

ROADMAP TOWARD EFFECTIVE FLOOD HAZARD MAPPING IN MALAYSIA

JICA region focused training course on flood hazard mapping

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A. THE ROLE OF FLOOD HAZARD MAPS TO MITIGATE FLOOD DAMAGES MALAYSIA

Flood Status In Malaysia

1. Flood is the most significant natural disaster in Malaysia in terms of frequency, area extent, population affected bad damage. It has been estimated that 9% of land area (29, 800 km²) in the country is prone to flooding, 22 % of the population (4.82 million) is affected by floods and the average annual flood damage is about RM 1 billion.
2. Heavy rainfall during North East Monsoon affecting the east coast of Peninsular Malaysia (widespread flood). Intense rainstorms during inter monsoon periods of April-May and August-October causing flash floods in major towns such as Kuala Lumpur and Johor Bharu.
3. Climate and Topography in Malaysia
 - Annual average rainfall
Peninsular Malaysia : 2500 mm
Sabah : 3000 mm
Sarawak : 3500 mm
 - Extreme events
600 mm in 24 hours
100 – 200 mm in 2 hours
 - Topography
 - i. Hilly upper reaches
 - ii. Normal sloping middle reaches (1 in 2,000)
 - iii. Gentle sloping lower reaches (less than 1 in 5,000)
 - iv. Mostly subject to tidal influence downstream
 - v. Shallow river bed in flood plain due to sedimentation
 - vi. High tidal influence can cause flooding in coastal areas
4. Types of Flooding and Causes of Flooding In Malaysia

- i. Extensive basin flood
(Riverbank overflow)
- ii. Inundation basin flood
(Backwater effect from tidal influence affecting lower reaches)
- iii. Inland flood
(Poor drainage from inland flood prone area)
- iv. Urban flash flood
(Inadequate drainage and storage systems to cater for rapid urbanization)

Table 1 – Flood Trends In Malaysia

Item	Year	1982	2002
Flooded Area (km²)		29, 021	29, 799
People Affected (million)		2.7	4.82
Flood Damage		RM 326 million (1992)	RM 915 million

Present Countermeasures For Mitigating Flood Damages In Malaysia

Structural (curative) as well as non-structural (preventive) measures have been proposed to alleviate the flooding problem.

Structural Measures

The main structural measures carried out by DID are:

i) Flood Control Dams

Some examples of dams specially constructed for flood mitigation are Batu Dam and Semberong Dam while irrigation dams include Pedu Dam and Beris Dam. Hydroelectric dams built by Tenaga Nasional Berhad among others are Kenyir Dam and Bersia Dam. The Klang Gates Dam is an example of a dam built for water supply but also serves as a flood mitigation dam.

ii) River Improvement Works

River improvement works, which are carried out, are realignment and canalisation of river channels, including widening and deepening to improve original undersized channels.

iii) Storage Ponds of Flood Attenuation

Disused mining pools can be used as detention or retention ponds to regulate floodwaters so that the flood peaks are attenuated. The Batu/Jinjang Pond Project in Kuala Lumpur diverts excess floodwater from Sg. Gombak into Batu Pond for temporary storage and from Sg. Keroh to Jinjang Pond. Water in the pond will be released slowly back to the river after the flood flow has subsided.

iv) Flood Diversion Channel or Tunnel

Certain river stretches especially in major city centres, due to intensive development along both riverbanks, can no longer be widened or deepened to accommodate the increasing flood discharges through the city. Under such circumstances, excess floodwater has to be retained upstream in storage ponds or diverted downstream through a flood diversion channel or tunnel. The Stormwater Management and Road Tunnel (SMART) Project implemented in Kuala Lumpur when completed will alleviate flooding in the city centre by diverting away large volumes of floodwater.

Non-structural Measures

Non-structural measures are employed more for preventing floods from occurring and with the aim of minimising losses due to flooding. Some of these measures are:

i) Integrated River Basin Management (IRBM)

Under the concept of Integrated River Basin Management, the whole river basin is planned in an integrated manner and all factors are taken into consideration when a certain development plan is proposed. Factors like zoning for river corridors, riparian areas, natural flood plain, conservation of wetlands, storage ponds etc will be taken into consideration when preparing flood management plans.

ii) Preparation of Guidelines and Design Standards

The DID has published more than 20 Hydrological Procedures as well as the Urban Drainage Planning and Design Procedure No. 1 which specified clear requirements, both physical as well as technical, for rivers and their reserves, as well as flood mitigation and urban drainage projects to be used as reference materials and guidelines.

In the year 2000, DID introduced the Urban Stormwater Management Manual (MASMA) which obtained Cabinet approval for implementation commencing 1 January 2001 and is to be complied with by all local authorities and the public and private sectors. The Manual provides control-at-source measures and recommendations on flood fighting by utilising detention/retention, infiltration and purification processes.

iii) Flood Forecasting and Warning System

Telemetric forecasting systems have been installed in the major river basins namely Kelantan, Pahang, Perak, Sadong, Kinabatangan, Klang, Terengganu, Besut, Dungun, and Johor whilst VHF flood forecasting systems have been established in smaller basins. In river basins prone to flash floods, flood warning sirens have been installed at strategic locations along certain urban rivers. These sirens will be automatically triggered once the flood level reaches a critical point to alert the local residents of impending floods. The Department also provides a web-based information system on flood warning and flood information through <http://infobanjir.water.gov.my>

Flood response will be functional after the flood event occurs especially during the monsoon season. It's included with the five main activities as below:

- i. 'Pre' flood, 'During' flood and 'Post' flood
- ii. Flood forecasting and warning system
- iii. Flood disaster management, flood fighting, evacuation
- iv. Flood operation and relief centres at District, State and Federal levels
- v. Flood damage assessment

Flood Hazard Map In Malaysia

As a non-structural measures, Flood Hazard Map is very useful to be implemented in Malaysia. With regards of the FHM objectives, to prevent loss of people's lives and helps smooth refugee from home to evacuation shelter as well as to notifying the residents of potential flood damage and enhancing their awareness of the importance of flood disaster preparedness could be achieved.

B. THE ALLOCATION OF ROLES IN MAKING FLOOD HAZARD MAPS IN MALAYSIA

No.	Organizations	Roles
1.	National Disasters and Relief Committee	Planning, coordinating and supervising relief operations during flood. Support the flood disaster preparedness activities among the committee members.
2.	Ministry of Finance	Prepare Malaysia's budgets for five yearly developments.
3.	Ministry of Natural Resources and Environment	<ul style="list-style-type: none"> - Support and provide development allocation for flood mitigation projects at the federal level. - Dissemination of Flood Hazard Map
4.	State Government	<ul style="list-style-type: none"> - Support and provide development allocation for flood mitigation projects at the state level. - Dissemination of Flood Hazard Map - Provide information on evacuation routes in their region.
5.	Department of Irrigation and Drainage	<ul style="list-style-type: none"> - Providing flood forecasting and warning service to the public. - Main organizations for planning, prepare and disseminate Flood Hazard Map.
6.	Department of Survey and Mapping	Providing the digital topographic map, DEM of the drainage basin.
7.	Meteorological Services of Malaysia, State Department of Information	Providing weather forecast information due to flood forecasting and warning activities.
8.	Malaysian Center For Remote Sensing (MACRES)	Providing the satellite images due to flood forecasting and warning activities.
9.	Department of Public Defence, State Fire and Rescue Department, Army and Police	Rescue works
10.	Department of Welfare	Providing the evacuation shelter information.

C. THE 'ACTION PLAN' OF MAKING FLOOD HAZARD MAPS IN MY COUNTRY

Target area : Kampung Baru, Kuala Lumpur

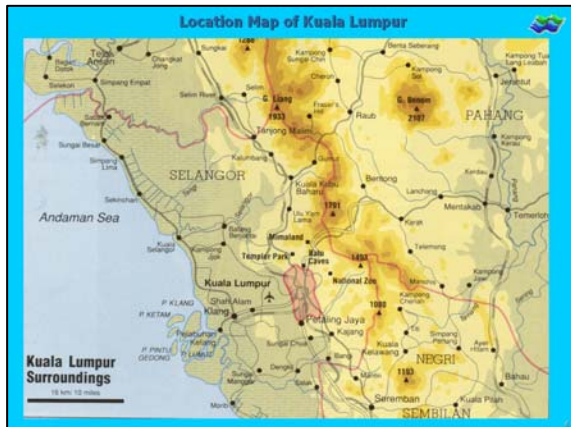


Figure 1 – The Location of Kuala Lumpur

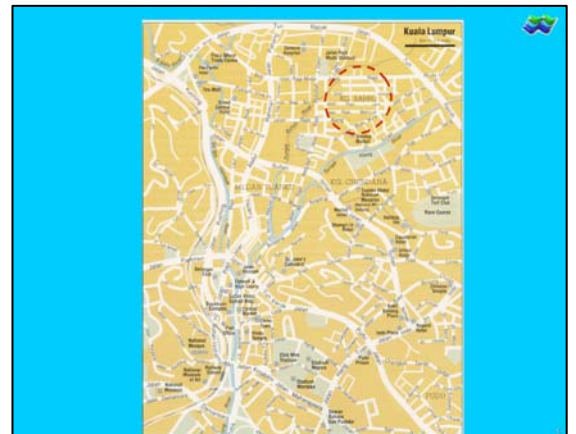


Figure 2 - The Location of Kampung Baru, Kuala Lumpur

Kampung Baru is only a village located on the floodplain of the Klang River, centre the town of Kuala Lumpur. It has total slightly more than thousand peoples and mostly working around the Kuala Lumpur and Selangor. The selection of Kg Baru as a pilot project is because it is crucial area within the Kuala Lumpur perimeter and has a significant impact to the local people. The location of Kg. Baru shown in Figure 2. Because of rapid development, flash flood always occurred and most of the resident do not have enough time to response and take a correct action. With the flood hazard maps, hopefully it will help the local resident to take a right direction and safer route to the evacuation shelter as well as to prevent losses of life and damages.

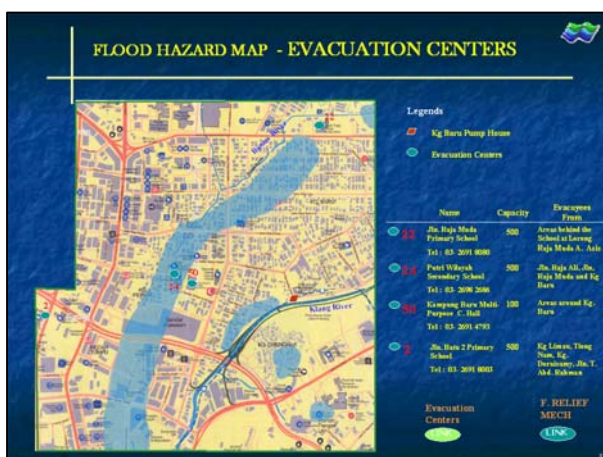


Figure 3 - The Location of Evacuation Shelter in Kampung Baru, Kuala Lumpur

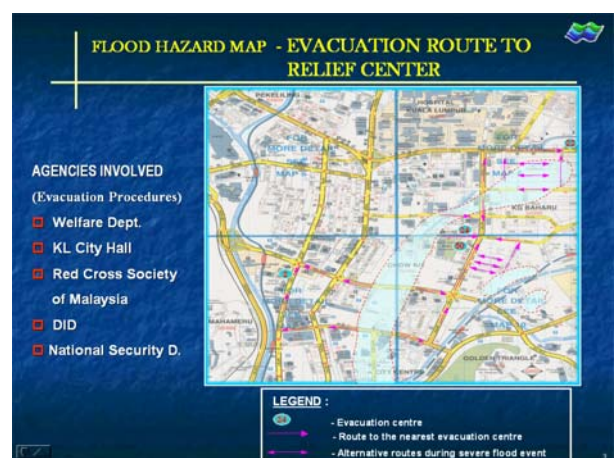
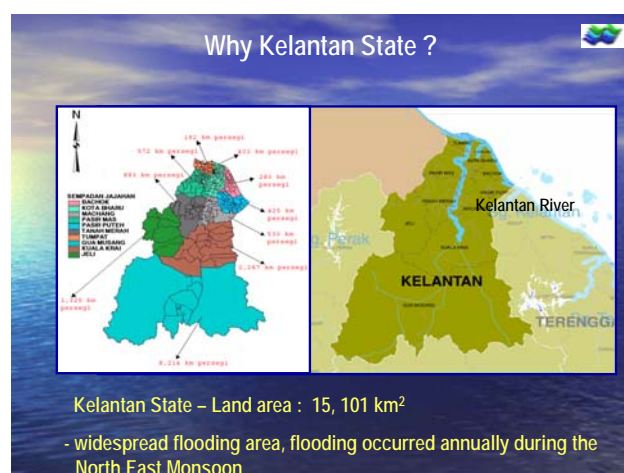


Figure 4 – Suggested evacuation route to evacuation shelter in Kampung Baru, Kuala Lumpur

Target Area 2 : Kelantan State



Flood impact to the Kelantan State (1983 – 2004)

Year	Total of Evacueess	Total of Death People	Total amount of damages (in Ringgit Malaysia)	Total amount of damages (in USD)
2004	10,476	12	14,317,800.00	3,767,842
2003	2,228	2	5,554,400.00	1,461,684
2002	no record	no record	1,420,000.00	373,684
2001	5,800	0	8,462,700.00	2,227,026
2000	506	0	4,940,620.00	1,300,163
1999	no record	1	1,924,440.00	506,432
1998	136	0	1,628,455.00	428,541
1997	no record	no record	922,020.00	242,637
1996	no evacuation	0	735,795.00	193,630
1995	1,172	4	1,485,095.00	390,814
1994	441	2	2,413,922.30	635,243
1993	13,587	0	1,512,816.50	398,110
1992	743	0	329,256.05	86,646
1991	no record	2	1,427,872.45	375,756
1990	4,581	4	1,036,100.00	272,658
1989	no record	no record	-	-
1988	41,059	0	-	-
1987	402	0	3,338,589.00	878,576
1986	7,968	0	6,092,454.25	1,603,277
1985	no record	no record	-	-
1984	7,177	9	1,998,268.00	525,860
1983	33,815	0	-	-

Usefulness of Flood Hazard Map in Kelantan State, Malaysia

- to reduce loss of people (incremental of death people)to reduce the property damage due to flood occurrence
- helps smooth refugee from home to evacuation shelter
- Enhancing awareness of the local resident due to the importance of flood disaster preparedness as well as notifying the residents of potential flood damage – show the evacuation route, evacuation shelter, forecasted inundation area and inundation depth by dissemination of the FHM Schools are the best place to disseminate the FHM as well as to give a better understanding to the childrens and teenagers due to impact of flood disaster. (enhance their awareness of flood disaster)
- Integration of flood modeling, topographical modeling and flood stimulation of the Kelantan River Basin will helped DID Malaysia to enhance the exist of flood forecasting and flood warning system
- Give an early warning information due to flood to local resident before their area/home inundated
- Give a technical support to the Director of State Security Department for issuing the evacuation order / recommendation order.
- Suggest the alternatives evacuation route if the exist road inundated.



Flooding in Kota Bharu, Kelantan - 10 to 16 Dec 2004

Action Plan Within The Next Five (5) Years

Year	Action Plan
2006	<ul style="list-style-type: none"> - Deliver a presentation of FHM to my division - Formed the committee members of FHM - Suggest to the department to send the right officer to attend the FHM course - Gain and enhance my knowledge in anticipated inundation area mapping, Topographic Map and GIS (Flood Runoff Analysis) - Check the availability and update topographic map at Department of Survey and Mapping - Having some meeting and understanding of FHM between the related organizations - Get an opinion and idea from the local residents' perspective of FHM - Carry out pilot project using existing FHM in terms of flood modelling, flood stimulation (review and enhance the exist FHM)
2007	<ul style="list-style-type: none"> - Promote the idea of FHM to the local government. - To disseminate the completed FHM to the target group (Kampung Baru Resident) - Educating people and enhancing their awareness due to flood disaster preparedness - Start planning and doing some ground works of FHM for rural area. Target area : Kelantan River Basin (which is located at the east coast of Peninsular Malaysia and yearly affected by the North-East Monsoon which bring more rain in October – January)
2008	<ul style="list-style-type: none"> - Carry out survey to study effectiveness – Kampung Baru - Model construction (consists Topographic Modelling, Flood Modelling and Flood Stimulation) for Kelantan River Basin
2009	<ul style="list-style-type: none"> - Model construction (consists Topographic Modelling, Flood Modelling and Flood Stimulation) for Kelantan River Basin (cont ...)
2010	<ul style="list-style-type: none"> - To disseminate the completed FHM to the target group (Kelantan State Resident) - Educating people and enhancing their awareness due to flood disaster preparedness - Carry out survey to study effectiveness – Kelantan River Basin - To conduct survey via questionnaire to the target groups with the view to improve the usefulness of the FHM

Problems In Making Flood Hazard Map In Malaysia

- i. Insufficient data e.g. updated topographical map
- ii. Data reliability – rainfall, water level and discharge
- iii. Inadequate expertise e.g. flood modelling and flood stimulation
- iv. Social and economic impact such as sales and price of land and properties will be affected by showing the forecasted inundation depth in the FHM, clarity and understanding public and private sector of FHM needed.

D. ADVICE/SUGGESTIONS IN MAKING THIS TRAINING COURSE MORE MEANINGFUL

- a. Preparation time for presentation of 'Town Watching' should be extend at least for two days.
- b. Insufficient time to understand the exercise on Topographical Maps and GIS for the new learners such as myself.
- c. Insufficient time to carry out more analysis e.g. rainfall runoff analysis.
- d. Due to my action plan and allocation of roles in making flood hazard maps in Malaysia, officer from Hydrology and Water Resources Division/State (e.g. Kelantan State Officer, Sabah State Officer) Department of Irrigation and Drainage Malaysia should have an opportunity to attend the FHM course for continuity of progressing and developing Flood Hazard Map in Malaysia.

Special Thanks!

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Sayonara and mata-ayi masho!