



Malaysia-Japan International Institute of Technology (MJIIT)

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#### Development of Floods Economic Valuation Model for Residential Properties

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#### Introduction

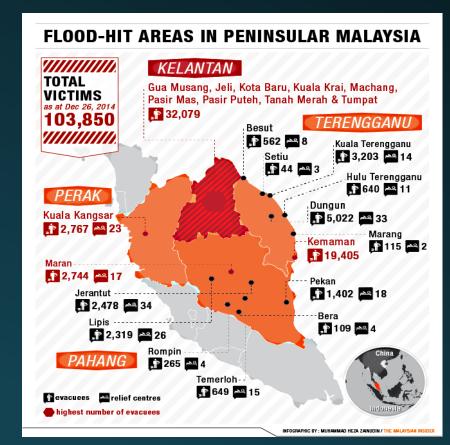
In Malaysia, floods are caused by a combination of natural and human factors. Heavy rains continue in Malaysia since the seasonal rains began from the end of December 2016 and have cause flooding in six (6) states in Peninsular and East Malaysia. The situation of floods in several areas affected and most of the families need to be evacuated and the figure involved in the evacuation as Table 1.

The frequent occurrence of flooding in Malaysia, the damage caused can be significant in relation to both property damage and service disruption. Property with physically damaged requires higher operating cost of repair and maintenance which might affect directly the value of the property.

#### Table 1: Evacuation of floods as 1 February 2017

States	Total number of families	Total number of people
Kelantan	21	105
Terengganu	30	93
Perak	181	576
Pahang	891	3210
Johor	384	1390
Sabah	0	0
Selangor	11	62

(Source: National Disaster Management Authority (NADMA)



#### Flood scenario in Malaysia



Pulau Pinang (15 Sept 2017)



KL- Petaling Jaya (March, 2017)



Rantau Panjang (Jan, 2017)



Kuala Lumpur (Dec, 2014)

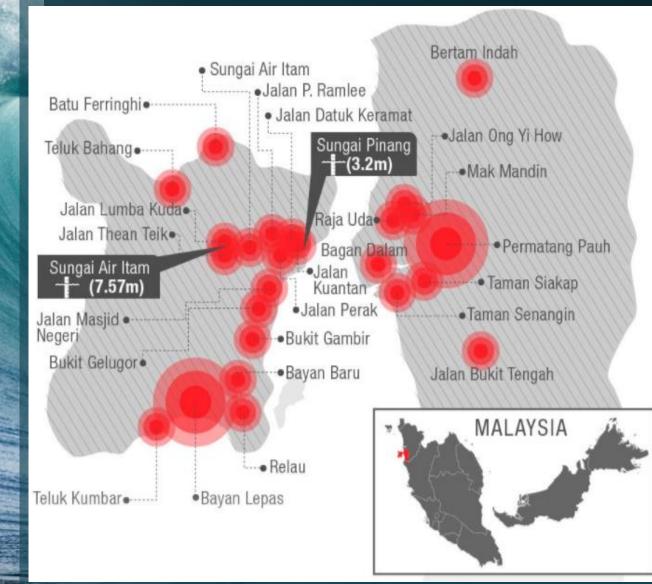


Kuala Krai (Dec, 2014)



Cameron Highland (Oct, 2013)

#### Latest flood – Pulau Pinang (23 Sept 2017)







Heavy rain in Penang.



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#### **Problem statement**

Lack of knowledge amongst valuer

 the difficulties in assessing flood damage because of the lack of knowledge amongst valuer.

Lack of consistency in assessing flood damage  During the flood generally the valuer not present and they must rely on second hand information from local residents about flood velocities and contamination content.

•The valuation process in determining the current market after disaster might be different between one and another property in same location. Only rely on Dept of Social Welfare.

Building material

Magnitude of flood

 Basically, building in flood-prone area were constructed with more porous material including block and concrete including bricks with vulnerable services located on the ground floor.

 Depths of over 1 metre (m) can damage the structure due to increased hydraulic pressure and velocities of water. Contamination of floodwater will change the absorption and drying out characteristics of material and treat to human health and increases the clean-up cost.

#### **Research Objective:**

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To develop Economic Valuation Model of flood impact to property value.

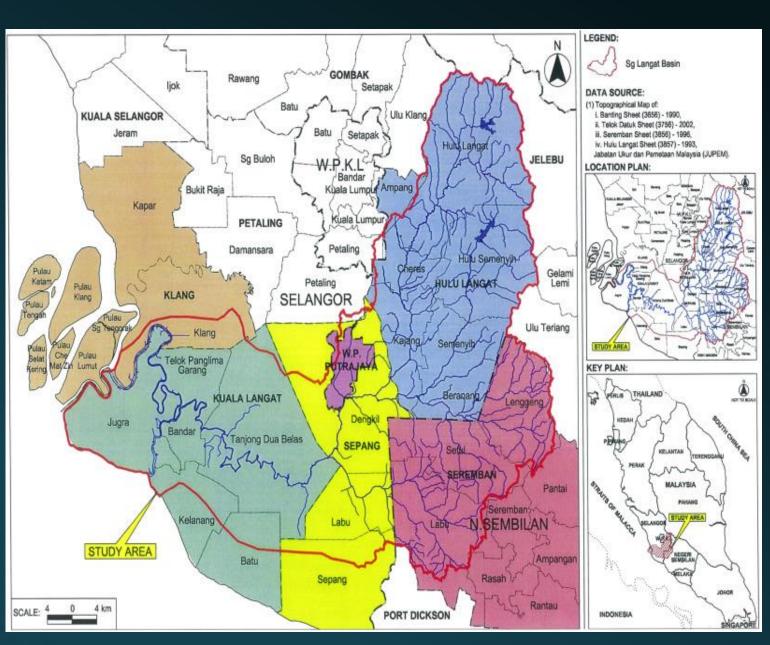
To investigate the property valuation model based on economic characteristics from the impact of flooding.

To calibrate and validate the economic valuation model with integration with GIS.

#### Case study: Langat River Basin

Overview	Description		
Transboundary	Covers 3 states including Selangor (78%), Negeri Sembilan (19%) and Federal Territories of Putrajaya (3%).		
Location	Situated approximately 27 km to the south of Kuala Lumpur (capital city of Malaysia).		
Total basin area	2,350 km.sq. and 200 km long		
Topography	Approximately 90% mountainous with a maximum height of 1400m above sea level.		
Climate	Tropical with a mean annual temperature of 32°C.		
Average annual	Approximately 2,400mm ranging from		
rainfall depth	epth 1,800 to 3,000mm.		
Population	1,184,917 million in 2000, growth rate 7.64%		
Geographical	Located ant latitude 02°50'48"N and		
location	longitude 101°40'48"E.		
Main catchment	Divided into five (5) catchments		
area	comprising of the Lui, Kajang,		
	Semenyih, Dengkil and combined small		
	catchments of Beranang and Labu.		
Monsoon seasons	Two monsoon seasons in a year, the		
	northeast monsoon from November to		
	March and southwest monsoon		
	between May and September.		

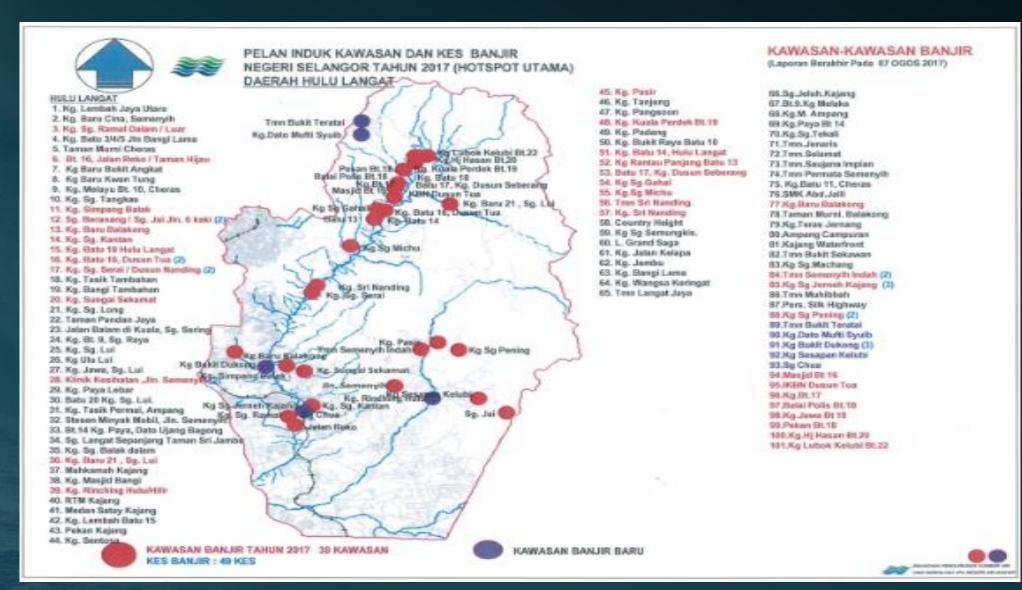
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### Selangor Flood Map

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#### Hulu Langat Flood Map



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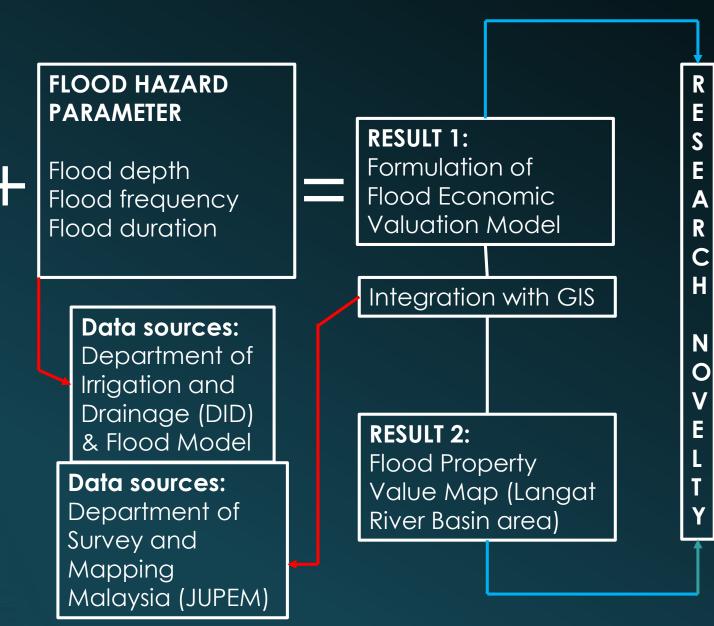
## **RESEARCH NOVELTY : Development of Flood Economic Valuation Model and Integration with GIS**

#### **ECONOMIC ATTRIBUTES**

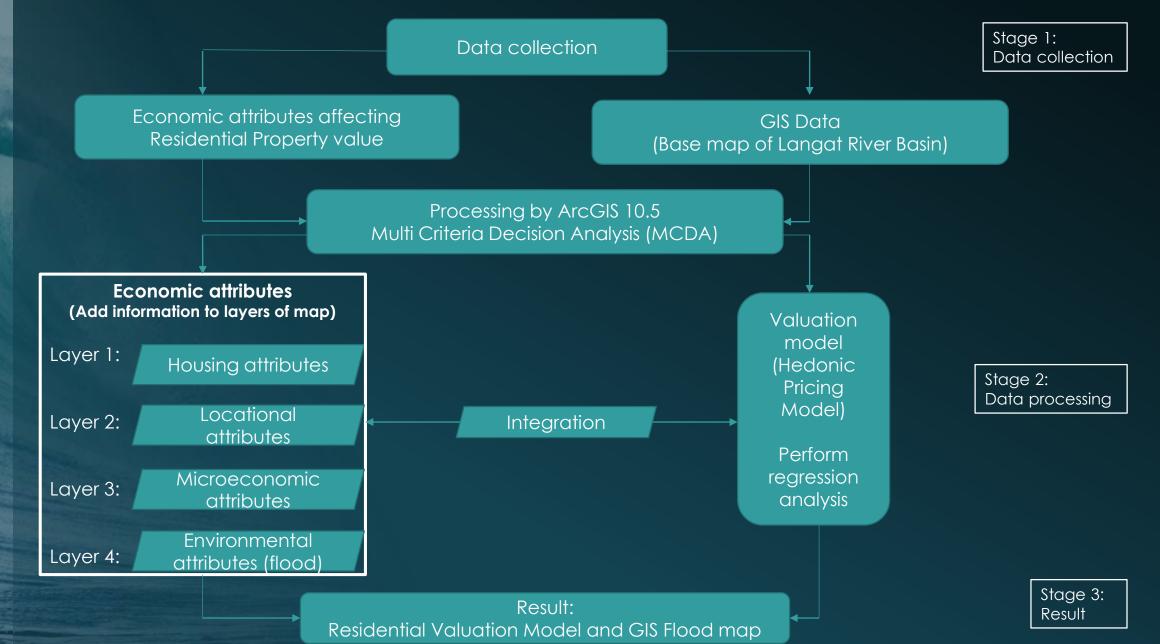
Building characteristics Age of house Number of rooms Number of bathroom Land area Build up area Tenure Building conditions

Location characteristics Distance to MRT / LRT Distance to shopping mall Distance to highway Distance to school Distance to hospital

> **Data sources:** National Property Information Centre, NAPIC



#### 11.0 Integration of Valuation Model with GIS



**Economic Valuation Model -** method of estimating demand or value of properties  $Log P_{i} = \beta_0 + \beta_1 FRE_{it} + \beta_2 DUR_{it} + \beta_3 DEP_{it} + \beta_4 BUS_{it} + \beta_5 BUS^2_{it} + \beta_6 CITY_{it}$ +  $\beta_7 \operatorname{CITY}^2$ ít +  $\beta_8 \operatorname{AGE}_{it}$  +  $\beta_9 \operatorname{LAND}_{it}$  +  $\beta_{10} \operatorname{BUILT}_{it}$  +  $\beta_{11} \operatorname{BATH}_{it}$ +  $\beta_{12}$  BED<sub>it</sub> +  $\beta_{13}$  AIRPORT<sub>it</sub> +  $\beta_{14}$  AIRPORT<sup>2</sup><sub>it</sub> +  $\beta_{15}$  HOSPITAL<sub>it</sub> +  $\beta_{16}$  HOSPITAL<sup>2</sup><sub>it</sub> +  $\beta_{17}$  SCHOOL<sub>it</sub> +  $\beta_{18}$  SCHOOL<sup>2</sup><sub>it</sub> +  $\Upsilon_1$  (FRE \* AGE)<sub>ii</sub> +  $\Upsilon_2$  (FRE \* LAND)<sub>ii</sub> +  $\Upsilon_3$  (FRE \* BUILT)<sub>ii</sub> +  $\Upsilon_4$  (DUR \* AGE)<sub>ii</sub> +  $\Upsilon_5$  (DUR \* LAND)<sub>ii</sub> +  $\Upsilon_6$  (DUR \* BUILT)<sub>ii</sub> +  $\Upsilon_7$  (DEP \* AGE)<sub>ii</sub> +  $\Upsilon_8$  (DEP \* LAND)<sub>ii</sub> +  $\Upsilon_9$  (DEP \* BUILT)<sub>ü</sub> +  $\mu_i$ 

## Description of variables

Variable	Description	Measurement Unit	
Р	Price of residential property value	Ringgit Malaysia (RM)	
FRE	Frequency of flood	Number of times within 5	
		years study	
DUR	Duration of flood	Number of days	
DEP	Depth of flood	Metres (m)	
BUS	Distance to the nearest bus station	Kilometres (km)	
CITY	Distance to the nearest city centre	Kilometres (km)	
AGE	Age of house	Number of years	
LAND	Size of land area	Square foot (sq. ft)	
BUILT	Size of built area (floor)	Square foot (sq. ft)	
BATH	Bathroom	Number of rooms	
BED	Bedroom	Number of rooms	
AIRPORT	Distance to the nearest airport	Kilometres (km)	
HOSPITAL	Distance to the nearest hospital	Kilometres (km)	
SCHOOL	Distance to the nearest school	Kilometres (km)	
FRE*AGE	Interaction term of flood frequency and house age		
FRE*LAND	Interaction term of flood frequency and size of land		
FRE*BUILT	Interaction term of flood frequency and size of built area (floor)		
DUR*AGE	Interaction term of flood duration and house age		
DUR*LAND	Interaction term of flood duration and size of land		
DUR*BUILT	Interaction term of flood duration and size of built area (floor)		
DEP*AGE	Interaction term of flood depth and house age		
DEP*LAND	Interaction term of flood depth and size of land		
DEP*BUILT	Interaction term of flood depth and size of built area (floor)		

#### **Research Contribution**

- 1. Represents how economic valuation method can be used to determined the impact of floods towards property value.
- 2. Represents a development of flood risk framework based the magnitude of floods.

#### **Publications**

- 1. A conceptual Framework of Determining the Property Value using Economic Valuation Method towards Floods Disaster, 1<sup>st</sup> Economic Business Conference (EBIC) 2017, Grand Aston Hotel, Medan Indonesia, 25 October 2017 (Scopus Index).
- 2. A Conceptual Framework of Economic Valuation Towards Floods Disaster, Asian International Multidisiplinary Conference 2017 (1-2 Mei 2017, Universiti Teknologi Malaysia, Johor).
- 3. Chapter of book Integration Of Disaster Management Towards Sustainable Housing And Community Redevelopment.

#### Conclusion

The generic floods framework and modeling presented explores the interaction between different internal and external factors affecting the economic value of properties. An extensive review of previous studies in economic valuation of property for different floods disaster studies considered to be main restrictive factor resulting in lack of empirical studies in this field.

This study brings together two existing research domains of floods and property value. Practitioners and researchers will find this study useful in developing an improved understanding of the economic valuation to flooding. The flood framework and modeling are important outcome of the research which will encourage further research in this area of study.

# THE END THANK YOU