“Flood Control in Facing Climate Change- A Malaysian Experience”

马来西亚面对气候变化的防洪实践

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Let Me Introduce Myself

- Ir. Dr. Quek Keng Hong 郭景峰 (马来西亚注册专业工程师, 澳洲新南威尔士大学土本工程学博士)
- Graduated with B.E. (Civil), M.Eng.Sc and PhD degrees from the University of NSW, Sydney, Australia.
- Professional engineer registered with the Board of Engineers Malaysia
- Member the Institution of Engineers Malaysia (IEM)
- A professional consulting engineer by practice.
- More than 3 decades of experience in urban drainage design and flood studies.
- Involved in many major infrastructural projects from around the country.
- Served as the chairman of the Water Resources Technical Division of IEM for two terms from 2003.



Major Flood in 2023

- 4 Mar 2023
- State of Johor
- At least 4 deaths and 40,000 displaced





Major Flood in 2022



- In mid-July, western Europe including Germany and China (Zhengzhou) were badly hit by floods.
- 21-12-2022, 7 states were affected: Selangor, Pahang, Kelantan, Terengganu, Negeri Sembilan, Melaka, Kuala Lumpur and Perak.
- 72,000 evacuated.
- In Selangor, 24-hour rainfall is equivalent to a month's rainfall.
- Financial losses 622 Million Ringgit (US$133 Million) or 0.03% GDP



Major Flood in 2021

- 17 Dec 2021.
- Worst flood todate.
- At least 54 deaths and 400,000 people relocated.
- Financial losses 6.1 Billion Ringgit (US$1.3 Billion) or abt 0.3% GDP.
- 6 States including Selangor, Negeri Sembilan, Kelantan, Pahang, Melaka and Terengganu.





Dec 2021 Flood- Photo 1

- December 21, 2021
- Aerial view shows the flooded Taman Sri Muda in Shah Alam
- One of the worst hit areas in Selangor state, Malaysia.



Dec 2021 Flood- Photo 2

- December, 2021
- Klang Valley- where Kuala Lumpur is located.
- Roads are turned into rivers.





Dec 2021 Flood- Photo 3

- December 2021
- Aerial view shows the floods in the southern state of Johor.



Dec 2021 Flood- Photo 4

- December 18, 2021
- Kampung Nelayan, Telok Gong, near Klang- coastal area.
- One of the worst hit area.



Dec 2021 Flood- Photo 5

- An artistic representation of the flood of December 2021 on Malaysian cities.
- Showing major Malaysian cities in the background including the Petronas Twin Towers.



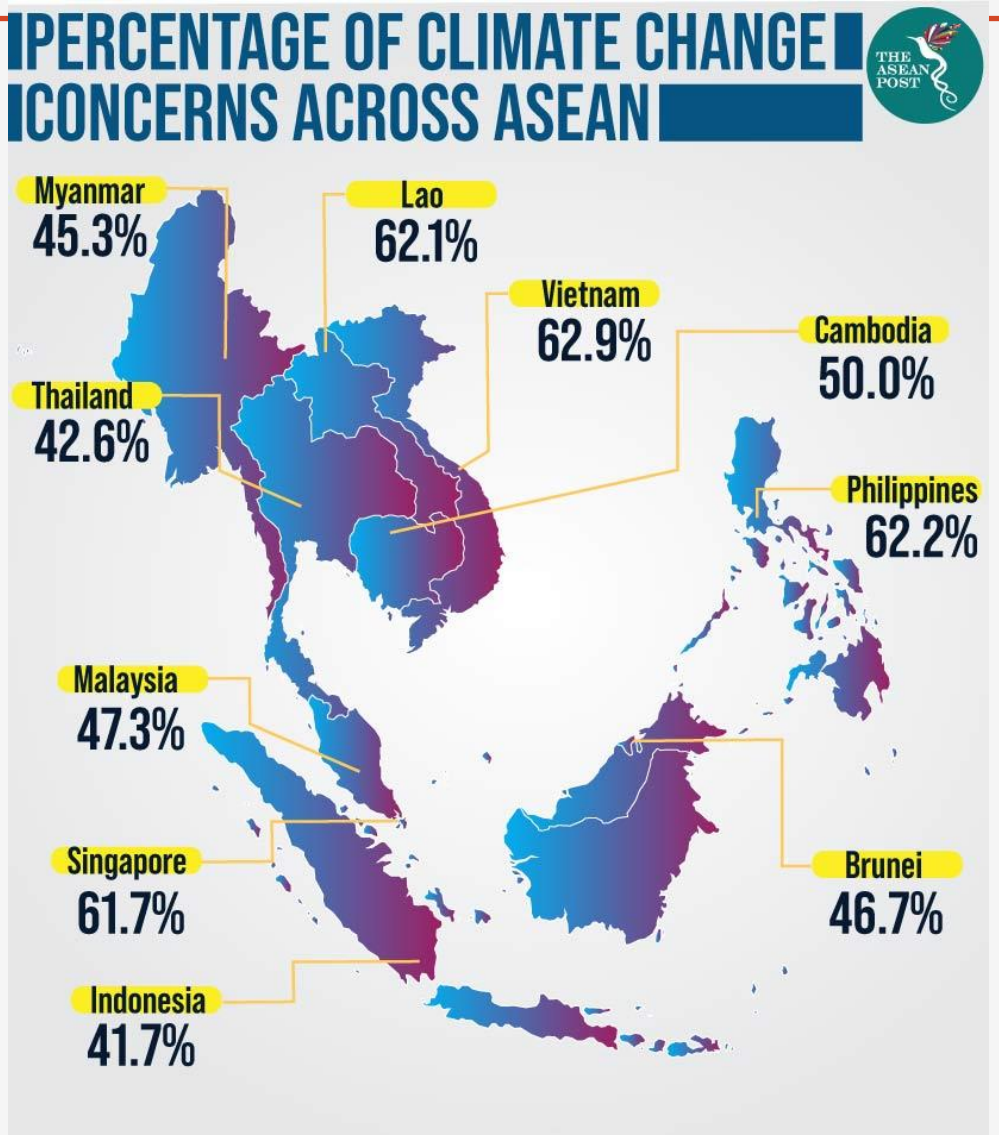
Causes of 2021 Flood

- 17 Dec 2021.
- The 24 hours rainfall was equivalent to the average rainfall for a month for Kuala Lumpur, with an Average Recurrence Interval of 100 years.
- Direct cause of the event was northeast monsoon flow factors and a low pressure weather system that reached the level of a tropical depression that formed in the South China Sea.
- The three factors led to massive rainfall to initially hit the east coast, before moving inland to other areas of Peninsular Malaysia



Impact of Climate Change on Malaysia

- Global warming due to greenhouse gas (GHG) emissions from human activity greatly affects the global climate system at an alarming rate.
- Each degree of increase in world temperatures, it will increase 7% humidity in the atmosphere and this will increase the frequency of extreme episodes of weather such as flash floods.
- The projections of extreme weather events in Southeast Asia including Malaysia will worsen in the future are alarming.



Malaysian Studies on Storms

- For Kuala Lumpur, studies have shown that the intensity of thunderstorms and extreme rainfall has increased by 30 per cent over the past 30 years, resulting in more frequent flooding.



- The Department of Irrigation and Drainage Malaysia has conducted a 40 year rainfall data study entitled: 'Study on Rainfall Change and Distribution in Malaysia' in 2018.

- A comparison of the average monthly rainfall for the period 1999-2017 and 1978-1998 showed an increase in the percentage of rainfall in January of 46.4 per cent, March (9.8 per cent), June (2.9 per cent), August (9.7 per cent), October (1.6 per cent) and December (12.3 per cent).

Main Types of Floodings in Malaysia

- Two main types of floodings are observed in Malaysia:
- Terrestrial flooding in terms of the increase in the number and intensity and frequency in inland areas
- Coastal flooding caused by rising sea levels that cause backflow in rivers in coastal areas.



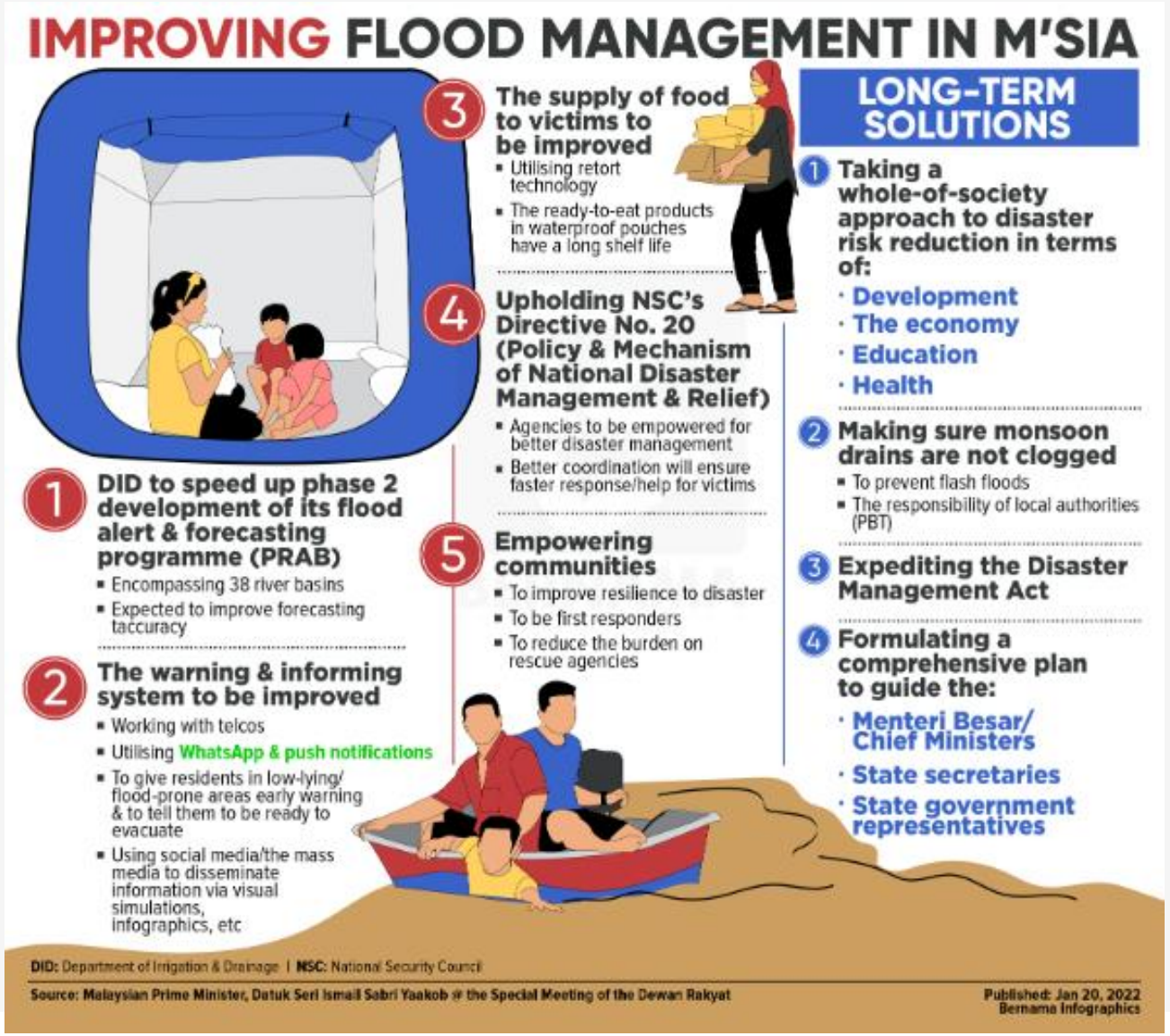
Factors Accentuate the Effect of Climate Change

- Urbanization- increased runoff due to decrease infiltration.
- Deforestation- reduced infiltration
- Inadequate drainage systems- constriction to flow
- Maintenance-related issues- rubbish causing obstruction
- High tide level causes backflow



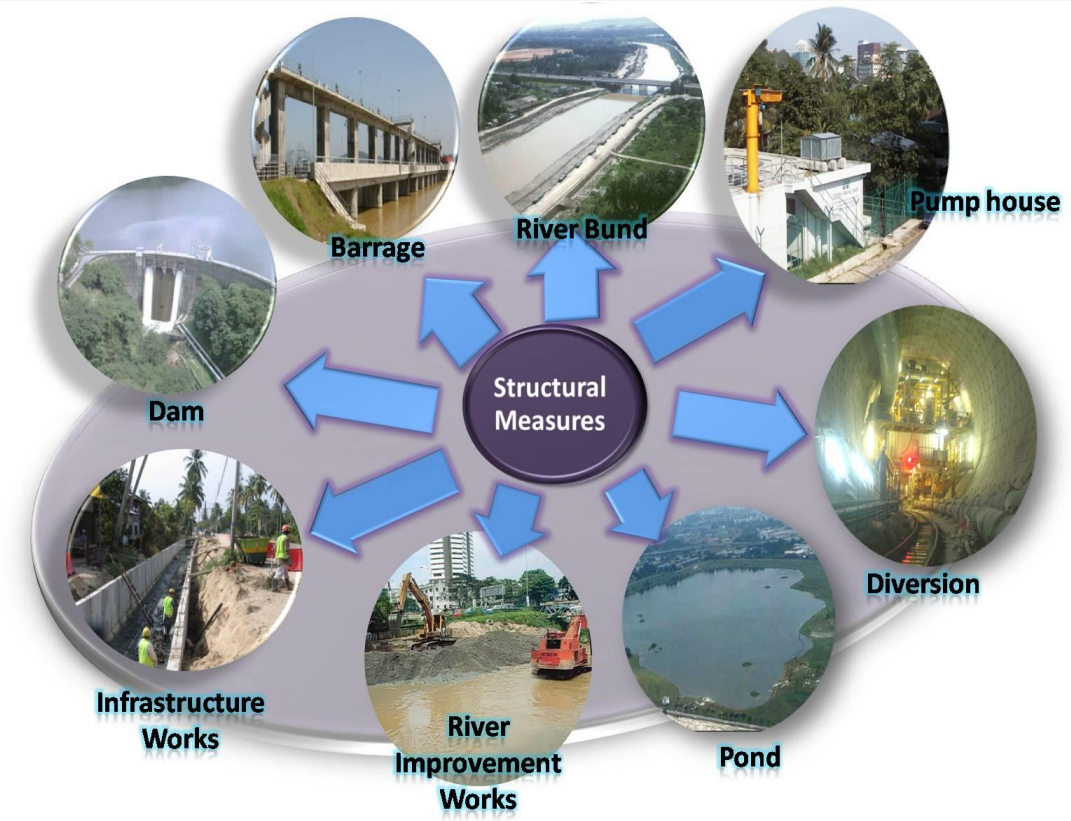
Total Solution in Flood Mitigation

- Malaysia adopted a dual approach in flood mitigation:
- Structural measures (curative approach), and
- Non-structural measures (preventive approach).



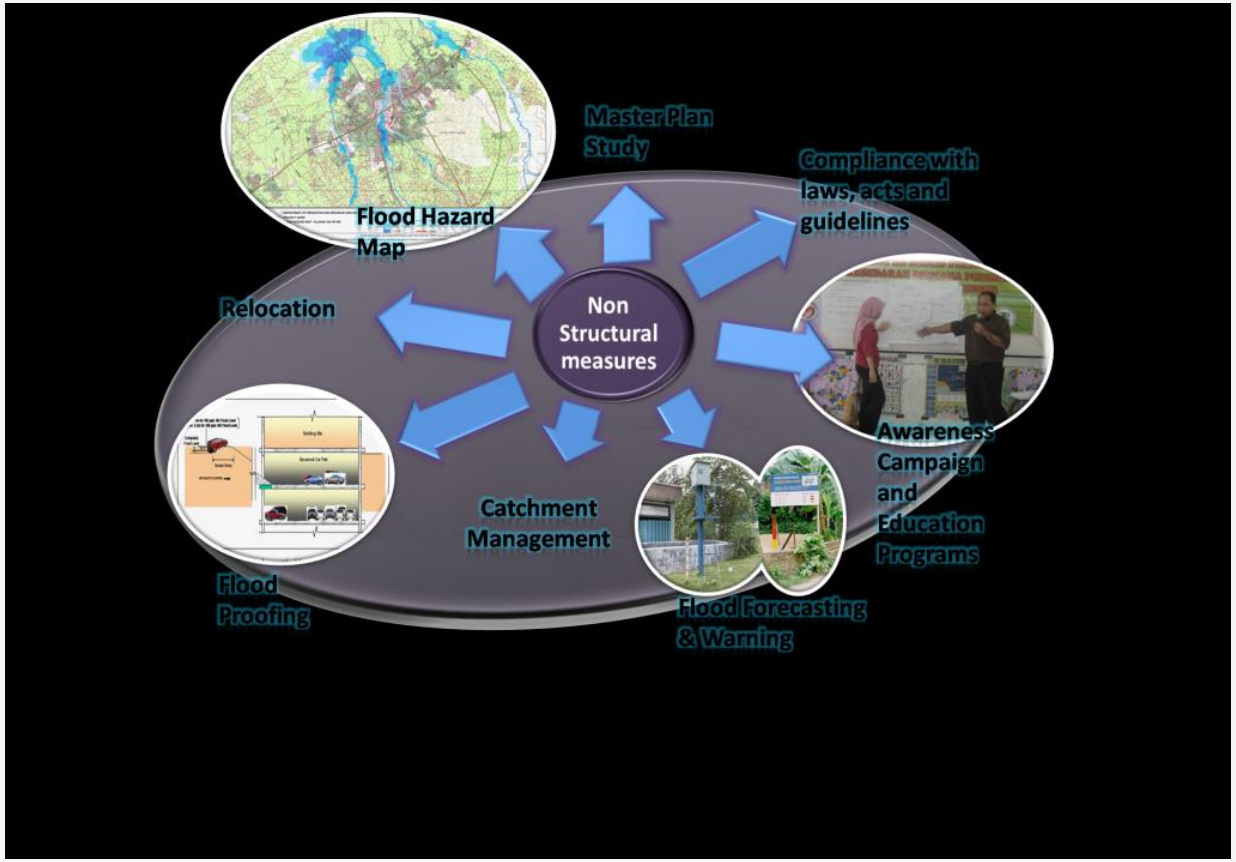
Structural Flood Mitigation

- Mitigate the effect of floodings via structural measures.
- These include dams, barrages, river buns, river improvement works, detention ponds, diversion and etc.
- Increase the design average recurrence interval level of flood protection structures by including the climate change factors.



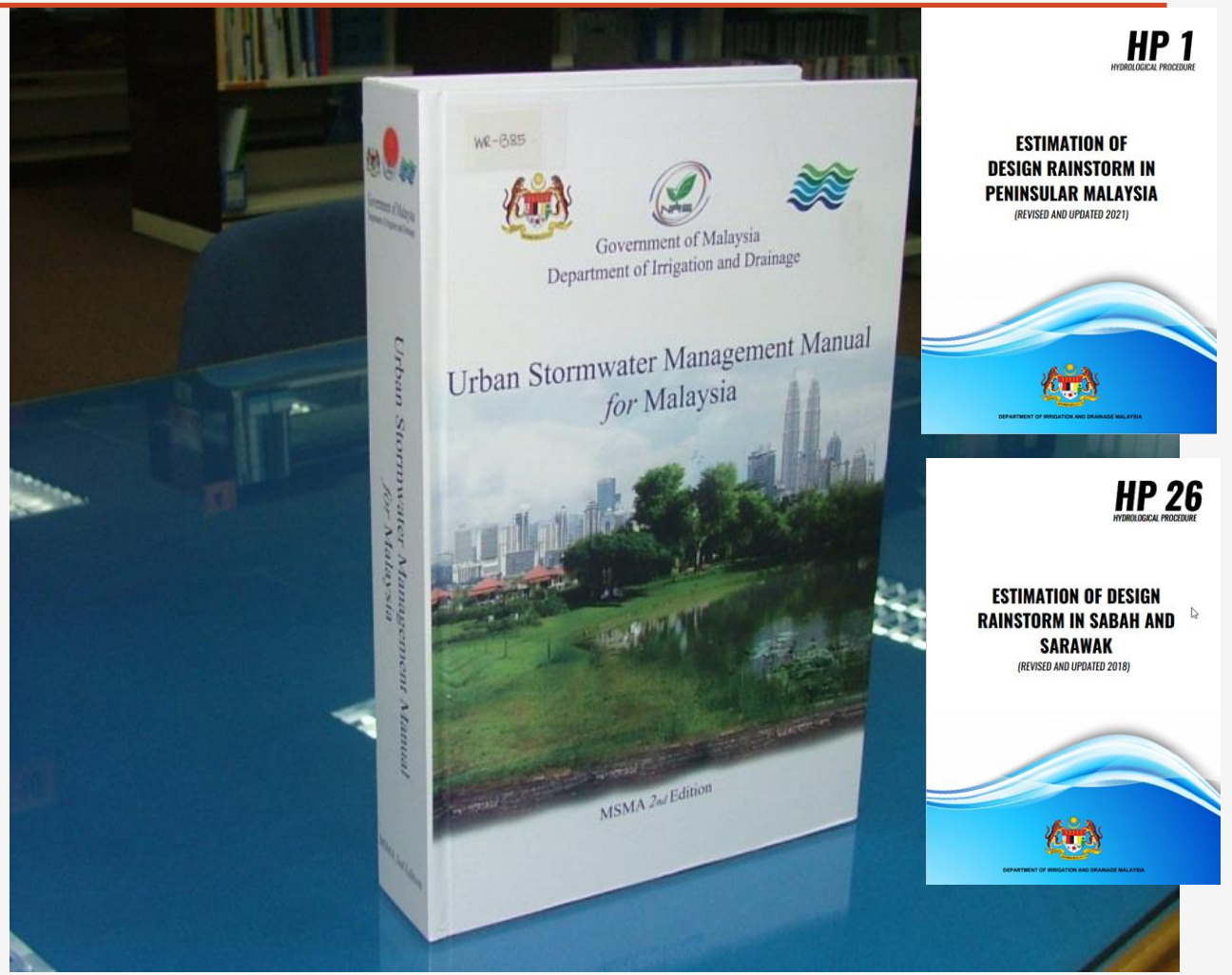
Non-Structural Flood Mitigation

- Nonstructural measures reduce damage by removing people and property out of risk areas.
- These include: flood hazard map, relocation, masterplan study, compliance with laws, acts and guidelines, awareness and education campaigns, flood forecasting and warning, catchment management and flood proofing.



Compliance with Drainage Guidelines

- Ensure compliance with drainage guidelines.
- The Urban Stormwater Management Manual for Malaysia (MSMA) – Published 2012
- HP1 (Estimation of design storm for West Malaysia) - Published 2021
- HP26 (Estimation of design storm for East Malaysia) – Published 2018



Increased Funding for Flood Mitigation

- In Budget 2023, the Malaysian Government has announced increased funding for flood mitigation works.
- Allocated RM15 bil (US$3.3 bil) flood mitigation works until 2030.
- This is a long-term strategy to adapt to climate change facing the country.



Case Study- Flood Mitigation Project

- One of the current flood mitigation projects out of 30 projects in the State of Pahang.
- District of Maran.
- Involving 3 rivers:
- Sg Jempul and Sg Yeh (52 km).
- Sg Luit and Sg Kertam (37.5 km).
- Sg Maran (2.4 km).

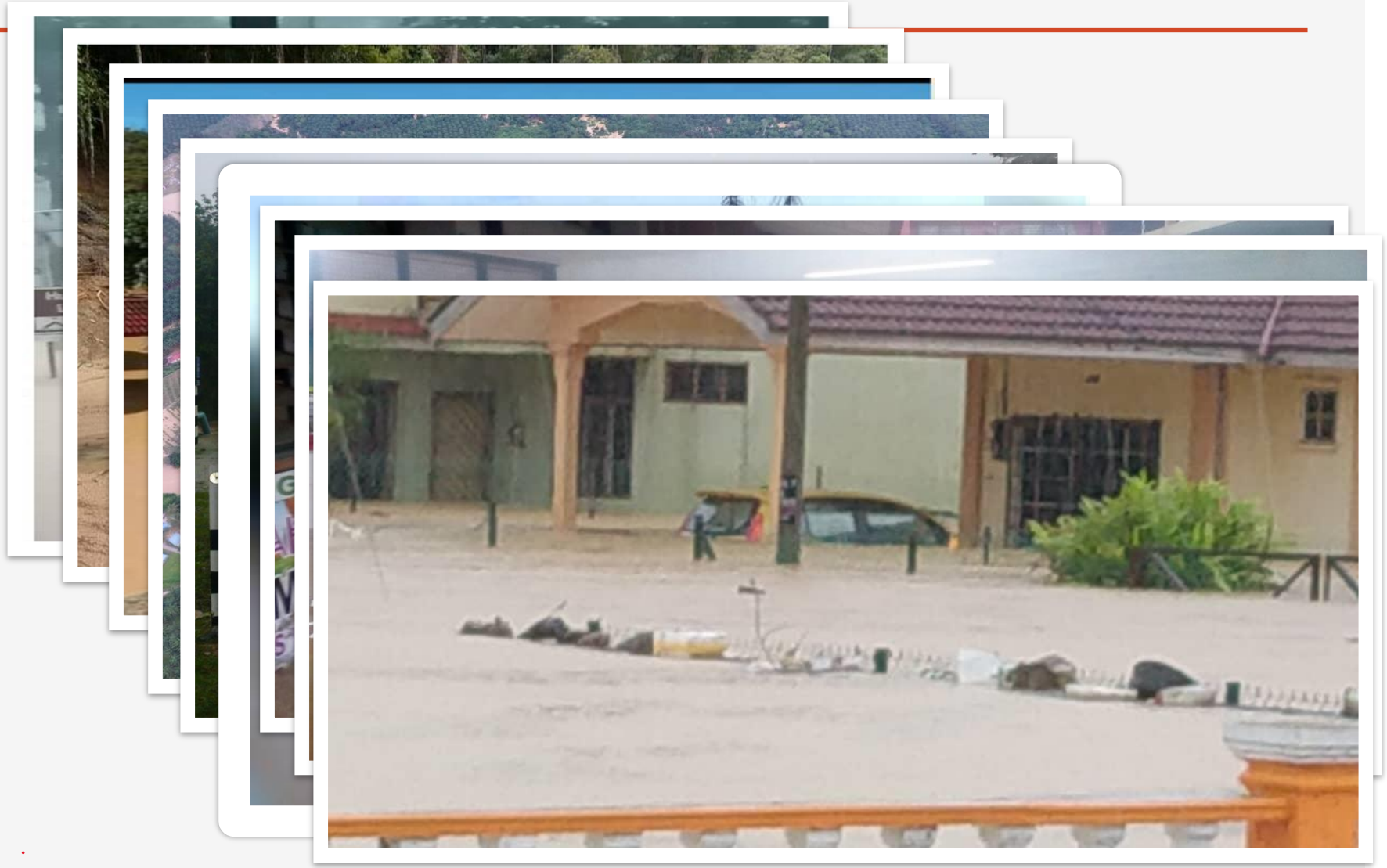






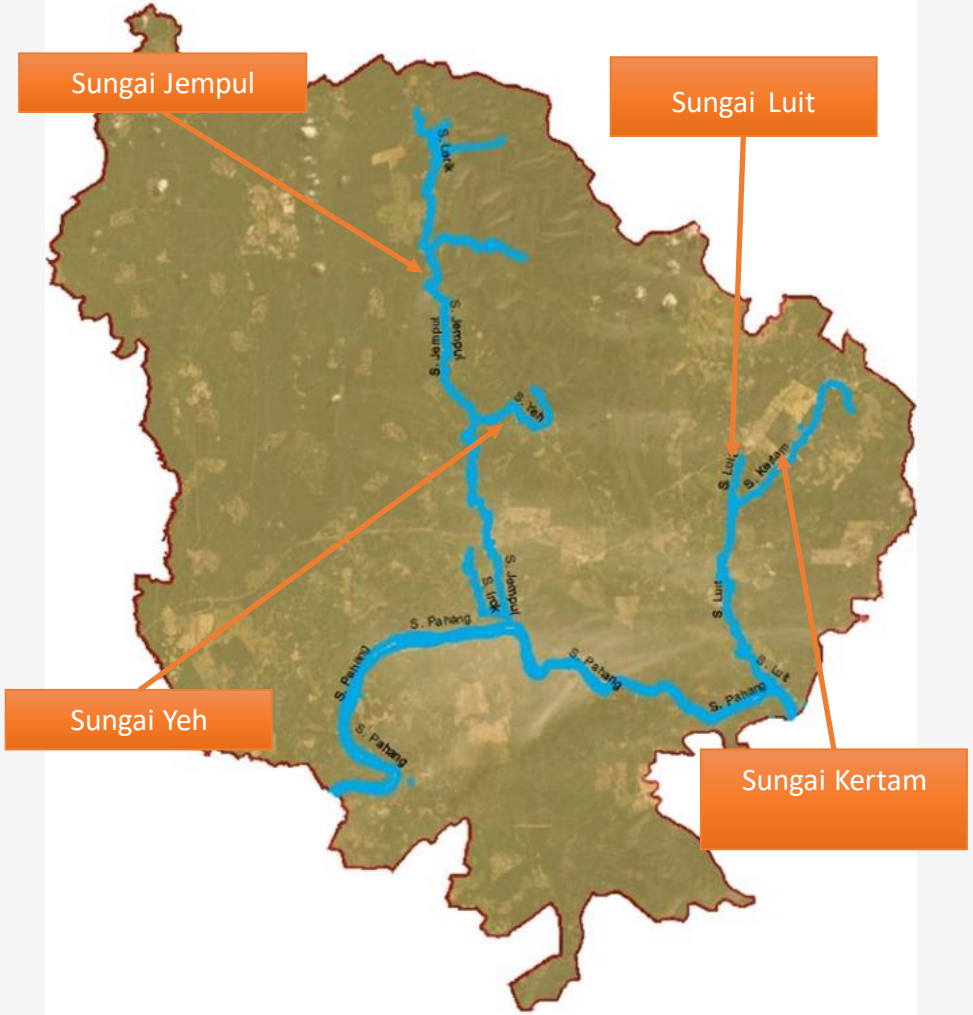
Case Study- Record of Past Floods

- Frequent floodings
- Extensive damage to properties
- Affected thousands of residents



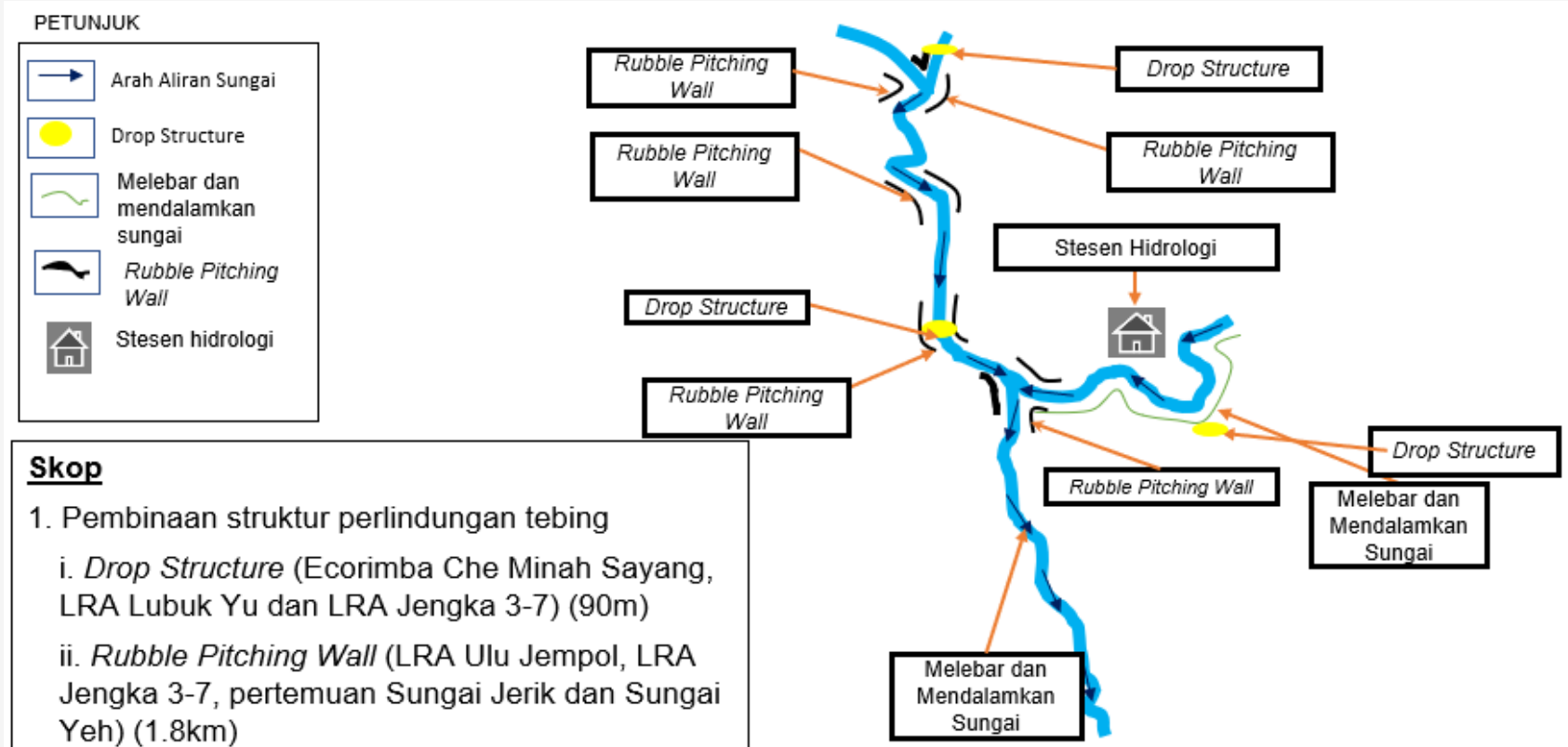
Case Study- Scope of Flood Mitigation Works

- Scope of Proposed Flood Mitigation Works
- Sg Jempul and Sg Yeh (52 km).
- Sg Luit and Sg Kertam (37.5 km).
- Sg Maran (2.4 km)



Case Study- Flood Mitigation Works I

- Details of Flood Mitigation Works I
- Sg Jempul and Sg Yeh (52 km).
- Widening and deepening, Drop structures & rubble pitching walls.



Skop

1. Pembinaan struktur perlindungan tebing
   i. *Drop Structure* (Ecorimba Che Minah Sayang, LRA Lubuk Yu dan LRA Jengka 3-7) (90m)
   ii. *Rubble Pitching Wall* (LRA Ulu Jempol, LRA Jengka 3-7, pertemuan Sungai Jerik dan Sungai Yeh) (1.8km)
2. Program mendalam dan melebar sungai
   i. Sungai Jempul = 37.5 km
   ii. Sungai Yeh = 14.5 km
3. Stesen Hidrologi (1 Unit)

Rajah 5 : Schematic Diagram cadangan Lokasi Dan Komponen Projek RTB Di Sungai Jempul & Sungai Yeh

Case Study- Flood Mitigation Works II

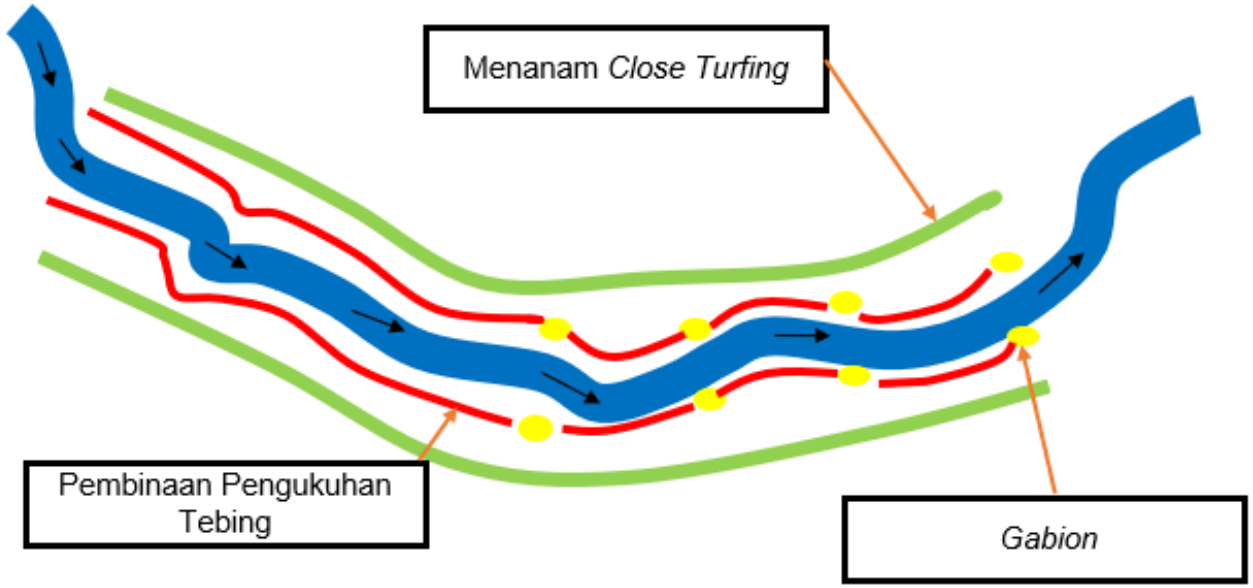
- Details of Flood Mitigation Works II
- Sg Luit and Sg Kertam (37.5 km).
- Widening and deepening, Drop structures, gates & detention pond (32 ha).



Rajah 6 : Schematic Diagram cadangan Lokasi Dan Komponen Projek RTB Di Sungai Luit & Sungai Kertam

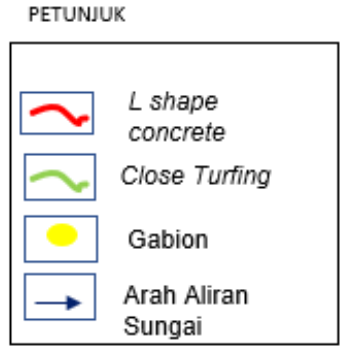
Case Study- Flood Mitigation Works III

- Details of Flood Mitigation Works III
- Sg Maran (2.4 km).
- River protection works including bunds



Skop

1. Pembinaan pengukuhan tebing sepanjang (2.4km)
2. Menanam *Close Turfing* sepanjang (2,4km)
3. Pembinaan *Gabion* sepanjang (0.04km)



Rajah 7 : *Schematic Diagram* cadangan Lokasi Dan Komponen Projek RTB Di Sungai Maran

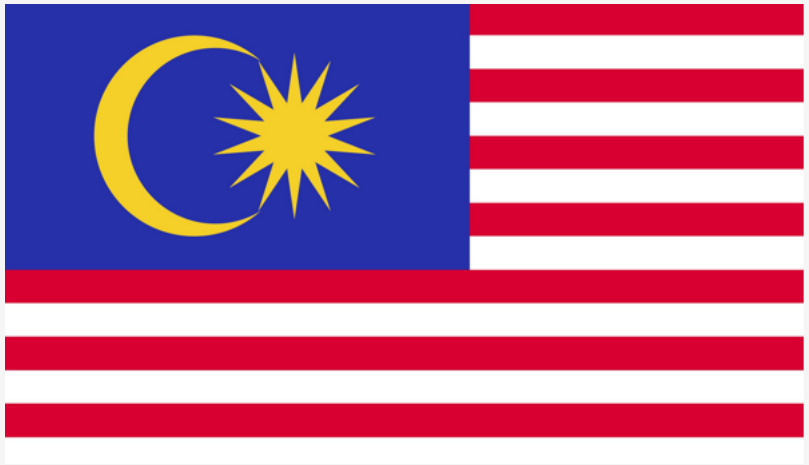
Flood Control Crucial for Malaysia's Growth

- Malaysia Prime Minister Anwar Ibrahim visited China twice- in March & September 2023.
- The visit brought >RM170 bil (US$38 bil) in investment.
- Foreign investment is critical to Malaysia's future growth.
- Maintaing a good infrastructure is crucial.



That’s the End of My Presentation…







Terima Kasih!

Thank You Very Much!

谢谢！

Questions about the Presentation?

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