

EAST AND SOUTHEAST ASIA REGIONAL SEMINAR ON FLOOD HAZARD MAPPING

JOHOR : 'The Sinking State?'
Case study : District of Muar and Batu Pahat,
Introduction of FHM

BY

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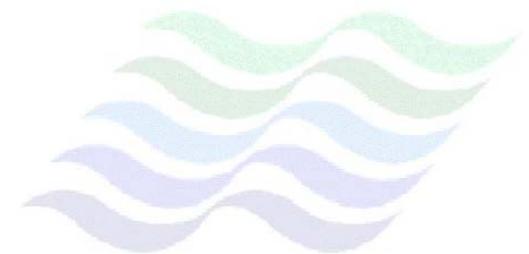
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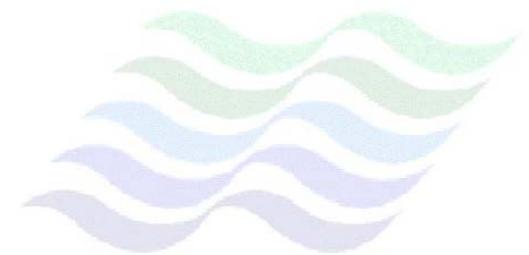
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Flood Management In Malaysia





STRUCTURE OF THE OF THE NATIONAL DISASTER MANAGEMENT ORGANISATION

Federal

Central Committee of National Disaster and Relief (CCDNR)



State

State Disaster and Relief Committee (SDRC)



District

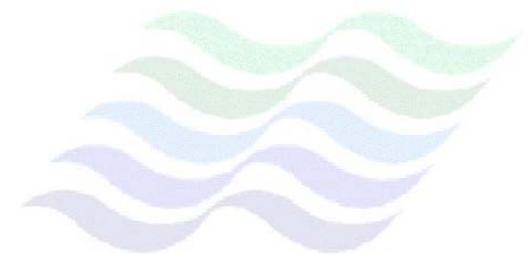
District Disaster and Relief Committee (DDRC)





STRUCTURE OF THE NATIONAL DISASTER MANAGEMENT ORGANISATION

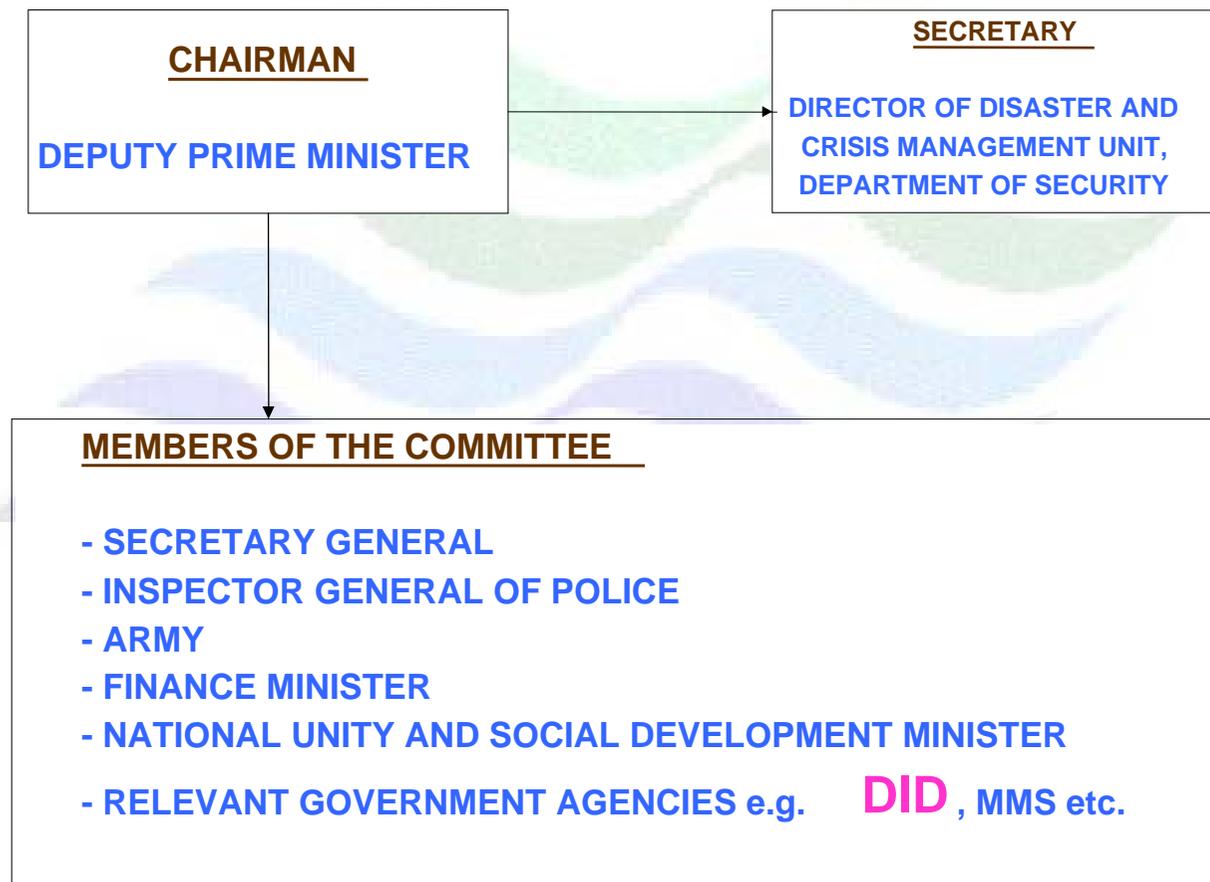
- National Disaster and Relief Committee (NDARC)
 - Federal Level
- State Disaster and Relief Committee (SDARC)
 - State level
- District Disaster and Relief Committee (DDARC)
 - District Level





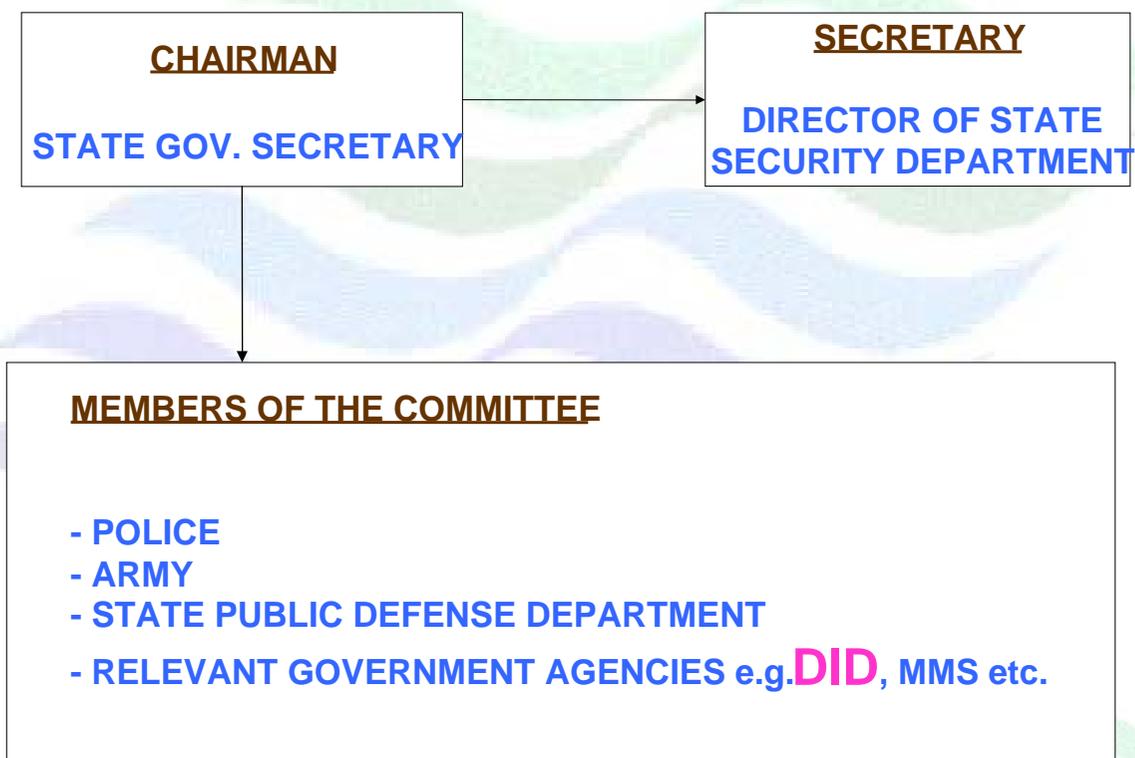
NATIONAL DISASTER AND RELIEF COMMITTEE (NDARC)

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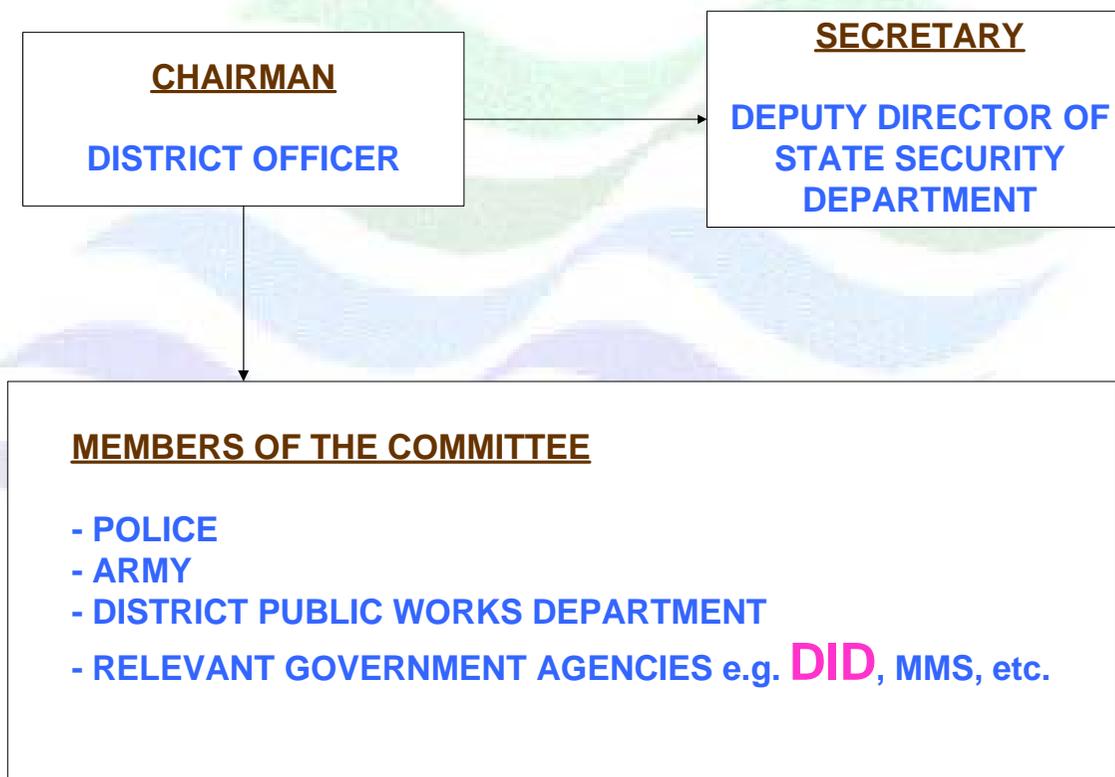


STATE DISASTER AND RELIEF COMMITTEE (SDARC)





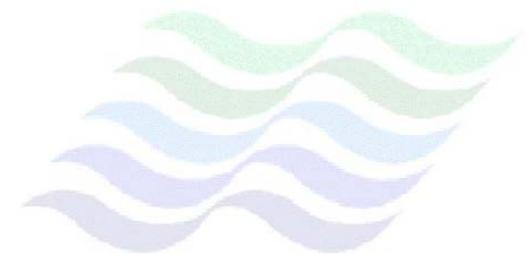
DISTRICT DISASTER AND RELIEF COMMITTEE (DDARC)





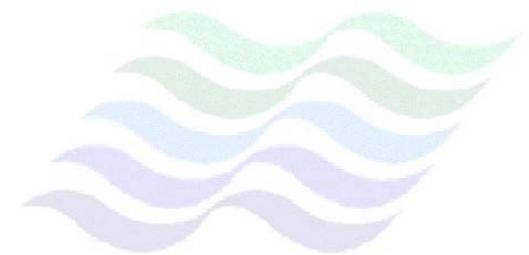
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Overview of flood events in December 2006 until January 2007





**Flood event
on 19-31 December 2006
(1st wave)**



EXTENT OF FLOOD AREAS



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JOHOR: The overflowing Sungai Kesang in Muar forced thousands of Muar residents to evacuate their homes on Dec 24, 2006. NST pix by Rosdan Wahid.



24/12/2006

JOHOR: These two motorcyclists disregarded danger as they continue to pass through the flooded Jalan Parit Sulong in Batu Pahat. NST pix by Rahim Rahmat.



JOHOR: Submerged vehicles were everywhere in Panchor, near Muar on Dec 24, 2006, as floodwaters made it difficult to remove the vehicles. NST pix by Junita Mat Rashid.



JOHOR: No problem getting around if you have a sampan in Kota Tinggi which is still flooded.



JOHOR: Parts of Kota Tinggi are still flooded.



JOHOR: After the floods in Segamat.



JOHOR: Railmen checking out the damage caused by the floods in Segamat. NST Pix



JOHOR: Newlyweds Haw Zhen Yap and Choo Kuan Yee proceeding with their marriage during the floods in Muar, Johor



JOHOR: The Kota Tinggi bus terminal flooded.



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JOHOR: Volunteers from Mercy getting some assistance from army personnel to send medicine, clothes, food and other items to flood relief centres in Kota Tinggi using boats as some areas are inaccessible through the roads on Dec 27, 2006. NST pix by Ahmad Othman.



27/12/2006
JOHOR: Mahat Haron, 51, (in the foreground) taking a dip in the floodwaters with his family members. When the picture was taken, the water measured at 4m deep. NST pix by Fathil Asri.



KUANTAN: Residents of Taman Pelangkah in Pekan, Pahang evacuating their homes on Dec 26, 2006 as floodwaters keep rising in the area. NST pix by Ilham Nusa.



25/12/2006
JOHOR: Sin Soon Huat of Kampung Parit Warijo in Batu Pahat resorted to setting up a barrier of sand bags at his home to keep floodwaters out. NST pix by Fathil Asri.



25/12/2006
JOHOR: Teacher Rosli Md Din, 40, (right) wading through the floodwaters in Kampung Dalam Sungai Kenanga, Batu Pahat, with hunches of cassava for his



JOHOR: Volunteers keep on sending food supplies to victims stranded in Kampung Batu Badak in Segamat on Dec 24, 2006, even at night. NST pix by Shahrul M.



JOHOR: Faizal Salleh, 31, doing his part in discarding pieces of wood which ended up inside the padi field in Kampung Kesang Gate, Muar as a result of the overflowing Sungai Kesang on Dec 24, 2006. NST pix by Rosdan Wahid.



JOHOR: This family resolved to wade through the floodwaters which have resulted in the closure of Jalan Segamat-Muar in Kampung Rawang and Pantai Layang in Muar. NST pix by Rosdan Wahid.



Flood Impact

No. of Casualties : 16 people

No. of Evacuees : 104,023 people

No	State	District	No. of Evacuation Centers	Evacuees		Casualties
				Total Family Involved	No. of Evacuees	
1	Johor	i) Johor Bahru	48	2,373	11,724	0
		ii) Kota Tinggi	35	1,161	5,227	2
		iii) Kluang	70	3,147	13,828	3
		iv) Muar	126	6,432	30,441	3
		v) Batu Pahat	116	5,948	27,971	5
		vi) Pontian	32	710	3,286	0
		vii) Segamat	72	2,442	10,286	3
		viii) Mersing	9	277	1,260	0
		Total	508	22,490	104,023	16

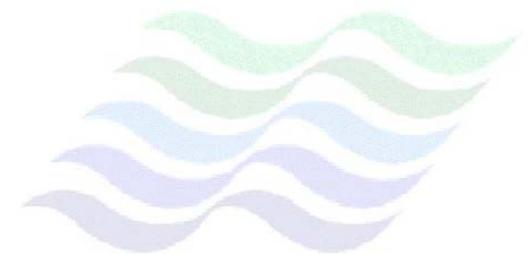




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(2nd wave)

Flood Hit Again!
on 11 until 31 January 2007



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All flooded: An aerial view showing the level of flooding in Kota Tinggi town yesterday. - 15 January, 2007



People carrying their belongings walk through flood waters in Kota Tinggi after heavy rainfall over the past two days caused a return of the dreaded floods. - 13 January, 2007



Novel idea: A family using a water tank and a tyre tube as a mode of transport in Kota Tinggi yesterday. - 15 January, 2007



People carrying their belongings from their shops in the town centre walk through flood waters to return home in Kota Tinggi after heavy rainfall over the past two days caused a return of the dreaded floods. - 13 January, 2007



Water, water everywhere: An aerial view of a housing estate in Kota Tinggi town at 9am yesterday. ? Courtesy of Oong Boon See - 14 January, 2007

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JOHOR, JAN 14: Kota Tinggi town. The clock tower under tower. NST Pix by Zain Ahmed.



JOHOR, JAN 14: Rescue ops in progress at Kota Tinggi town. NST Pix by Zain Ahmed.



JOHOR, JAN 14: Kota Tinggi town. NST Pix by Zain Ahmed.



JOHOR, JAN 14: Kota Tinggi town. NST Pix by Zain Ahmed.



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Segamat, Johor, Jan 13: Flood victims can only look at the impassable stretch of Jalan Medoi, at KM6 of Jalan Segamat. NST pix by Abd Rahim Rahmat.



Kota Tinggi, Johor, Jan 14: Residents of Taman Muhibbah surveying the situation in their area using a raft made of pieces of planks and empty containers. NST pix by Shahrul M. Zain.

SIKAP PRIHATIN: Naib Ketua Pergerakan Jamaluddin (kanan) meninjau keadaan Kota Tinggi, Johor.



Batu Pahat, Johor, Jan 14: Newly weds Rita Paikuni and Zulham Jonit being taken on a boat for their bersanding ceremony to be held at the flood relief centre at SK parit Binqan. NST pix by Amran Hamid.



Kota Tinggi, Johor, Jan 14: Evacuees at the Sekolah Agama Taman Kota Jaya flood relief centre had to be relocated to another centre as floodwaters begin to rise at the school. NST pix by Zain Ahmed.



Batu Pahat, Johor, Jan 14: Wardina Shamin Miswan seems to be having fun playing in the floodwaters near her home in Kampung Parit Binqan. NST pix by Amran Hamid.

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PITAS, SABAH, JAN 15: The village mosque in Pitas, the interiors of Sabah, is also affected by the flood.



PITAS, SABAH, JAN 15: Flood situation in Pitas, one of the poorest districts in the interior of Sabah.



Kuantan, Pahang, Jan 15: Deputy Prime Minister Datuk Seri Najib Razak surveying the situation in Kampung Kurnia in Rompin. Most areas in Rompin are now under water. NST pix by Nordin Abdullah.



Kota Tinggi, Johor, Jan 15: Police officers from the Kota Tinggi IPD on their rounds at crime-prone areas in the town. NST pix by Ahmad Othman.



Kluang, Johor, Jan 15: The access road to Kampung Seri Cahaya has collapsed due to the continuous rain. NST pix by Amran Hamid.



Kota Tinggi, Johor, Jan 14: These houses in Taman Kota Jaya are not spared by the floodwaters. NST pix by Zain Ahmed.



Kota Tinggi, Johor, Jan 14: Sekolah Kebangsaan Bandar is one of the five schools in the district submerged by floodwaters. NST pix by Ahmad Bahri Mardi.



Kota Tinggi, Johor, Jan 14: The half-visible bridge over Sungai Johor in the middle of the town leads to the Kota Tinggi Hospital. NST pix Ahmad Bahri Mardi.



Kota Tinggi, Johor, Jan 14: The tomb of the famous Laksamana Bentan is also flooded. NST pix by Zain Ahmed.

Flood Impact

No. of Evacuees : 109,259 people (15 January 2007)

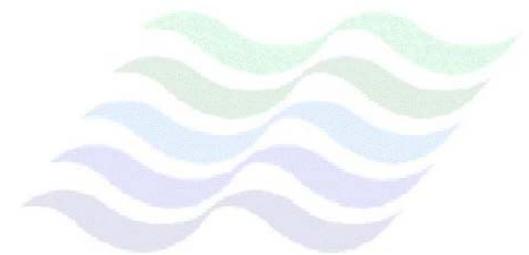
No.	District	No. of Evacuees (people)
		Highest (15 January 2007)
1	Johor Bharu	16,417
2	Muar	5,611
3	Kluang	16,024
4	Batu Pahat	38,520
5	Segamat	6,593
6	Kota Tinggi	13,186
7	Pontian	4,669
8	Mersing	8,239
	Total	109,259





CAUSES OF FLOODING

- **Extremely Heavy Rain**
 1. ***Continuous and Widespread***



Rainfall Distribution on 18-21 December 2006

	Station Name	18/12/2006	19/12/2006	20/12/2006	21/12/2006	4-Day Rainfall (mm)	Dec. Monthly Rainfall (mm)
1	Segamat	66	239	162	48	515	187
2	Air Panas	98	477	149	58	782	205
3	Labis	96	301	130	23	550	205
4	K.Penghulu Chaah	103	251	84	9	447	232
5	Ladang Chan Wing	92	245	101	2	440	238
6	Empangan Sembrong	120	193		23	406	208
7	Bandar Kluang	58	251		21	431	243
8	JPSLarkin	80	292		23	461	227

3.8X

2 X



Rainfall Distribution

On 11-14 Januari 2007

	Station Name	District					4-Day Rainfall (mm)	Dec. Monthly Rainfall (mm)
			11/1/2007	12/1/2007	13/1/2007	14/01/2007		
1	Air Panas	Segamat	81	204	129	17	431	164
2	Empangan Bekok	Batu Pahat	85	237	88	52	462	191
3	SgBekokB77	Segamat	99	247	93		471	168
4	Ladang Chan Wing	Segamat	110	240	100		469	168
5	Ulu Sebol	Kota Tinggi	124	290	76	42	532	176
6	Bukit Besar	Kota Tinggi	147	234	42	35	458	176
7	Bandar Kluang	Kluang	121	182	105	15	423	143

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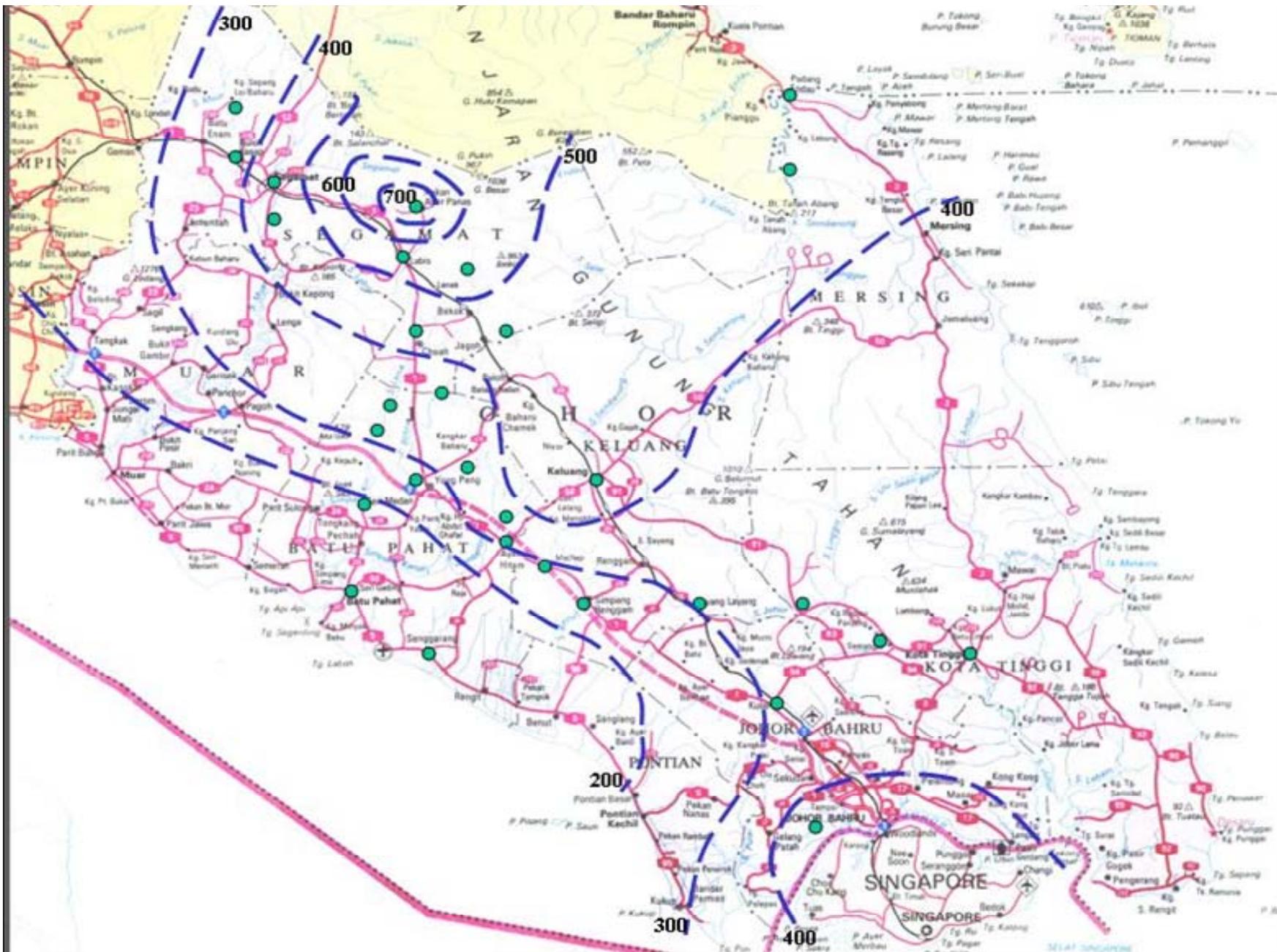
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RAINFALL ISOHYET FOR 3 DAYS (18 - 20 DECEMBER 2006)

AT STATE OF JOHOR

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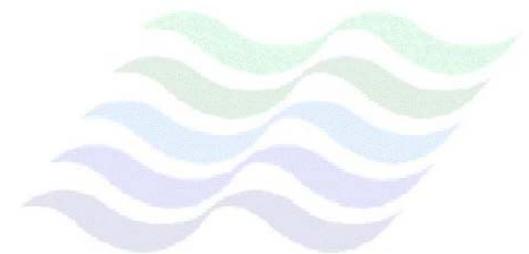
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CAUSES OF FLOODING

- **Extremely Heavy Rain**
 1. ***Continuous and Widespread***
 2. ***Very Intense***



Records of Rain On 18-21 December 2006

Rainfall Station	Total Rainfall (mm)		Return Period (yrs)	
	24 hrs	48 hrs	24 hrs	48 hrs
Air Panas	535	693	> 100	> 100
Labis	320	499	> 100	> 100
Segamat	288	447	> 100	> 100
Ldg Chan Wing	257	395	> 100	> 100
Kompleks Penghulu Chaah	234	419	> 100	> 100
Buluh Kasap	241	350	30	60



CAUSES OF FLOODING

- **Rain → *Continuous, Widespread and Very Intense,***
- **River swelled and overflowed**
- **Low lying areas (e.g. District of Batu Pahat)**
- **Land Subsidence (Peat swamp areas)**
- **Inadequate Drainage Capacity**
- **Antecedent condition from 1st flood event**
- **Spring Tides**



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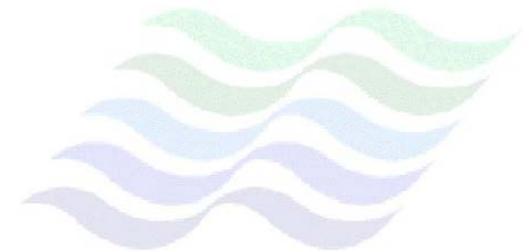


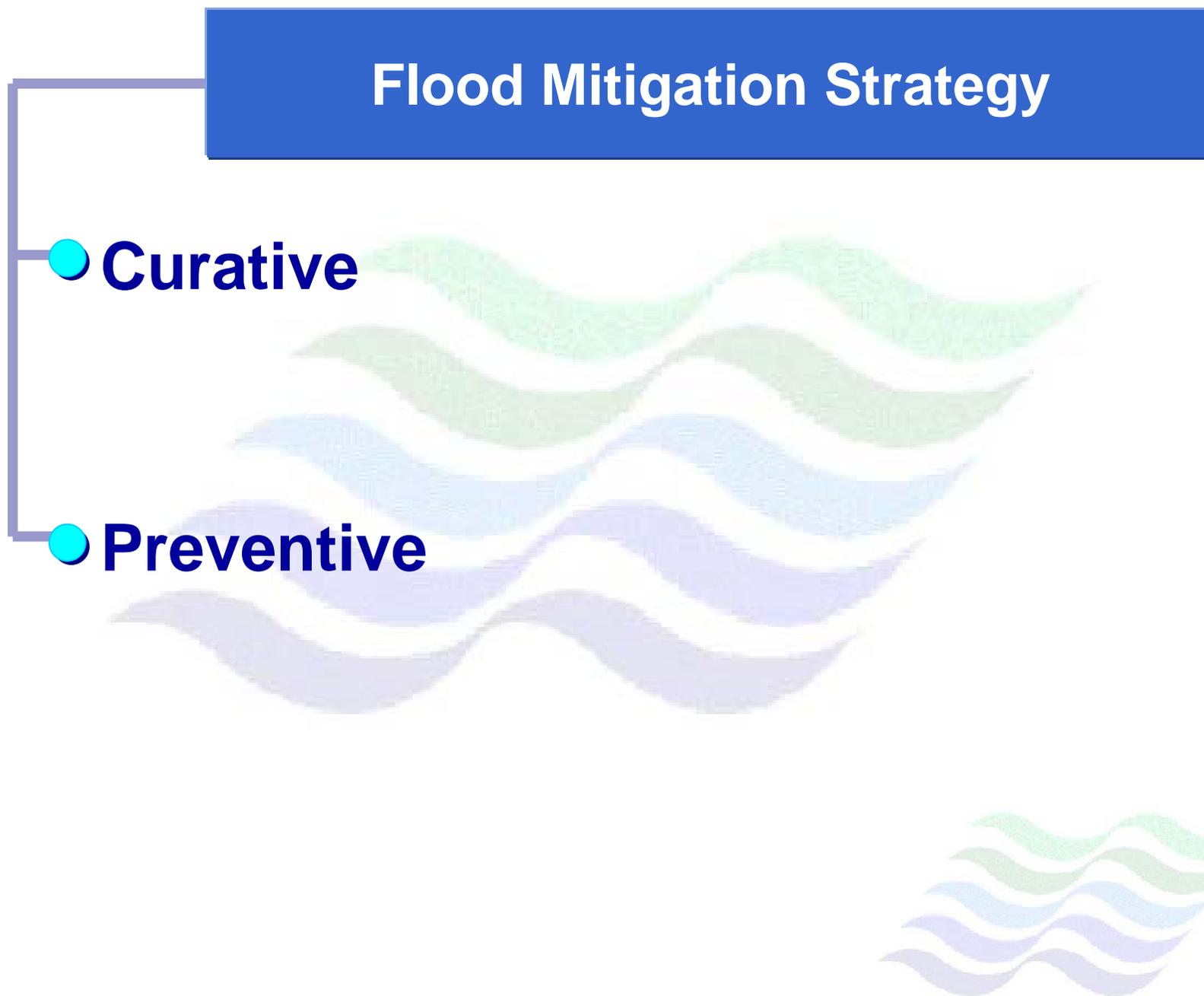
Yong Peng Town, District of Batu Pahat on 19 Jan 2007 (Low lying area)



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Flood Mitigation Strategy







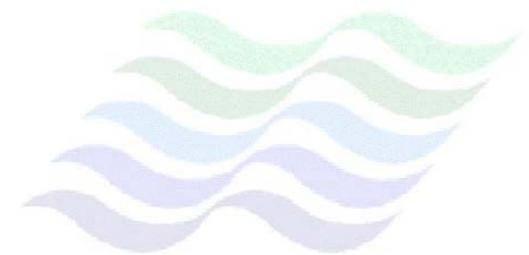
Flood Mitigation Strategy

● Curative

Structural approach/long term

- Deepen and widen the river
- Stabilization of river bank
- Detention pond / Dams
- Raise river levee
- Build pumping station
- Enhancement of flood warning system (siren station) etc

● Preventive



Flood Mitigation Strategy

- **Curative**

- **Preventive**

- 1) *MSMA → Urban Stormwater Management (control at source)*
- 2) *ESCP → Erosion Sediment Control Plan*
- 3) *New approach → House on stilt*
- 4) *New approach → Flood Hazard Map*





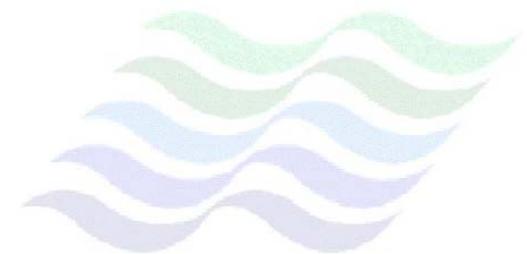
House on stilt

**During flood event - Flood waters
do not reach in the house.**



Case Study

Flood Hazard Map For Johor - District Muar - District Batu Pahat



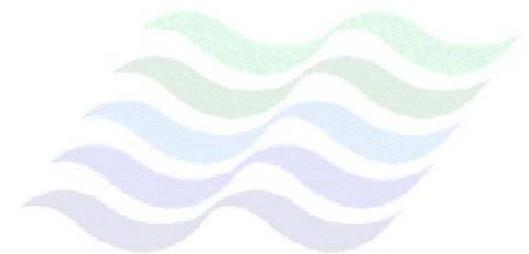


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About the Flood Hazard Map –

- **Goal** – to evacuate affected residents efficiently in a safe and proper manner during floods
- **A map that provides graphical information on inundation** (inundation areas, depth, etc)
- **Evacuation Info.** (location of evacuation centers, well marked routes, highlight dangerous spots, etc.)
- **The map** is produced and **publicised** through a joint effort by those in disaster management and those in charge of rivers, eg. Disaster Management Center, Local Authority, Welfare Dept. DID etc.

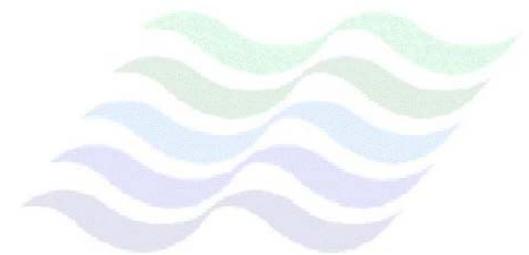
Source : *Flood Hazard Map Manual for Technology Transfer March 2003, Ministry of Land, Infrastructure, Japan Infrastructure Development Institute, Japan)*





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Objectives of Producing Flood Hazard Map In Malaysia



Objectives of Producing Flood Hazard Map In Malaysia

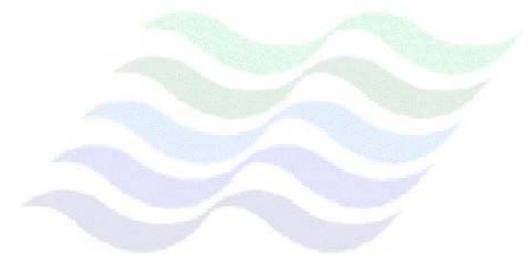
- To produce and disseminate *Flood Hazard Map* so that people can evacuate in a **SAFE, SMOOTH AND QUICK** manner when flooding occur
- A **useful tool** for Director of State Security Department in **Flood Relief Management** e.g. issuing evacuation order / recommendation order, managing evacuation centers.
- To **identify problems** which may cause danger to the residents during evacuation
- To come up with a **possible solutions** to minimize any casualties and loss of properties





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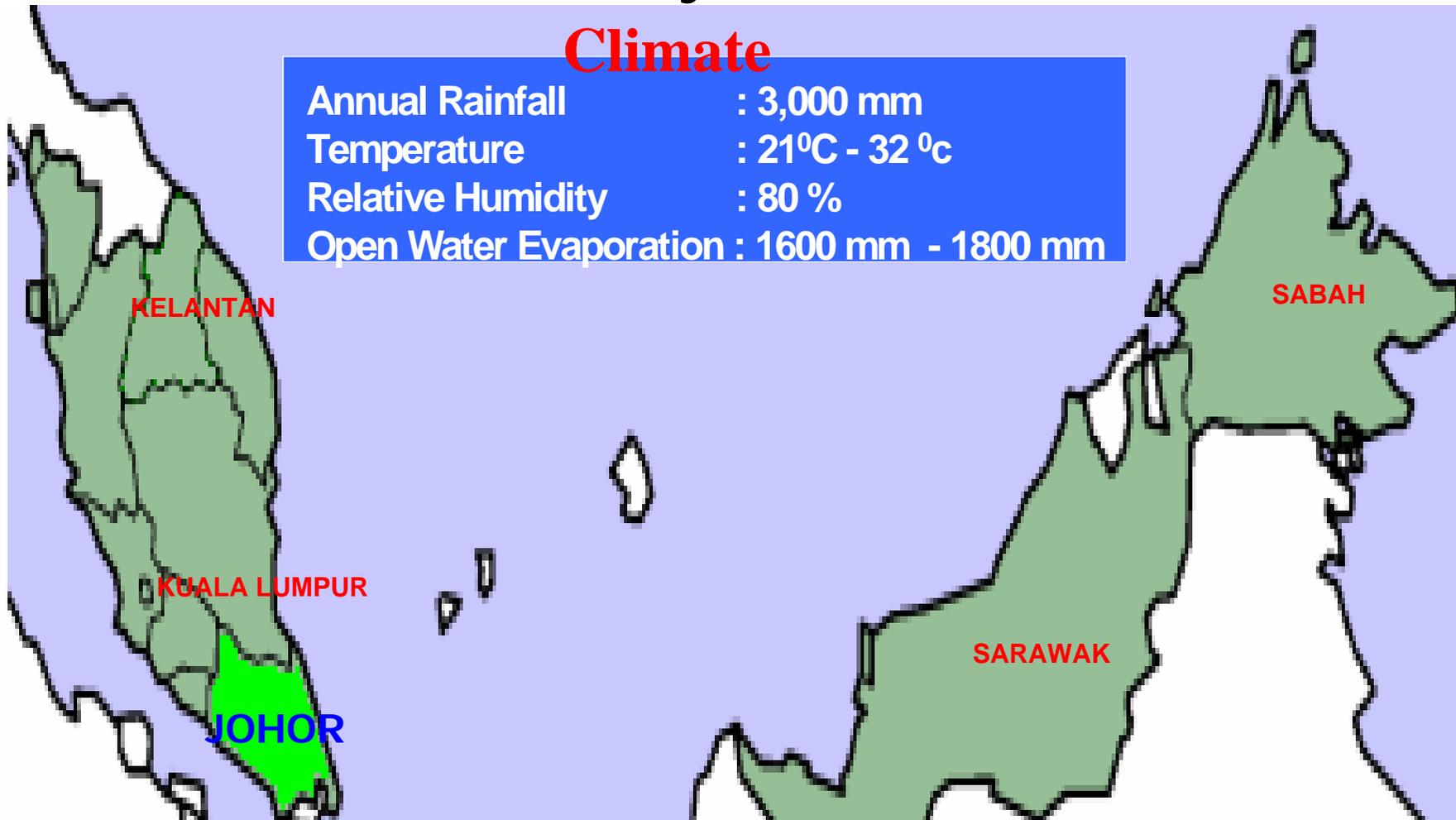
Production of Flood Hazard Map In Malaysia



Malaysia

Climate

Annual Rainfall	: 3,000 mm
Temperature	: 21°C - 32 °C
Relative Humidity	: 80 %
Open Water Evaporation	: 1600 mm - 1800 mm



Malaysia consist 14 states includes the Johor State

Case Study : Johor - Located at Southern Peninsular Malaysia

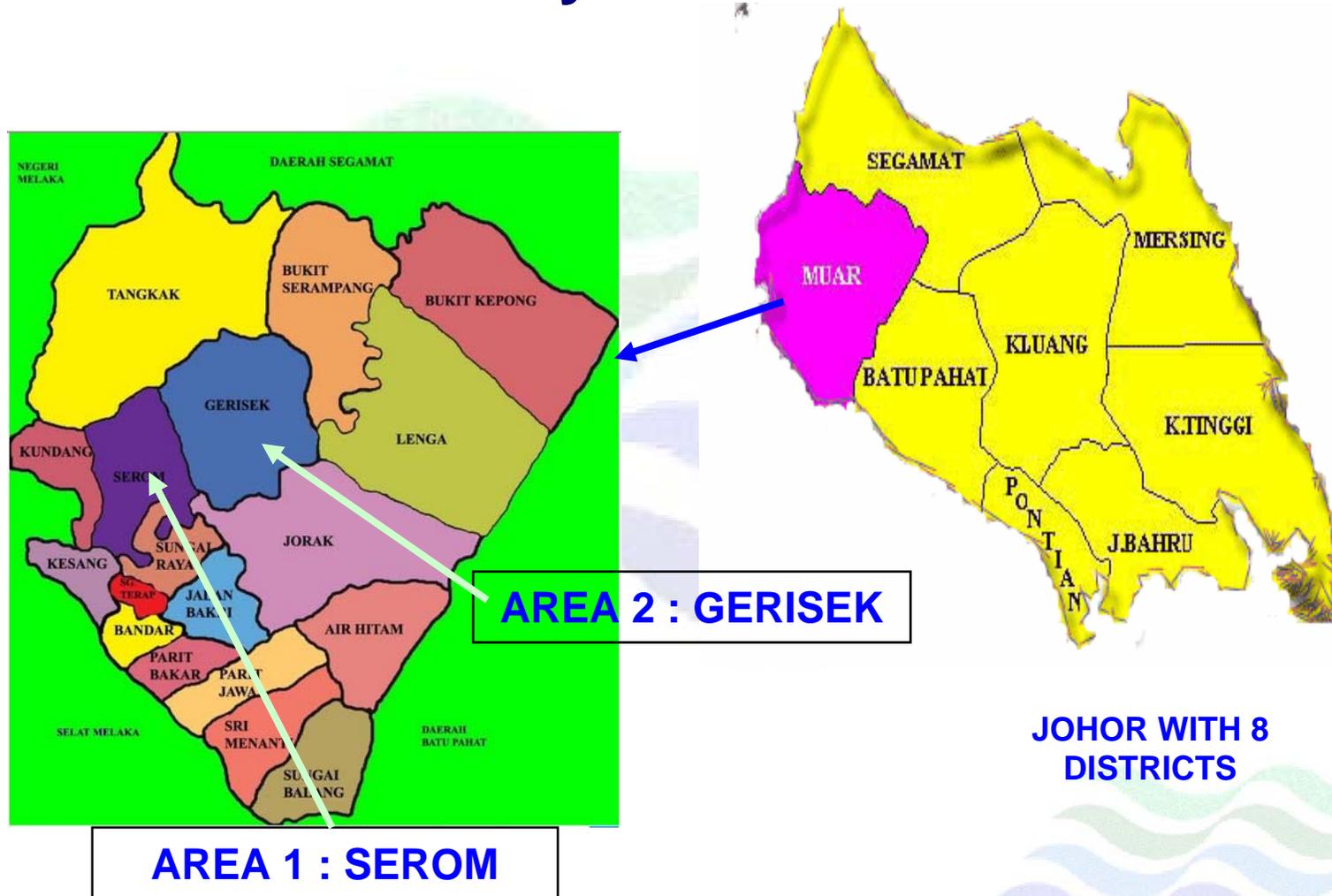
- Consists 8 districts





Production of Flood Hazard Map

1st case Study- District of Muar



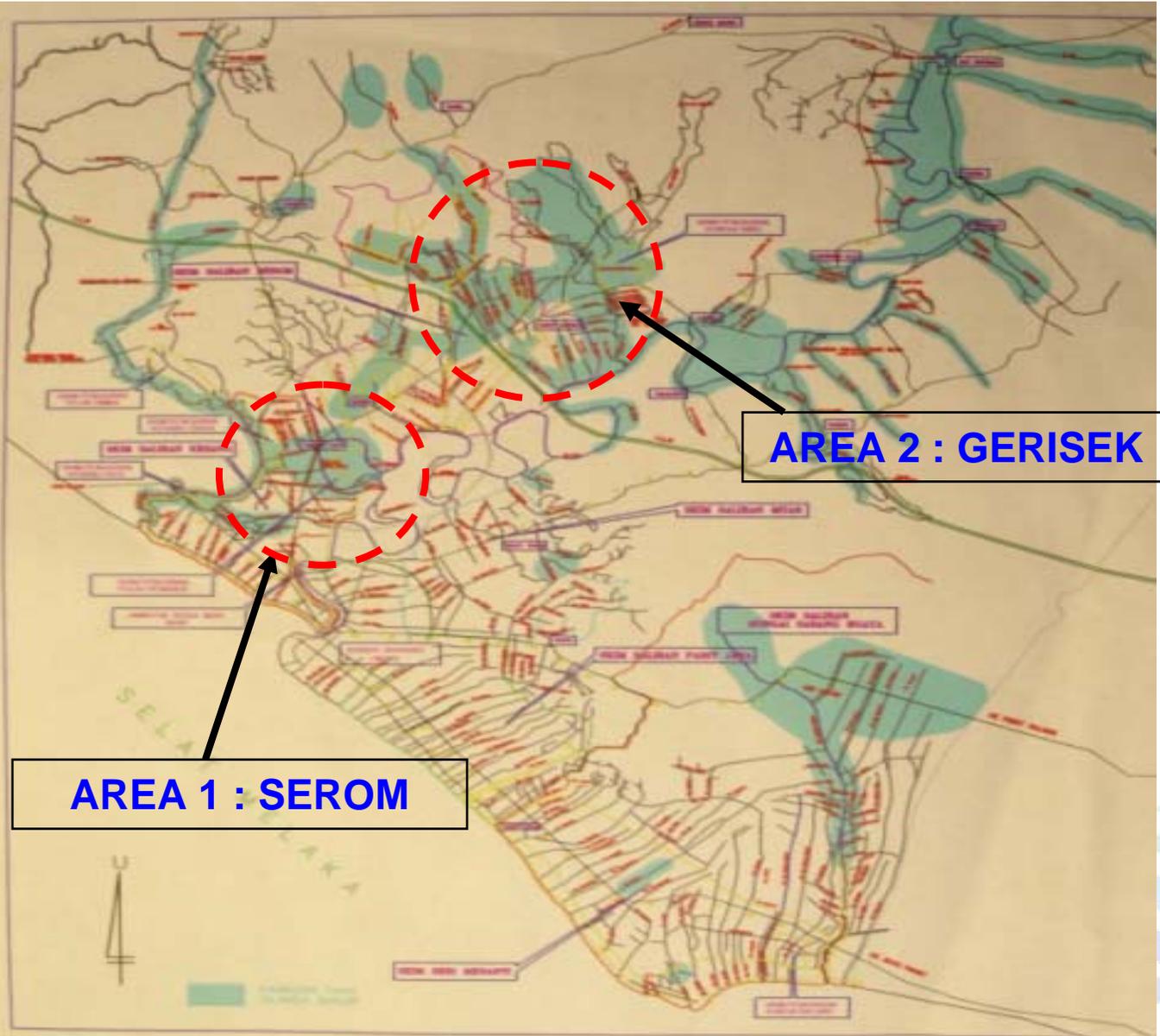
JOHOR WITH 8
DISTRICTS



Inundated Areas at the District of Muar



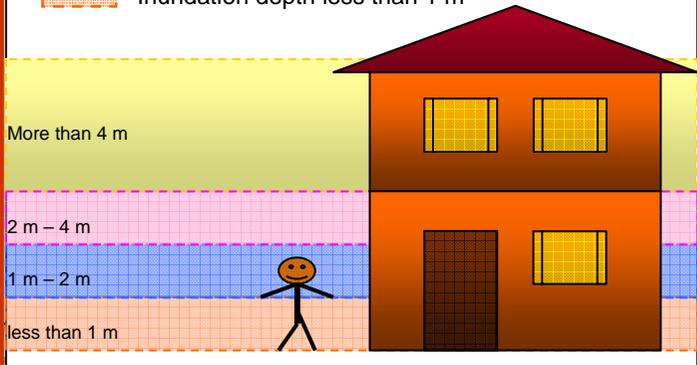
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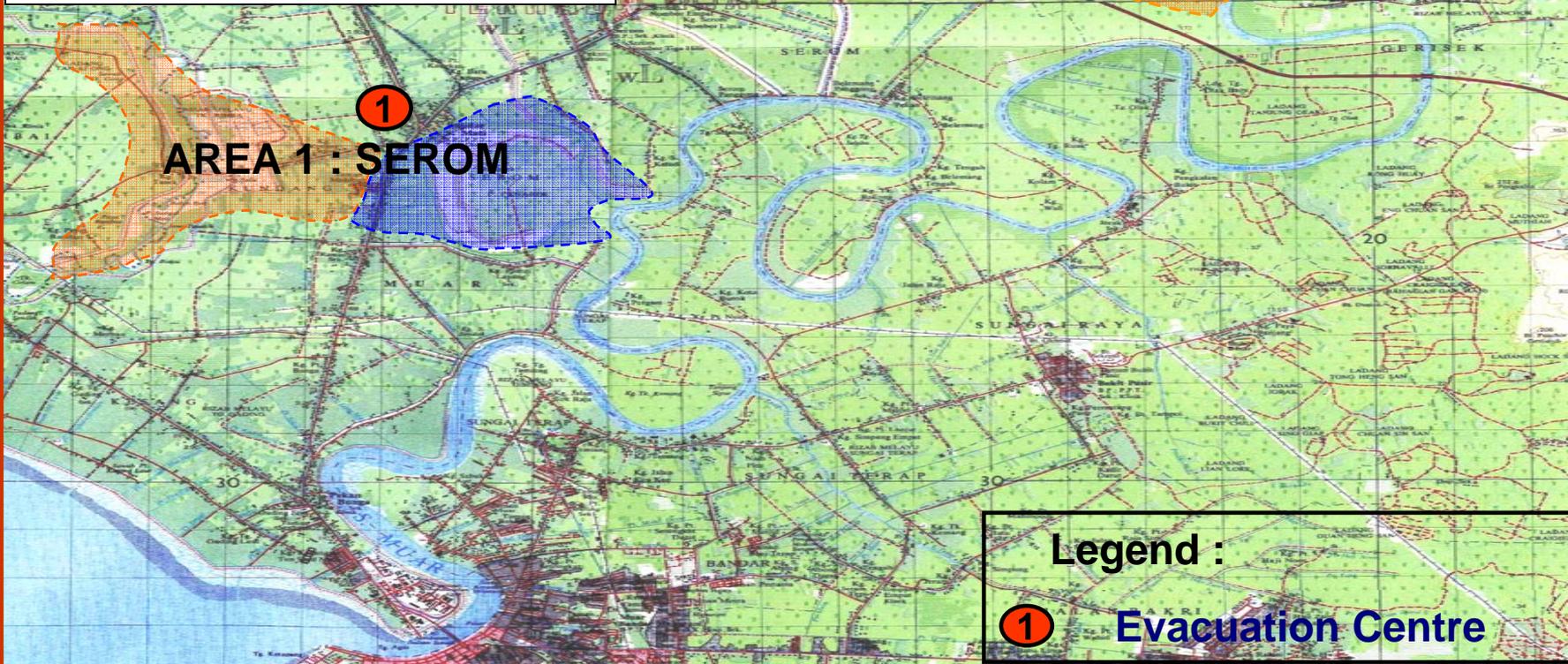
HOW TO READ THE MAP

(Anticipated Inundation Depth)

-  Inundation depth more than 4 m
-  Inundation depth between 2 m to 4 m
-  Inundation depth between 1 m to 2 m
-  Inundation depth less than 1 m



MUAR RIVER FLOOD HAZARD MAP

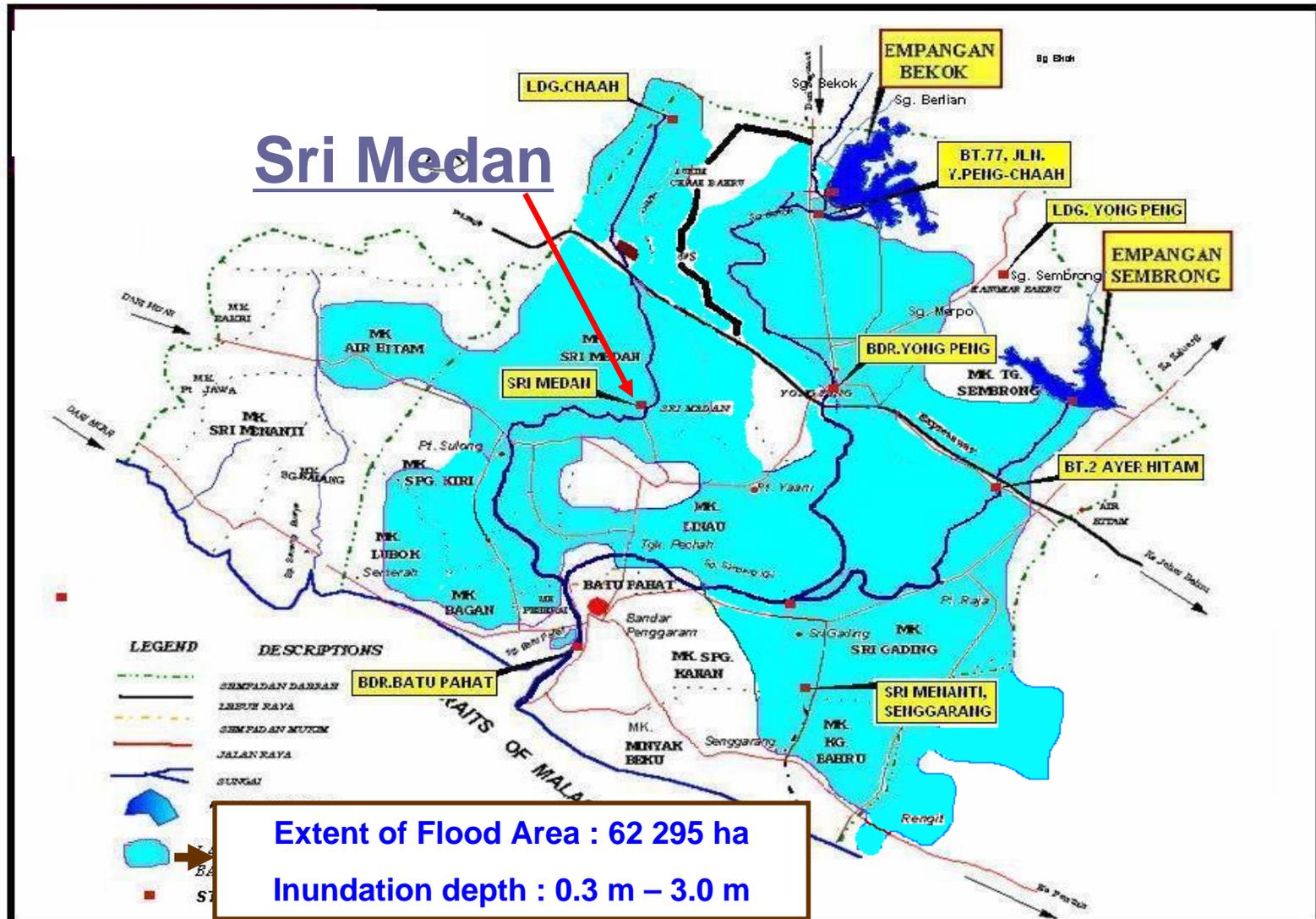


Production of Flood Hazard Map

2nd Case Study- District of Batu Pahat



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Sri Medan, District of Batu Pahat on 27 Jan 2007



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- The worst flood occurred on the 2nd wave of the flood event
- Inundation depth : 0.3 – 3.0 m

Sri Medan, Batu Pahat on 27 Jan 2007 Still inundated



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← Interview with the evacuees



Condition in evacuation centre



Facilities at the evacuation centre :

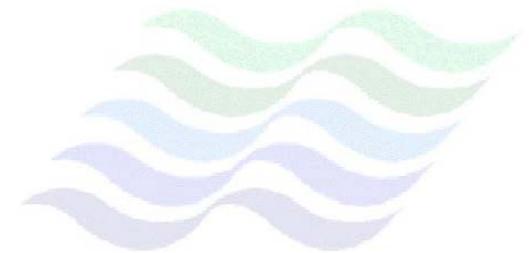
- 1. Water Tank
- 2. Mobile Toilet





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Problems and Possible Solutions



Problems and Possible Solutions

No.	Problems	Solution
1.	Flood warning	Equip more sirens and make good use of the siren from the Police Patrol Car / Fire Fighting and Rescue Truck
2.	Flood forecasting	<ul style="list-style-type: none">- Installation of more telemetry rainfall and water level stations- Establish flood forecasting model
3.	Residents reluctant to evacuate early	<ul style="list-style-type: none">- Public awareness talk/seminar on the danger of flood – lives and property loss- Flood pamphlets- Give talk on the importance of FHM and organised drill session (before flood events)
4.	No Flood Hazard Maps	<ul style="list-style-type: none">- Identify flood prone area- Prepare flood inundation map



Problems and Possible Solutions

No.	Problems	Solutions
5.	<p>Inundation areas are very deep</p> <p>From 0.5m to 3m in depth</p>	<p>Installation of more pumping stations to cope with the flood discharge.</p> <p>Deepening of rivers and systematic drainage.</p>
6.	<p>No evacuation signage.</p>	<p>Installation of signage along the road which lead to the evacuation centre</p>
7.	<p>Evacuation centres not gazetted</p>	<p>Gazetting of evacuation centres</p>
8.	<p>Difficulties to evacuate at night</p>	<p>Installation of high spot light at the gazetted evacuation centres</p>



Problems and Possible Solutions

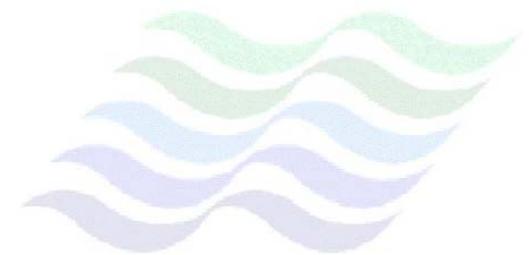
No.	Problems	Solutions
9.	Ignorant of the importance of FHM	Organising frequent talk on FHM to give awareness to the public Organising 'town watching' to school children
10.	Flood-mark not widely established	Establishing flood mark on permanent features.
11.	GIS based flood hazard map	<ul style="list-style-type: none"> - Acquire relevant base map - Digitize flood hazard map - Use digital terrain model
12.	DEM (Digital Elevation Maps) not established. Lead to inaccuracy of demarcating flood depth	Establishing more DEM's





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Conclusions



Conclusions

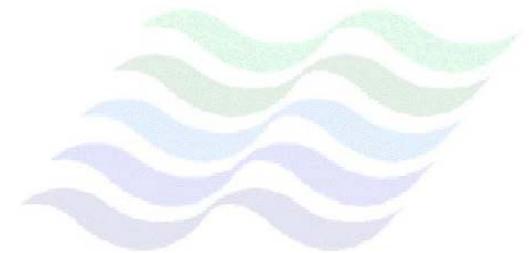
- ❑ The production of Flood Hazard Map can be a useful tool and lead to a safe, smooth and quick manner thus less casualties and loss of properties.
- ❑ FHM is very important before any structural measures undertaken and can serve to complement structural measures after they are implemented
- ❑ Town watching and awareness talk on the importance of FHM are very useful to gather the latest information, the needs of the residents during evacuation process and the needs of the Government to save lives and properties
- ❑ The cooperation between residents, Municipal Office and the Government will save a lot of lives and property loss, thus lead to a safe, smooth and quick evacuation.





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Acknowledgement



Acknowledgement

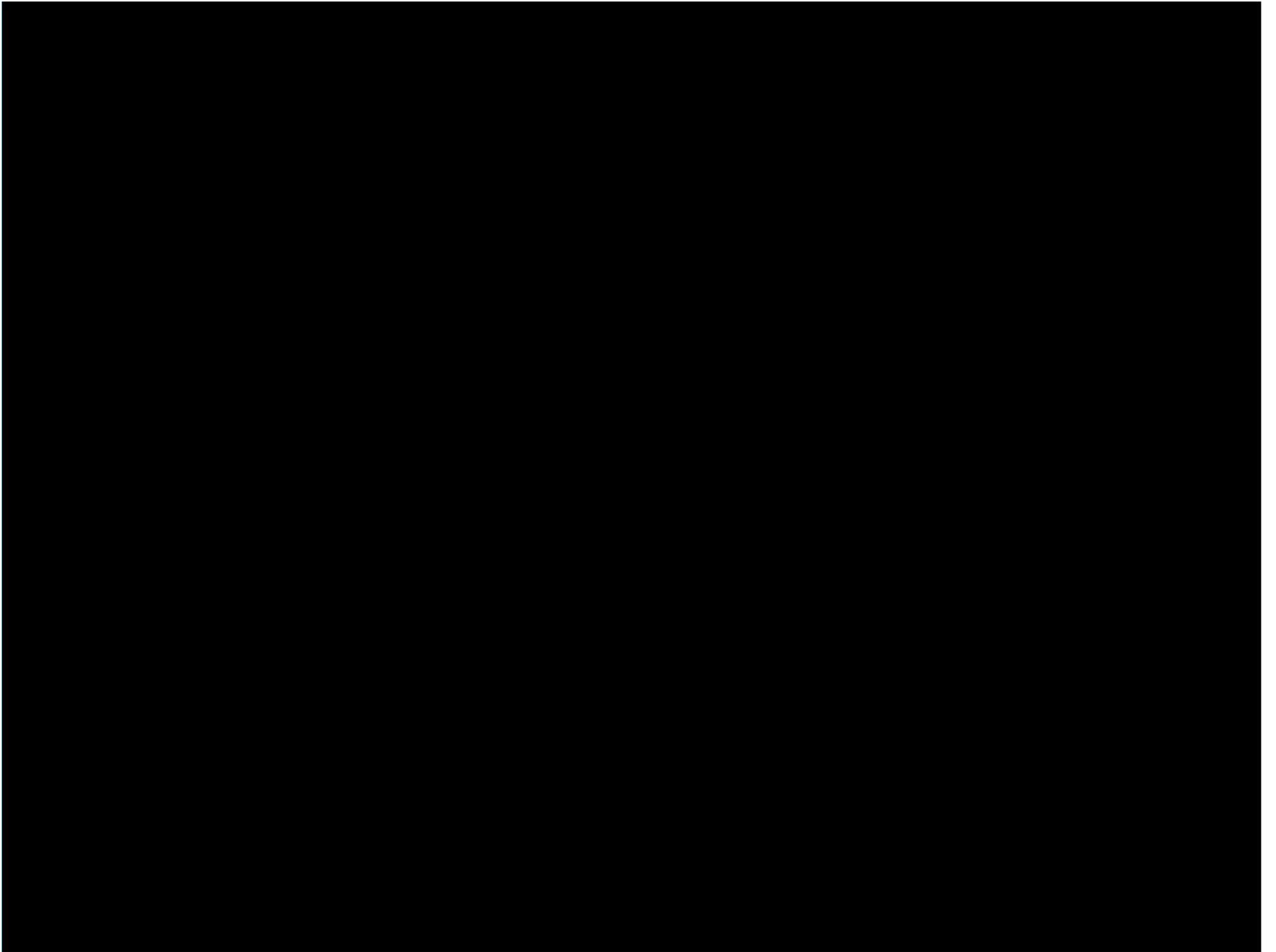


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We would like to take this opportunity to thanks the Director of Hydrology and Water Resources Division, DID Malaysia, DID's District Engineer of Muar and Batu Pahat, supporting staffs and my colleagues for making this Flood Hazard Maps a success;

My deepest appreciation to ICHARM / JICA for giving DID Malaysia the honour to host this seminar and thus giving us the opportunity to share our experience in producing Flood Hazard Maps in this seminar.



AREA 1 : SEROM



Names of evacuation center

: Penghulu Abdullah Primary School

Capacity of the evacuation centre

: 500 people

Capacity of the evacuation centre during flood event : Approximately 300 people



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AREA 2 : GERISEK



Names of evacuation center : ⁵⁸
**Multipurpose Hall of Bukit
Gambir**

Capacity of the evacuation
centre :
1500 people

Capacity of the evacuation
centre during flood event :
Approximately 750 people

Facilities for handicap person :

1. Pathway
2. Utilities room
3. Hall
4. Operation Centre Room
5. Toilets
6. Spacious parking area

