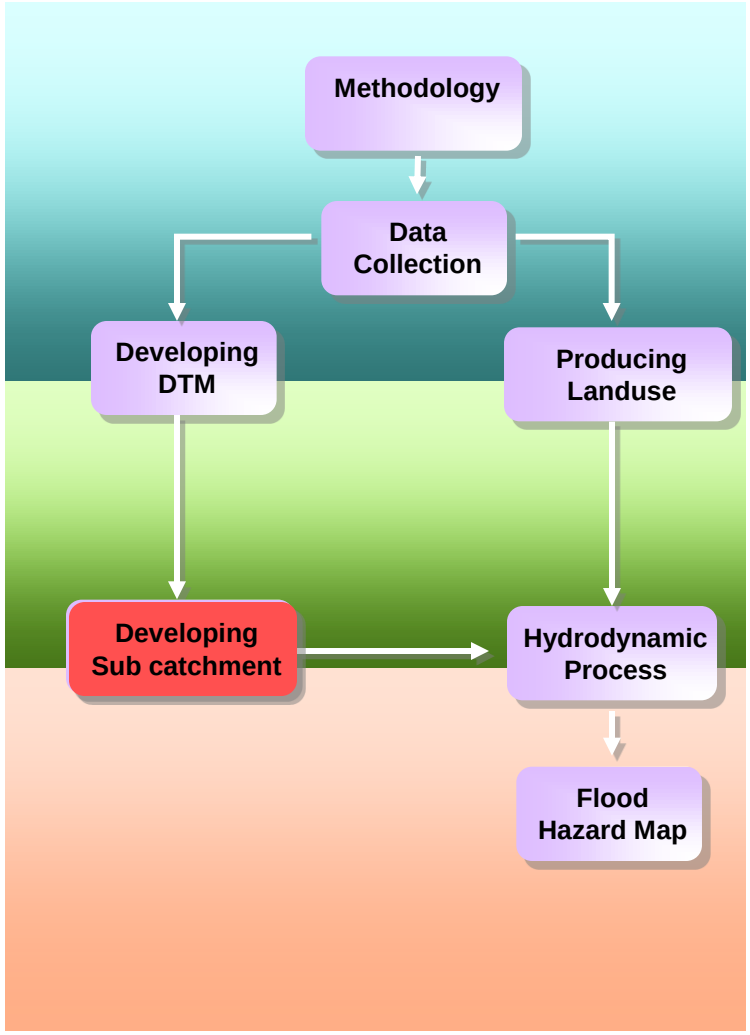


- The landuse map was produced digitizing process using GIS software, satellite image
- The categorisation of landuse shown in different colours

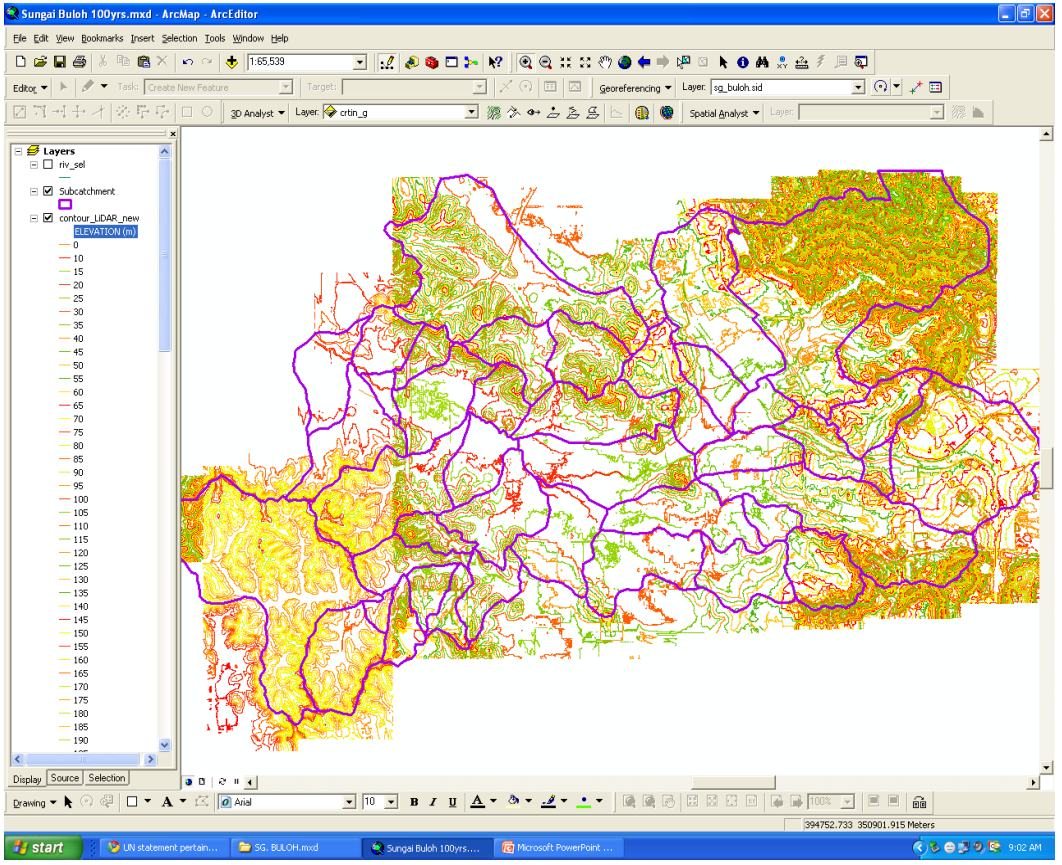


Landuse map of Sungai Buloh Catchment

Developing Sub Catcment

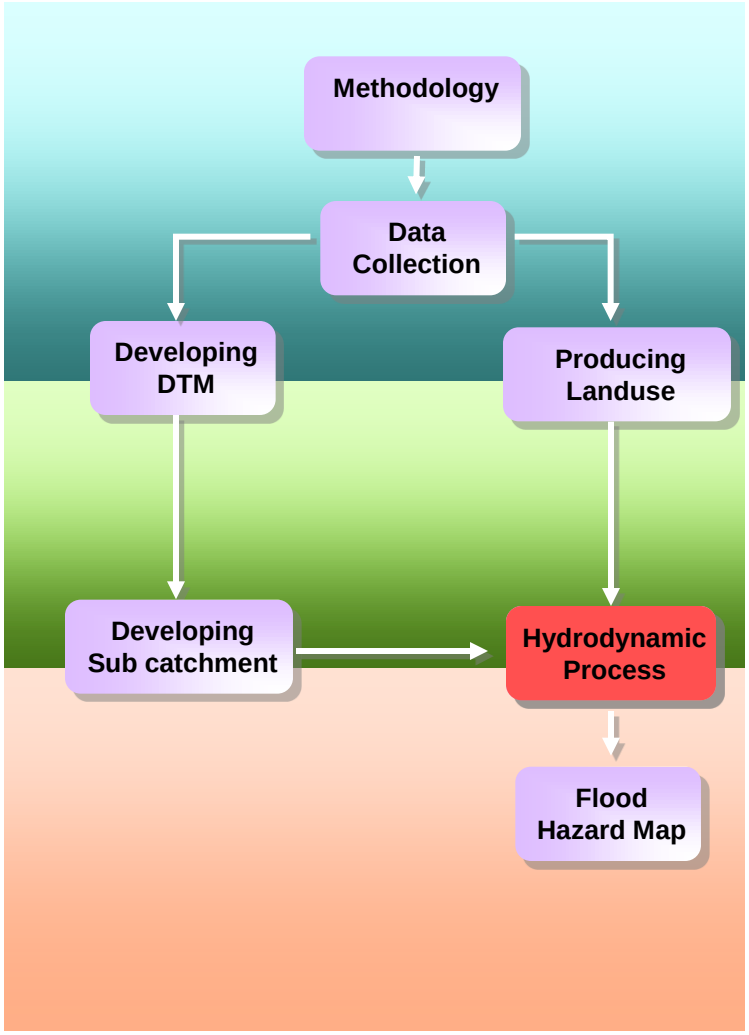


- Sub catchments were produced from the contour layer of 5m interval

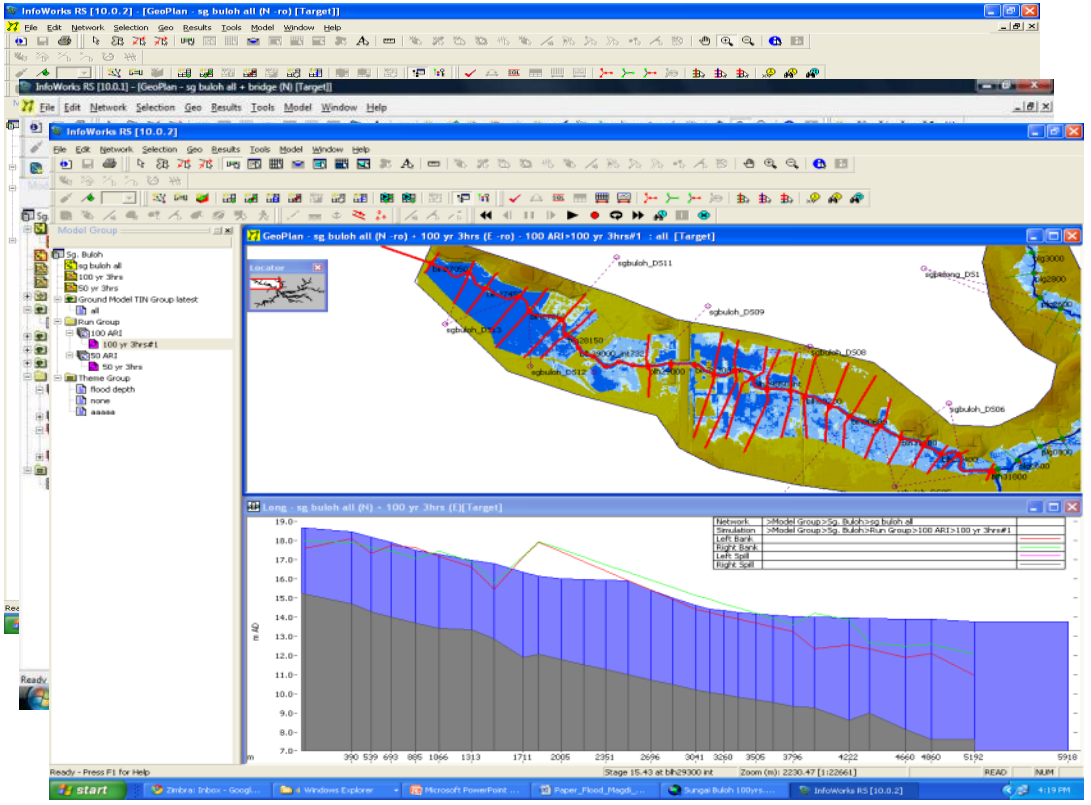


Sub catchments digitize from contour layer

Hydrodynamic Process

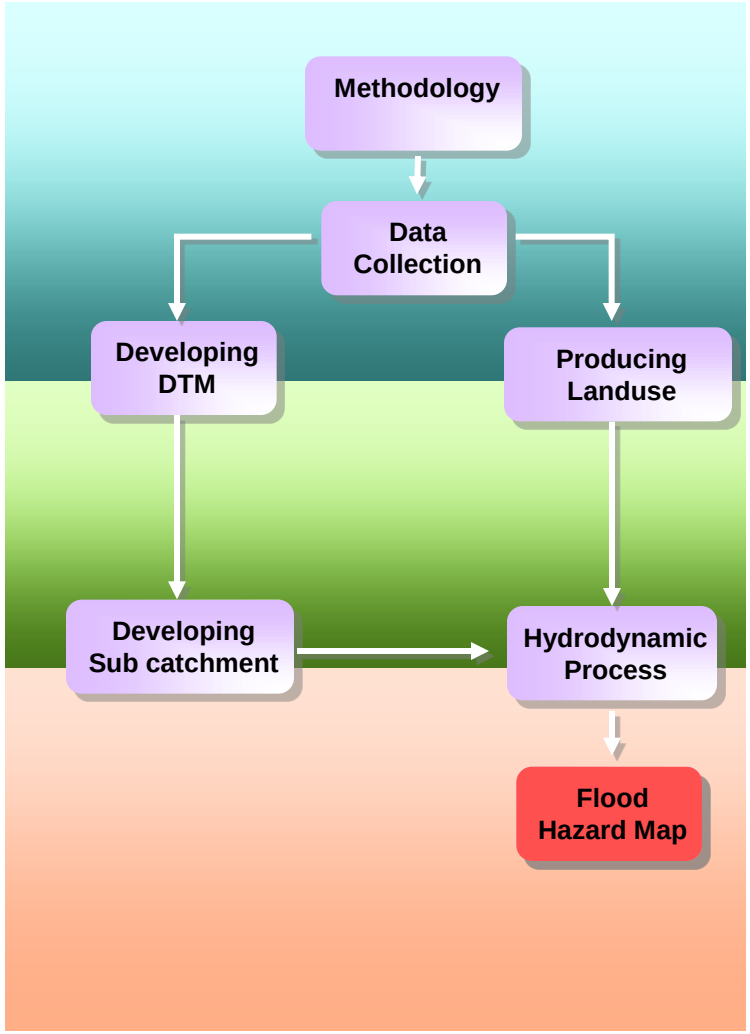


- The hydrodynamic process mainly consists of hydrologic and hydraulic components
- The river model is extended to the flood plain to generate the flood extent



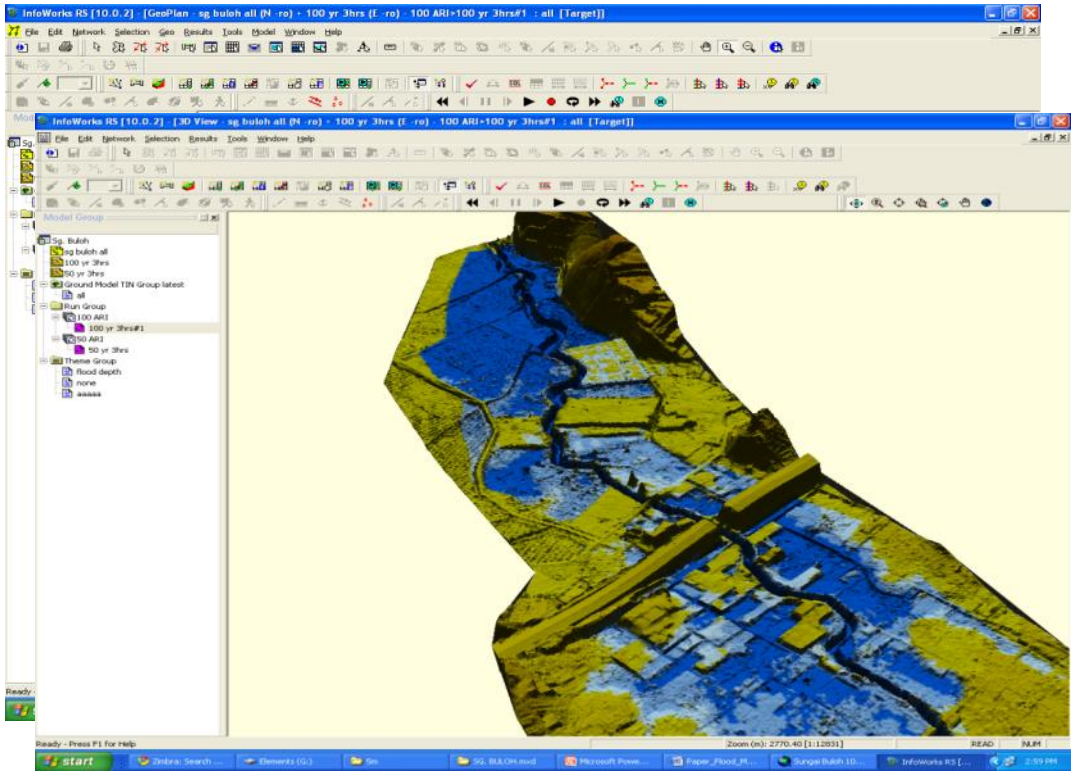
Long Section of Sungai Buloh

The Software



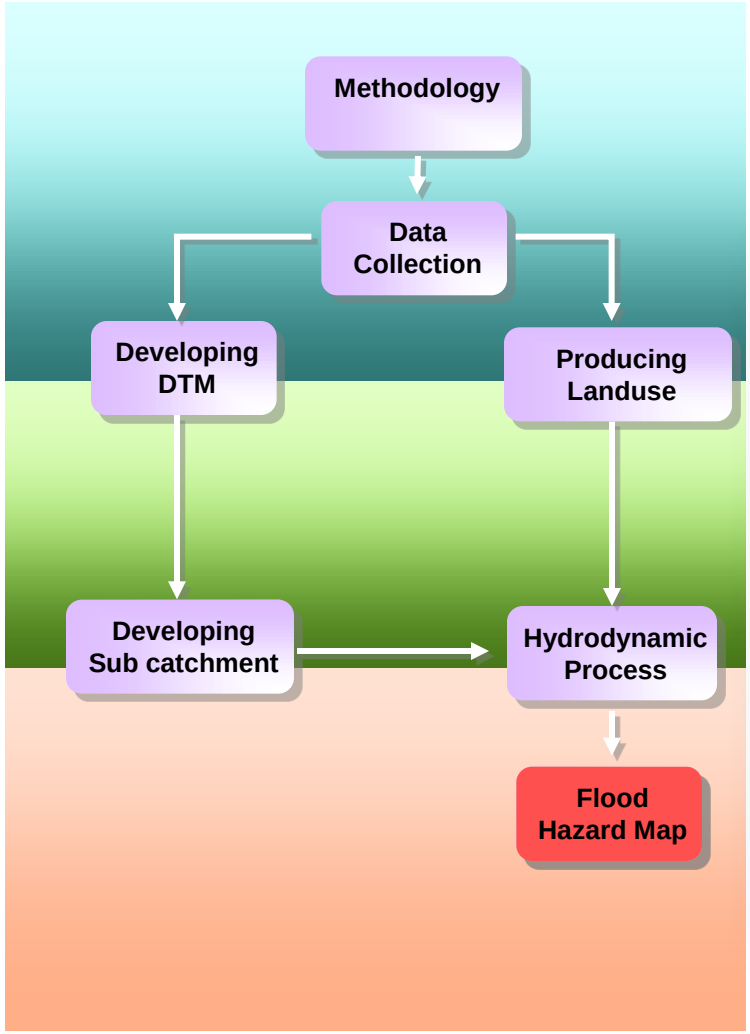
- InfoWorks RS allows model results to be overlaid onto the underlying DTM to generate accurate and reproducible flood extent maps

- Able to show flood extent and depth, and can be animated to show the progression of a flood event



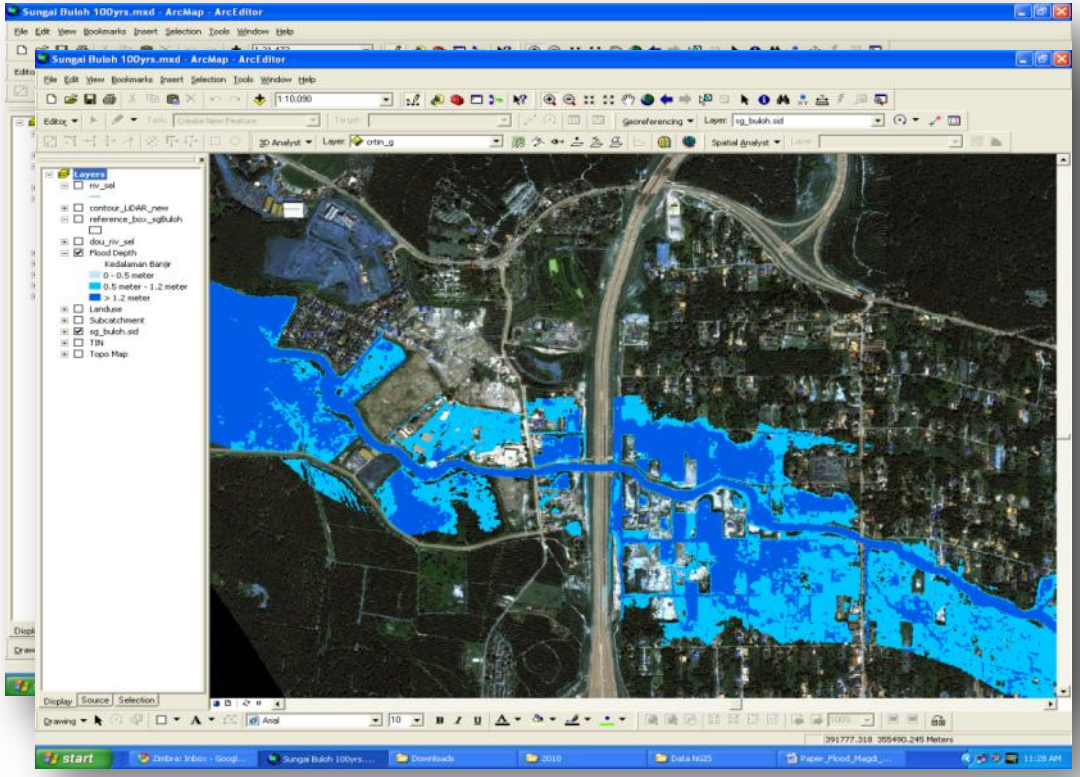
Output from InfoWorks RS in 3D view

The Map



- The completed flood map is then exported as a shapefile

- ArcGIS is then used to overlay the flood map with other layer such as landuse map to produce flood hazard map



Close up of the flood hazard map with different depth

Conclusion

- GIS had been used at all these stages to support and speedup the data processing and analysis

  - GIS has the ability to perform and display different types of professional analysis including to “create, manipulate, analysis and display all types of geographically or spatially referenced data

- Fast and extensive access to information on the ground and in the office pertaining particular flood mitigation projects through GIS system

Recommendation

- **Flood hazard map which is produced from the hydrodynamic simulation can be made available in GIS format. GIS tools shall then be used for decision making by the Department ‘s management for project implementation.**

- **Flood hazard layer is easily share with other agency to promote more efficient information sharing between different stakeholders**

- **Flood hazard map produced from flood simulation analysis can be used by Government Agencies to regulate floodplain by establishing the development and redevelopment policies to restore the functionality of the floodplains**

- **Integrated Flood Management (IFM) Master Plans can be incorporated into Town and Country Planning Structural Plans to ensure that drainage requirements are met for designated areas**

- **Flood Hazard Map can be used as a guide by the Disaster Management Agency to identify the suitable location for Flood Relief Centre in the event of flooding.**

Therefore, geospatial data should now be used progressively in flood management activities.

With that, the flooding issue must be mitigated and solved in fostering the economic growth of this country.

Terima Kasih