

**STAKEHOLDER FORUM FOR INCORPORATING  
CLIMATE CHANGE RESILIENCE IN THE NATIONAL  
WATER RESOURCES POLICY ACTION PLANS**

**CLIMATE CHANGE RESILIENCE IN  
FLOOD MANAGEMENT**

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IR BIBI ZARINA CHE OMAR  
FLOOD MANAGEMENT DIVISION  
DEPARTMENT OF IRRIGATION AND DRAINAGE,  
MALAYSIA**

**27 OCTOBER 2014  
PULLMAN HOTEL, PUTRAJAYA**

# WHAT IS CLIMATE CHANGE

The term ‘climate change’ refers to “the warming of the earth’s atmosphere and oceans, in addition to an increase in the natural variability of the climate”.

*(Municipal Climate Change Action Plan Guidebook,  
Canada-Nova Scotia Infrastructure Secretariat, 2011)*

# Climate change trends indicate that in the future, we are more likely to experience:

- warmer temperatures
- increasing amounts of precipitation
- greater UV exposure;
- sea level rise (higher tides)
- stronger winds, storm surges
- more frequent storm events; and
- more frequent 'extreme weather events' such as heat waves, droughts, and heavy precipitation in the form of rain, snow or ice storms, coupled with strong winds.

# What is Climate Change Adaptation?

- ▶ Climate change adaptation is about taking actions that will help to reduce the impacts associated with anticipated climate change trends, events and hazards. It is also about taking advantage of new opportunities that may be created as a result of climate change.

- ▶ We recognize these challenges, and our engineers and planners work with clients to find the right solutions that manage risk, protect people and assets, meet regulatory requirements and offer long term resilience against further variability and change

# Flood Events in Malaysia

- ▶ Major floods was recorded since 1926 followed by 1949 and 1971
- ▶ 9% (30,000 sq km) of the total area of the country is prone to flooding
- ▶ Approx 4.8 mill people live in areas prone to flooding
- ▶ Recent floods 2006, 2007 and Jan 2011, some urban areas in Johor - including Segamat, Johor Bharu, Kluang, Kota Tinggi and Muar were flooded and completely cut off
- ▶ In this state alone between 40,000 -70,000 people were evacuated and at least two people died in this particular experience
- ▶ Both waves of these disasters were considered to be the costliest floods in Malaysia's history with a total cost of RM 1.5 billion.

# Challenges in Flood Management

- ▶ Floodplains are continuously being developed
- ▶ Residents/stakeholders have high expectations and less tolerance towards flooding
- ▶ Structural flood management costs is rising
- ▶ Non-structural approach has not been well accepted (IFM, IWRM)
- ▶ Global climate change

# FLOOD RISK MANAGEMENT IN CLIMATE CHANGE RESILIENCE

Aims to :

- Control and reduce occurrence flooding
- Reduce damage and flood losses
- Protect life and prevent damage to property

# How to overcome?

- ▶ Adopt concept of Living with Floods and Incorporate Integrated Flood Management (IFM) in development plans
- ▶ Adopt BMP's in CCF
- ▶ Stakeholder's Engagement

# Integrated Flood Management

- ▶ It is an integrated approach for an effective and efficient flood mitigation management, which maximize the efficient use of flood plain and minimize damage to properties and loss of life.
- ▶ IFM concept of living with flood is based on the following principles:
  - ▶ Employ basin approach
  - ▶ Treat floods as the water cycle
  - ▶ Integrate land and water management
  - ▶ Adopt mix strategies based on risk management approaches'
  - ▶ Ensure participatory approach

# Adopt BMP's in CCF

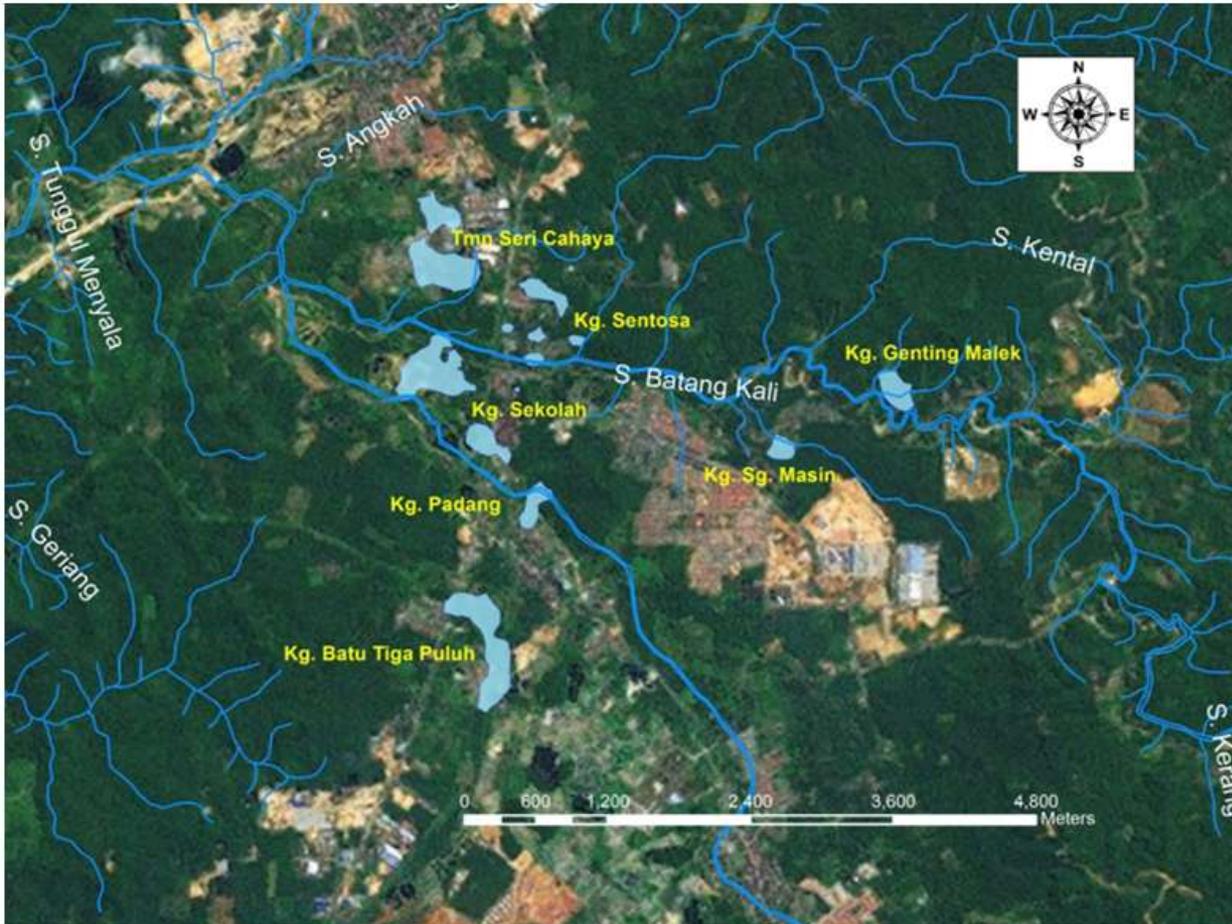
- ▶ Best practice in flood management is to consider and plan for a 1:100 year flood event. This is an event that has a 1% chance of occurring in any given year, over a hundred year period of time.
- ▶ In preparing for such events, flood hazard maps has to consider the CCF in the 1:100 year flood event
- ▶ Nahrim's Technical Guide No.1 - Estimation of Future Design Rainstorm under the Climate Change Scenario in Peninsular Malaysia predicts that the total water level associated with a 1:100 year flood is anticipated to increase over time, as a result of climate change.

# Stakeholders' Engagement

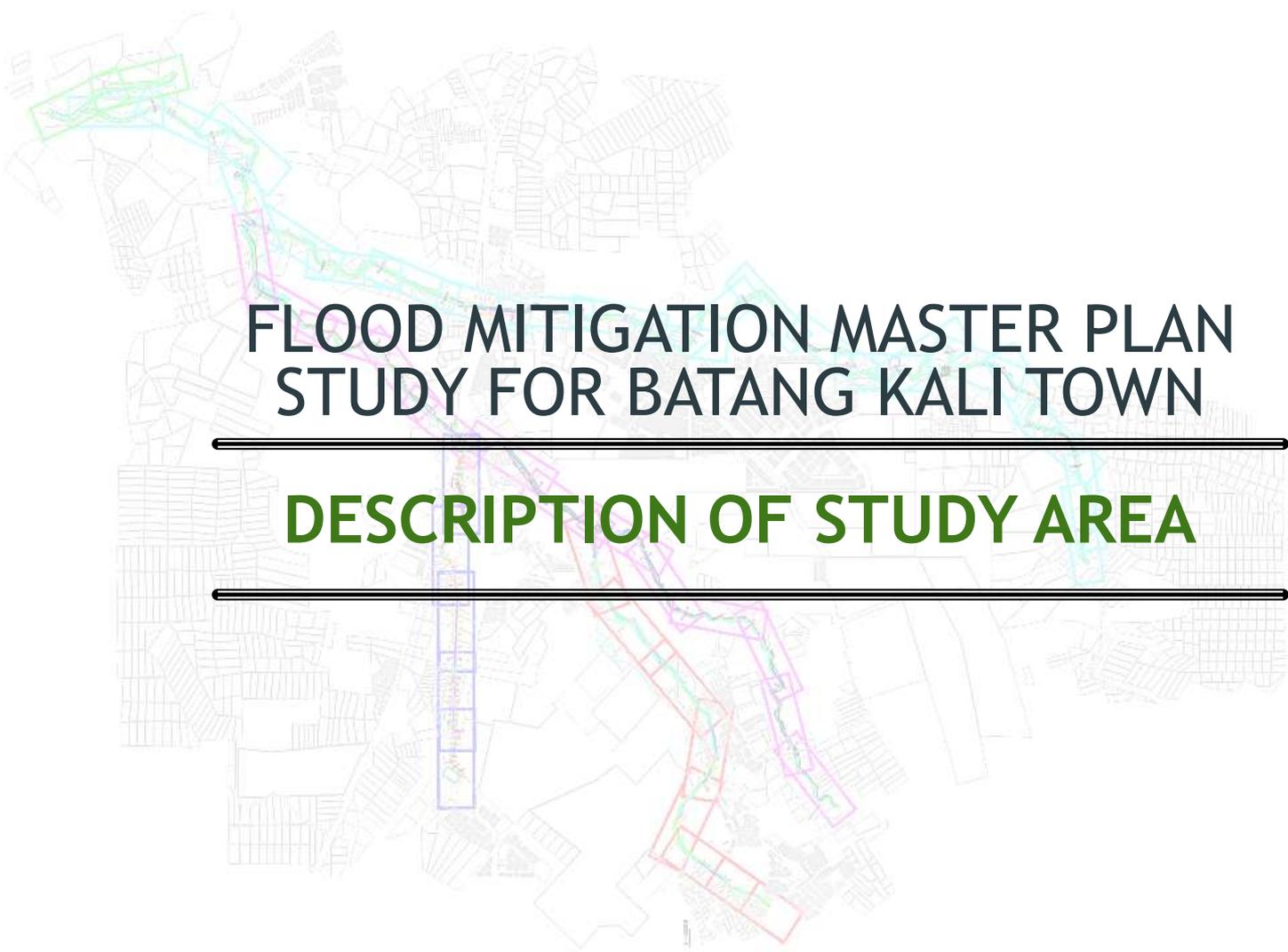
Education, consultation and partnerships can assist to reduce and address the potential impacts of flooding;

- ▶ Policy Maker - Preparing policies and funding
- ▶ Technical experts - research, preparing regulations for physical adaptation
- ▶ Government officers - implementation, monitoring and enforcement
- ▶ Community representatives - understanding and participation

# CASE STUDY



Flood inundation map for 2012 flood event



# FLOOD MITIGATION MASTER PLAN STUDY FOR BATANG KALI TOWN

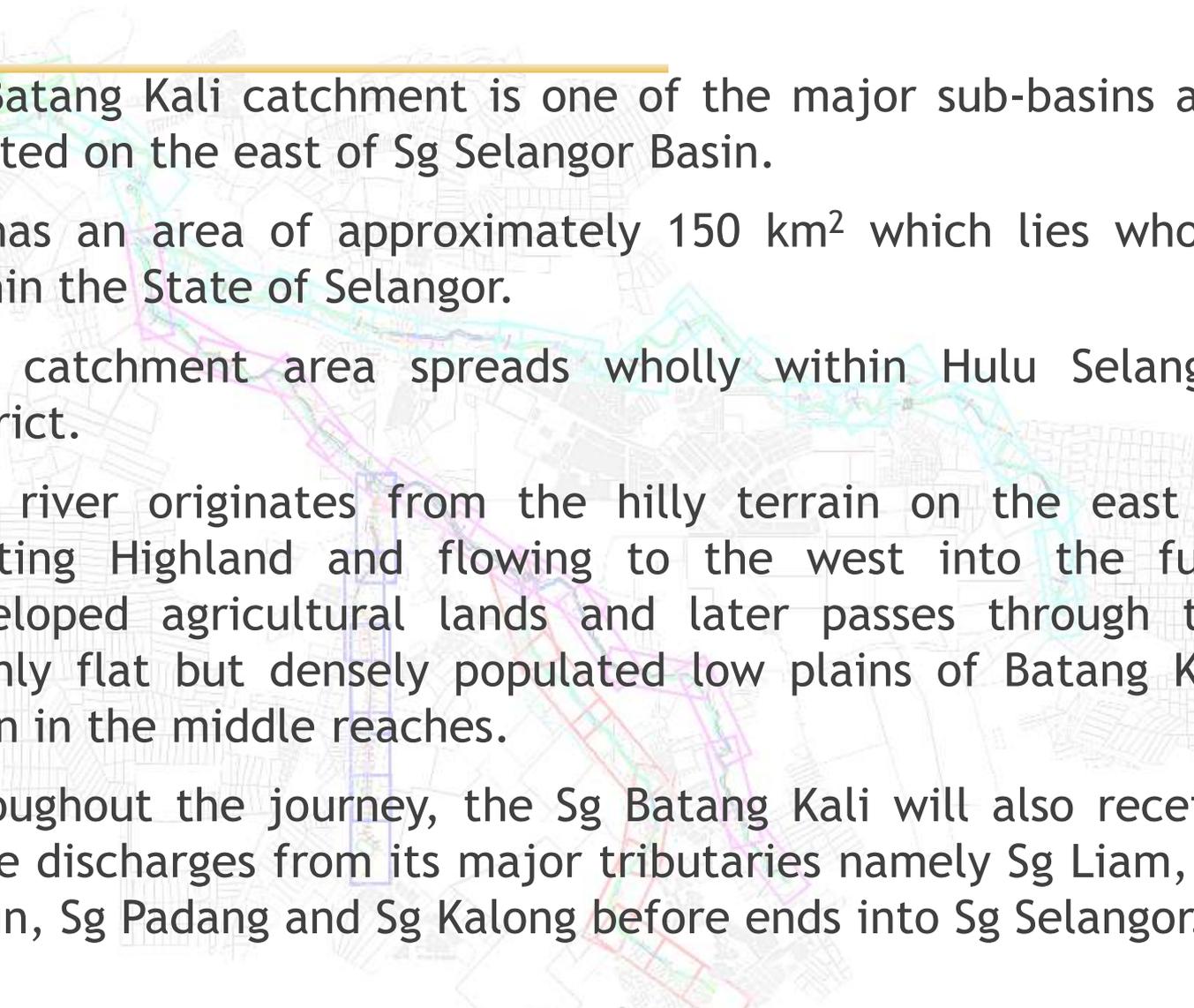
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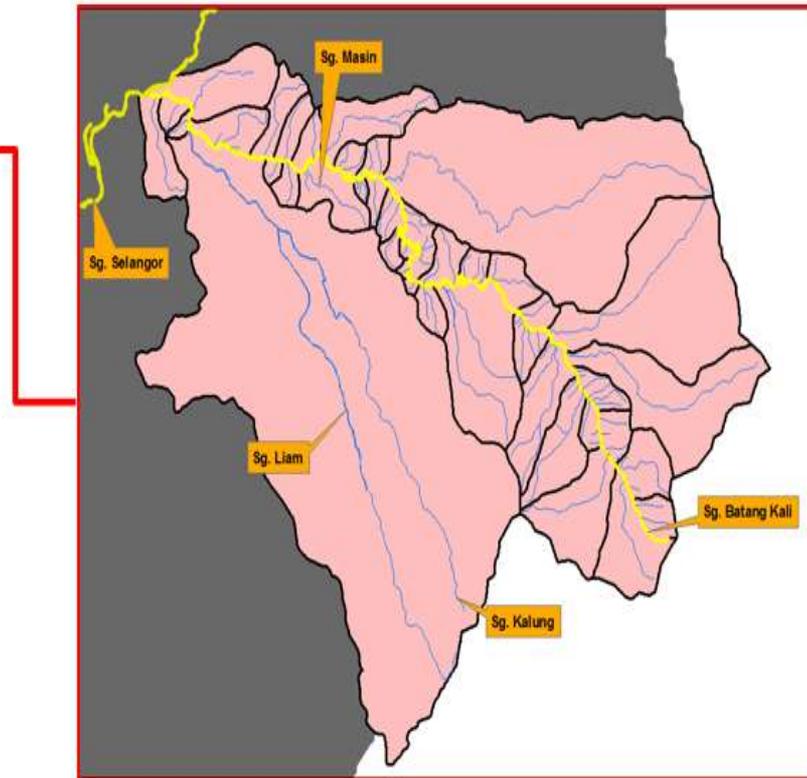
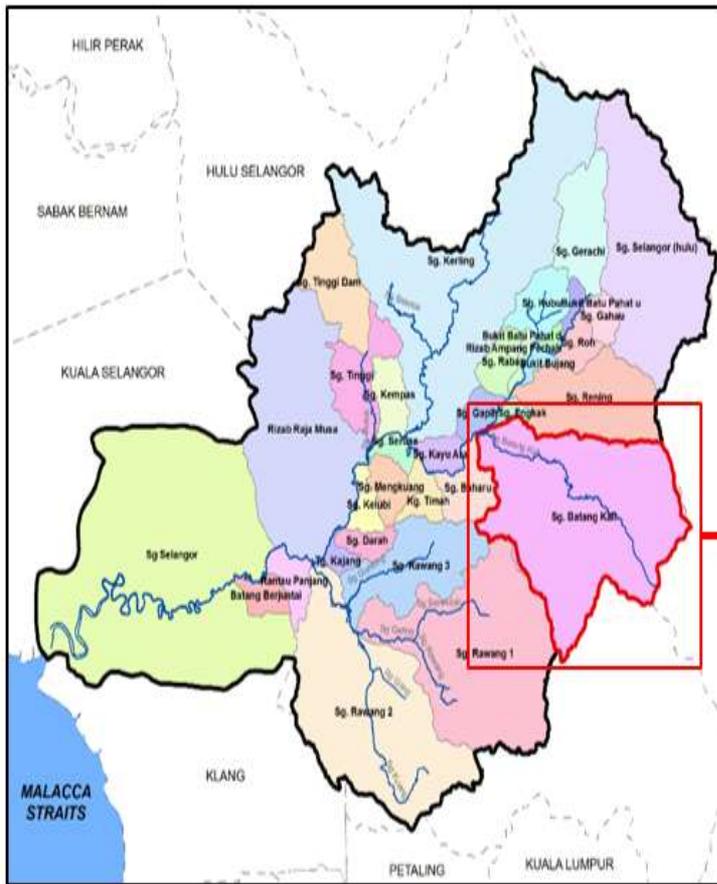
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## DESCRIPTION OF STUDY AREA

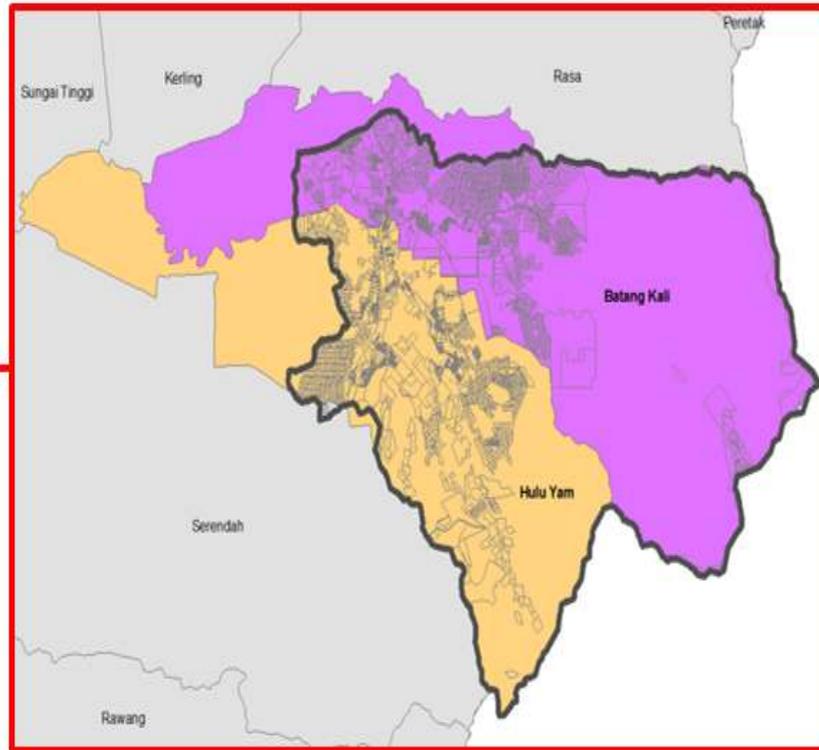
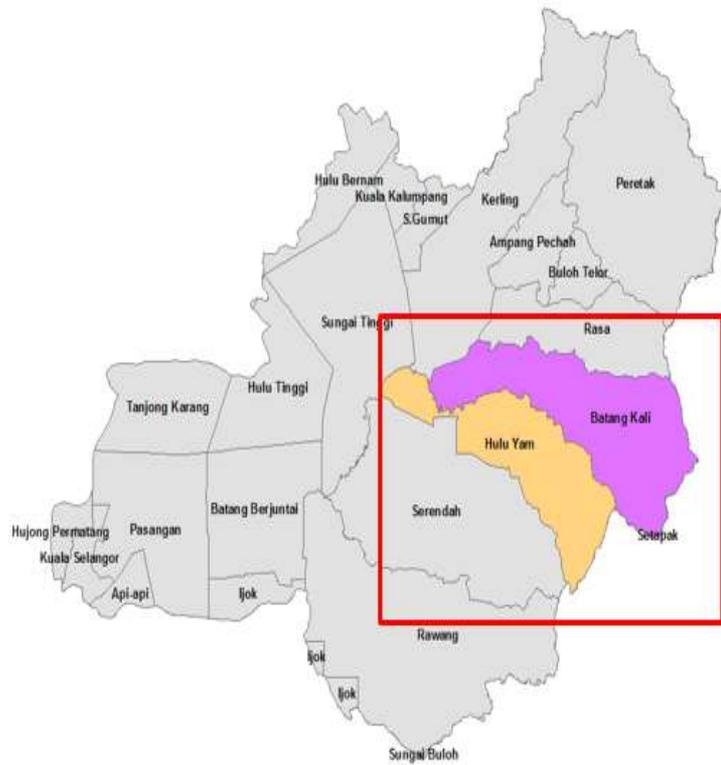
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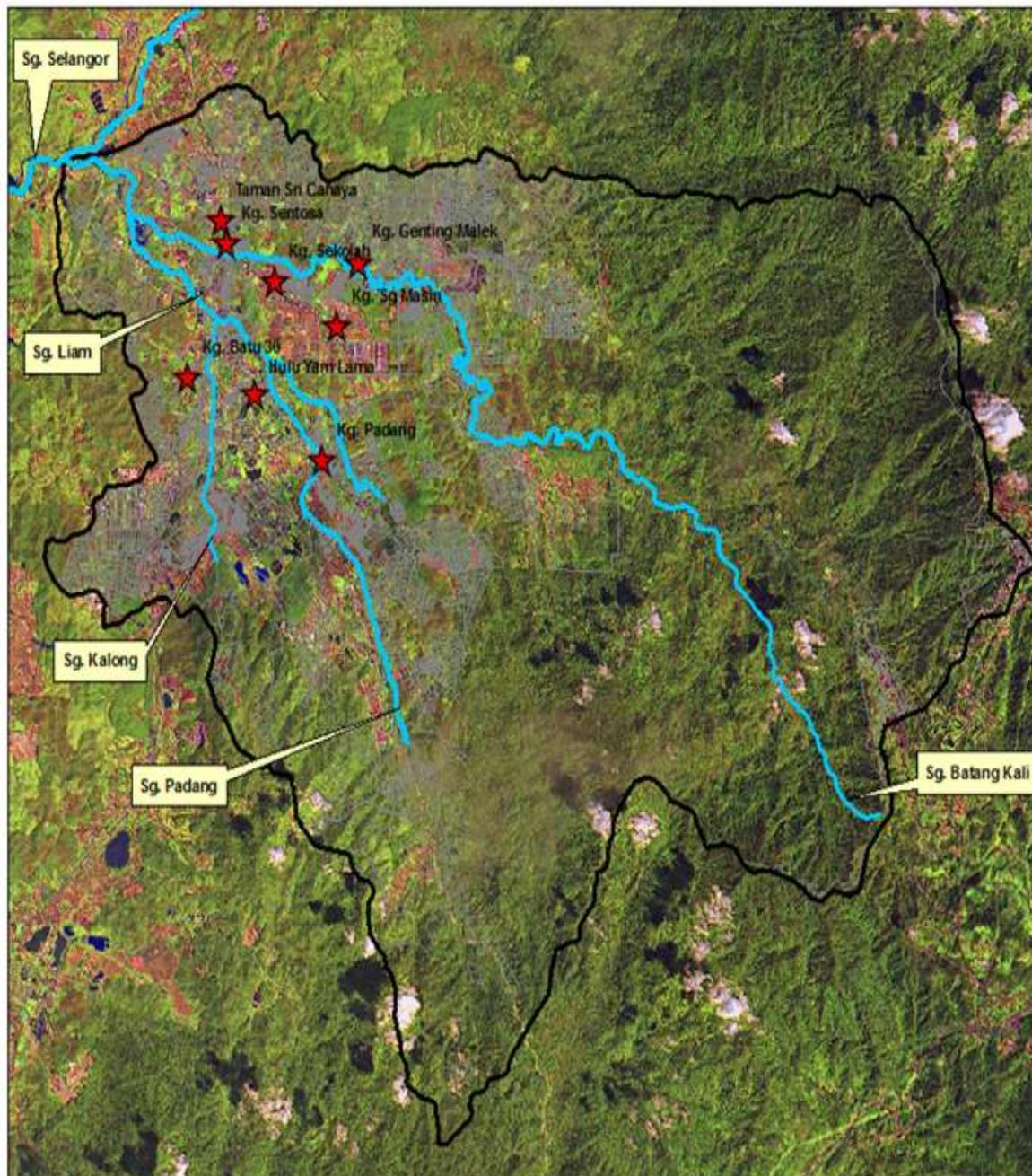
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- ▶ Sg Batang Kali catchment is one of the major sub-basins and located on the east of Sg Selangor Basin.
  - ▶ It has an area of approximately 150 km<sup>2</sup> which lies wholly within the State of Selangor.
  - ▶ The catchment area spreads wholly within Hulu Selangor District.
  - ▶ The river originates from the hilly terrain on the east at Genting Highland and flowing to the west into the fully developed agricultural lands and later passes through the mainly flat but densely populated low plains of Batang Kali Town in the middle reaches.
  - ▶ Throughout the journey, the Sg Batang Kali will also receive more discharges from its major tributaries namely Sg Liam, Sg Masin, Sg Padang and Sg Kalong before ends into Sg Selangor.



Study area of Sg Batang Kali



**Sub-district (mukim) within Sg Batang Kali sub-basin area**



**Legend**

-  Kampung
-  Rivers
-  Sg Batang Kali sub basin
-  Cadastral Lot

Client:



Jabatan Pengairan dan Saliran (JPS)  
 Jalan Sultan Salahuddin,  
 50626 Kuala Lumpur,  
 Malaysia

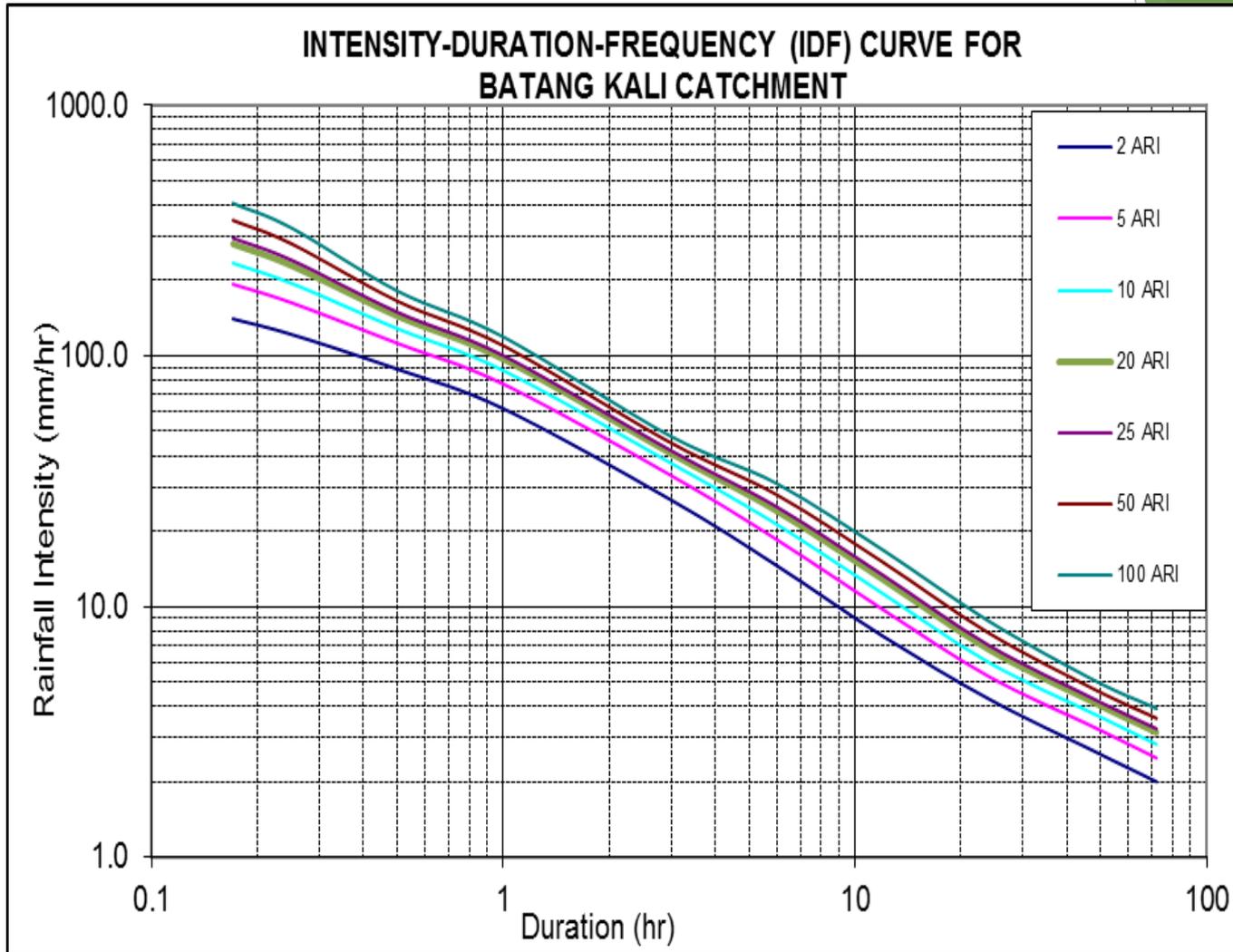
Consultant:



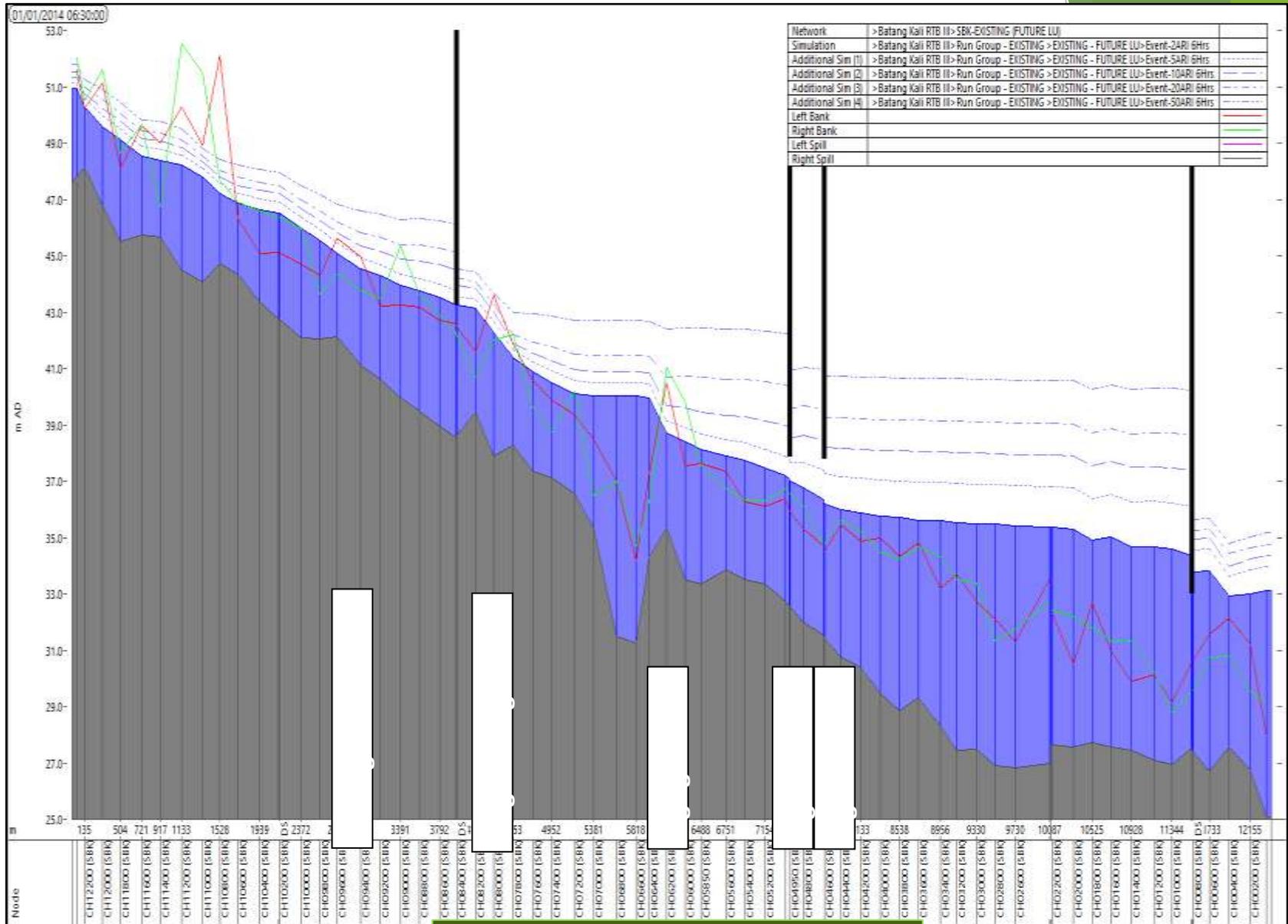
RBM Engineering Consultant  
 No 12-3  
 Jalan Sri Hartamas 8,  
 Taman Sri Hartamas,  
 50480 Kuala Lumpur  
 Tel: 1 700 815 025 Fax: 03-5887 9287

Project:  
 Flood Mitigation Master Plan Study  
 for Batang Kali Town

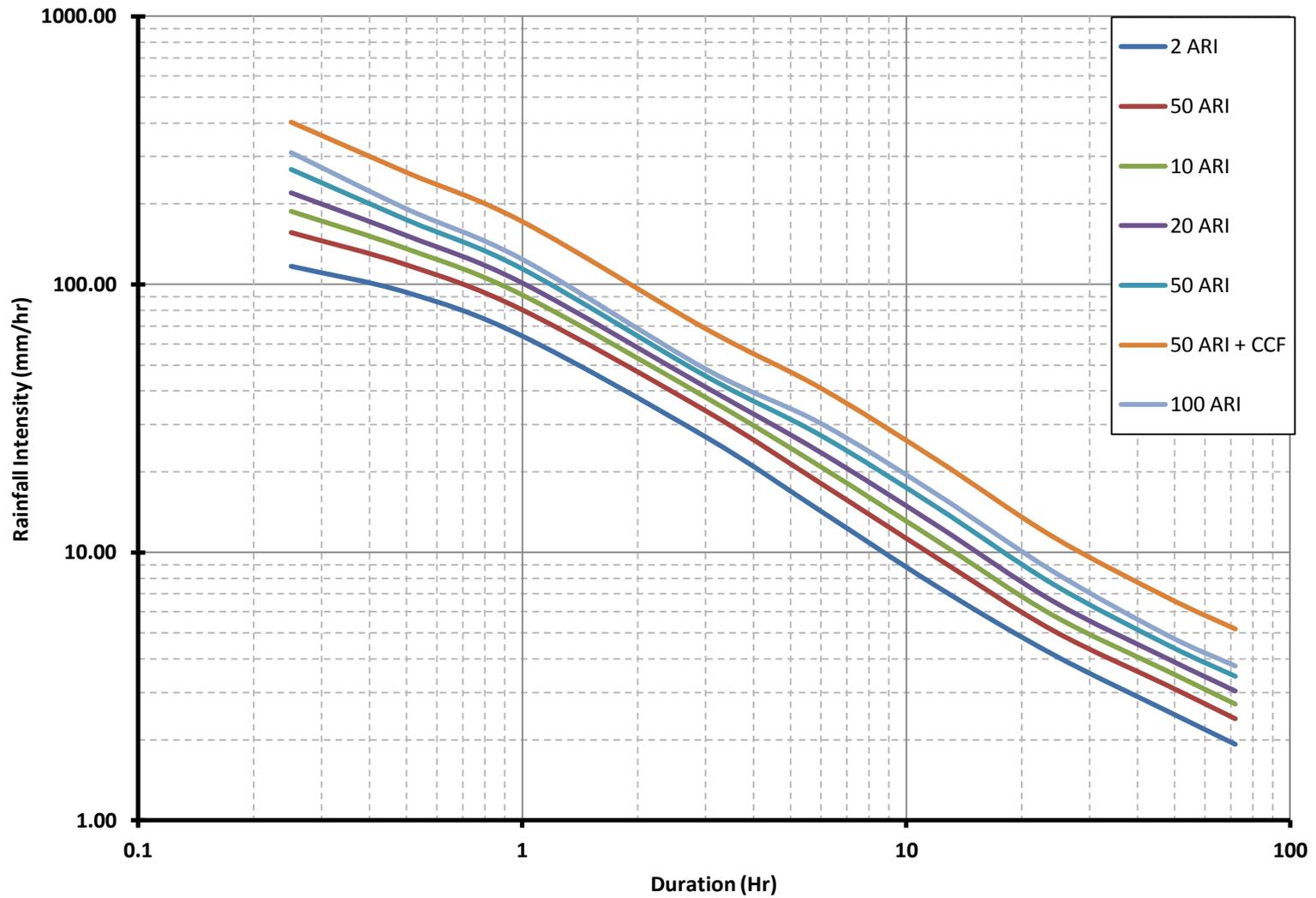
Figure 6.1: Location Effected by Frequency Flooding



**Intensity-Duration-Frequency  
Curve for Batang Kali Basin**



Maximum water level along Sg Batang Kali under various ARI (future landuse)



IDF DI LOJI AIR KKB

# FLOOD MITIGATION MASTERPLAN

## Priority Work I - River Improvement Work

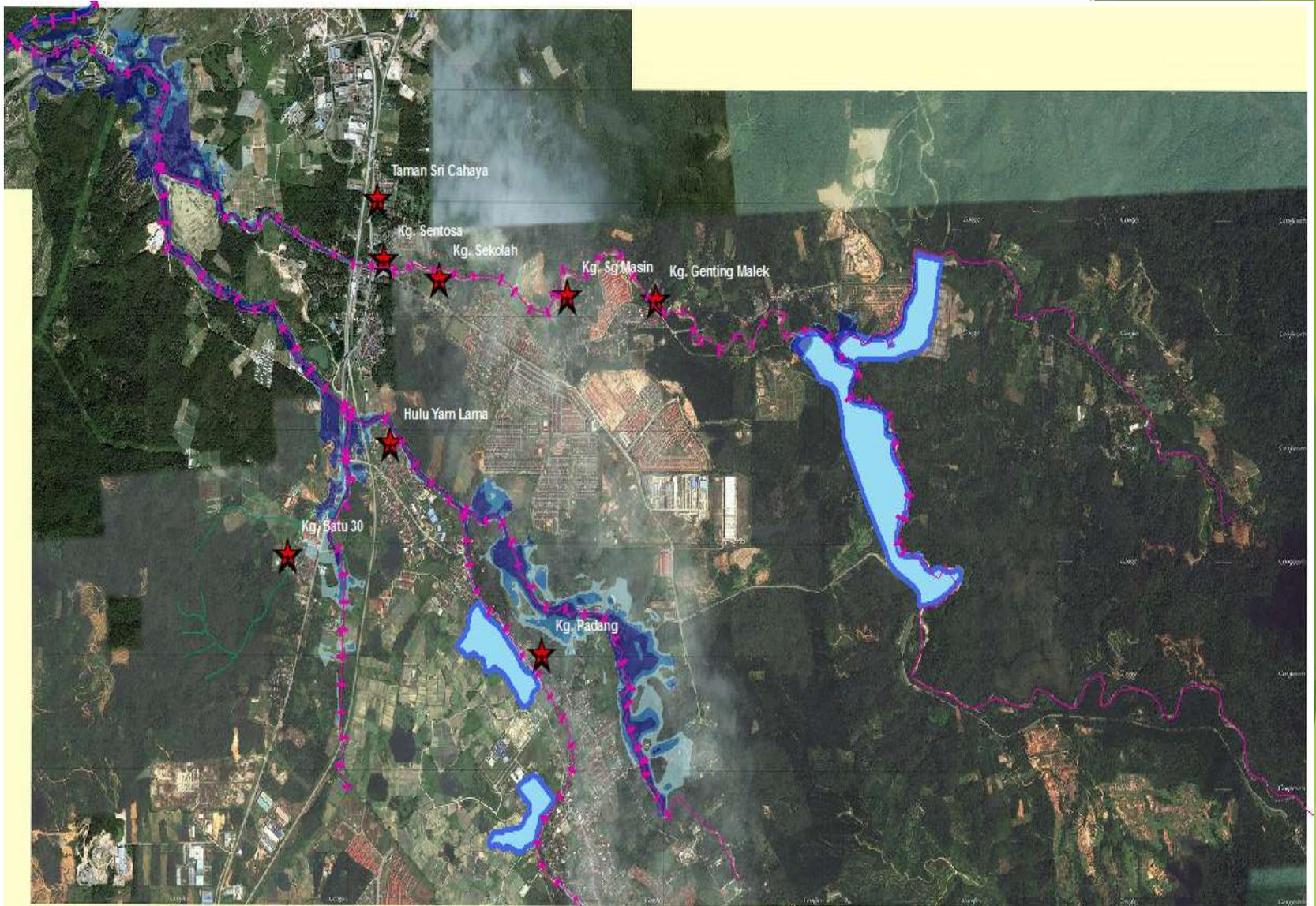
- The Priority I will promote on the quick win solution to solve flooding problem within the Sg Batang Kali sub-basin particularly at the flood prone areas
- The intended protection level at this stage is to avoid from river flooding during the 20 year ARI storm event

## Priority Work II - Bunding System at Affected Location

- This phase will complement the earlier Priority Work I in order to achieve the desired level protection of 50 ARI
- . Height of the bund varies from 0.3m to 8m and particularly 5m to 8m at Kg Sg Masin.

## Priority Work III - Mini Reservoir (Flood Storage) and Downstream River Improvement

- With the combination of implementation for both Priority Work I and Priority Work II it will provide more than 50 years ARI protection for Sg Batang Kali System.



**2D-Simulation Results for 50ARI + CCF  
- Sg Batang Kali Overall Master Plan**

# Conclusion

While efforts to reduce global warming remain important, there is no doubt that our climate is changing.

Thus we have to work together to better understand the implications of climate change and to take action on adaptation strategies, so that the community and region will continue on a path of resiliency and prosperity.