WATER MANAGEMENT AND SUSTAINABILITY IN ASIA

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WATER MANAGEMENT AND SUSTAINABILITY IN ASIA

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PREFACE

This book is a manifestation of the intentions of the authors to share works by researchers in the field of water resources to the global society in the form of a book series publication. But it is not merely about sharing, it is also about research improving on past works and be published. All the chapters here are the improved version from the works presented in the International Conference on Water Resources (ICWR 2018) in Malaysia. With the publication of this book, it is intended that the knowledge and research works can be shared with the global public especially in Asia to understand the importance of managing our water resources. It is a big part of our responsibility, be it from a researcher, non-researchers, leaders in the water industries, leaders of the nation and the whole community. It is our small contribution to state that works are being done to improve the current situation and hopefully these will help create positive actions by all.

Our huge gratitude to all the authors involved in the making of this book, and to the School of Civil Engineering, Universiti Teknologi Malaysia and the Department of Irrigation and Drainage Malaysia for organising the international conference. It has provided a platform for knowledge sharing and dissemination.

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A. FLOOD RISK MANAGEMENT

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CHAPTER 1

THE IMPACT OF FLOOD HAZARD ON RESIDENTIAL PROPERTY PRICE

Muhammad Najib Razali, Siti Hafsah Zulkarnain and Zakri Tarmidi

ABSTRACT

This study assesses the effects of flood hazard on property price, which focus on residential property. The growth in the population has resulted in more areas being explored, including areas that are prone to flooding. The exploration of a new area for housing development also brings vulnerability to flood hazard. This research employed hedonic regression method to assess the impact of flood to property price between low-flood and non-flood areas. The case study areas are residential properties along Langar River, Selangor, Malaysia. The findings reveal that residential price in case study areas have only little impact in terms of price impact from the flood events. This study also establishes a new valuation model by considering flood hazard. It is expected that the impact from the flood to property price will be significant in future due to changes in property demand patterns as well as the increase in environmental issues.

Keywords: Property; house; price; flood; value; market

INTRODUCTION

Property price is very important to the buyers as it highly correlates with the investment decision whether on an individual scale or institutional scale.

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The property investment decision-making process has been very complex in recent years and attention has been paid to the relationship between property valuation, risk analyses, financing and risk which could have an impact on the property value. The property industry is also becoming aware of the need to take into account the risk factor in determining property value as demand for property is significantly increasing. One of the risk factors that have become increasing aware among buyers and investors is risk to natural disasters such as floods. Floods are low-probability events with potential for large-scale consequences (Bin 2005). Some states in Malaysia are very prone to flood hazard and have experienced some kind of flooding. Floods have a significant impact on the value, due the impact on the property structure. Damage to property structure will increase the risk factor to the property value. Consequently, it will lessen the property value in the long term. The risk reduction measure is important because it may be the only feasible option once the house is built (Bin 2005). Nevertheless, the increased population has forced property investors to take high risks in investing in property projects in high risk locations. In Malaysia, the high demand of property, especially residential properties, has increased the residential projects in many areas, particularly in big cities. These projects have created unsustainable development which consequently affects the drainage system which triggers flash flooding. As a result, many residential areas are indirectly at high risk of being in flood hazard areas. The general consensus by disaster experts has been that homeowners will not voluntarily adopt disaster mitigation measures (Simmons et al. 2002). Most individuals ignore this type of risk in the decision-making process in order to own a property. As a result, property investors are taking this opportunity to develop more residential projects in high risk flood hazard areas. Therefore, this research evaluates the effect of houses built in a floodplain on the price of a home.

LITERATURE REVIEW

The occurrence of flood is caused by uncontrollable human activities in nature. Among these activities is the construction of a mega project to restrict river drainage and solid waste disposal by those who operate the manufacturing industries (Pottinger & Tanton 2011). The growth coupled with property development brought greater vulnerability to the human habitat, which included loss of life and properties. The amount of developed property and the value of real property in the high-risk area have steadily increased over the recent years. The value of these areas has used similar methods with other properties based on location and type of properties. Therefore, it important to assess the impact of floodplain areas on the house prices in Malaysia. The issue of flood risk appears to attract a growing number of property stakeholders, especially financial institutions and insurance companies. There is a growing awareness that property developers are ignoring environmental concerns within investment decision-making, which can be financially risky.

Although flood in Malaysia is not as frequent as in several other countries due to its geographical location, nevertheless the impact is quite significant. There have been major recent flood events in Malaysia such as in December 2007 (Kelantan,

Terengganu, Pahang, Johor and Kuala Lumpur), November 2010 (Kedah and Perlis) and December 2014 (Kelantan, Terengganu, Pahang, Perak, Perlis and Sabah) which had a significant impact on the loss of properties and lives. The rapid development of such areas in Kuala Lumpur, Penang and Kuching in Malaysia is more easily affected by flash floods (Ghani, Chang, Leow, & Zakaria, 2011). According to a report by the Department of Irrigation and Drainage (DID), the estimated area vulnerable to flood disaster is approximately 29,800 km^2 or 9% of the total Malaysia area and is affecting almost 4.82 million people, which is around 22% of the total population of the country. The normal flood phenomenon in Malaysia is flash flooding which normally occurs in big cities. According to the DID (2000), floods in Malaysia have been classified in two categories, and they are flash floods and monsoon floods. The clear difference between these two disasters is the period taken by the river flow to recede to the normal level (Gasim, Toriman, & Abdullahi, 2014). Research by Kong, Bahrun, and Kun (2010) showed that 28% of people believe that flood is due to improper drainage systems, 20% is from pollution, 18% is the management or urbanisation, 16% of the factor is from environmental aspects and 11% believe weather is the causative agent. Evidently, extreme flood and drought events can cause tremendous damage to the economy and ecology and, in the worst case, bear enormous risks for life. They are phenomena that are not constrained by watershed or international boundaries, and they can grow to afflict large areas and many countries simultaneously (Lehner, 2006).

Although many researches have been undertaken relating to the detrimental aspects of flooding, nevertheless the scope of study has mostly majored in engineering or environmental aspects. Very limited study has explored the impact of flood hazard on house price in Malaysia. Despite the fact that Malaysia experiences occasional raining seasons especially during the monsoon season (December to February), every year it sees flash floods in big cities, and in recent years, the damage caused by this hazard has been significant in relation to both property damage and service disruption.

According to Sayers, Hall, and Meadowcroft (2002), the severity of any resultant flooding will be governed typically by the number of defences breached or overtopped, as well as the vulnerability of the assets and preparedness of the people within the floodplain. In assessing the impact of the flood hazard on house price, it is important to know the flood risk impact. Therefore, analysis of the flood hazard impact will be based on the understanding of the probability of the flood hazard event in the location. The science and technology of flood management has made tremendous progress in the last half century, which is based on the parametric and statistical models describing key elements of the flooding system (loads, defence response, inundation and impacts) which is now available and continuing to be developed (Sayers et al., 2002).

METHODOLOGY

This study focuses on the Langat River flood area in the State of Selangor, which has been reported to the authorities since 2014. The data represent substantial

portions of the residential markets in the affected Langat River area in Selangor. The Langat River area was reported to have among the highest number of flood events in Malaysia. The residential area along the Langat River is also among the highest density area in Malaysia. Therefore, it will provide a sound basis to examine the impact of flood hazard on house price as well as examine the supply and demand behaviour. Data have been collected for the Langat River area in Selangor based on data extracted from the DID, Malaysia.

Data collection in these studies was from secondary data involving various government agencies and departments as follows:

(a) National Property Information Centre (NAPIC).
(b) DID.
(c) Department of Survey and Mapping Malaysia (JUPEM).

The data were analysed on a comparison basis between the non-flood low and the flood event areas that have been affected with significant damage only. For the purpose of this study, similar socio-economic statuses within sub-urban as well as village areas were compared to assess the type of value of the residential properties in various case study areas.

FLOOD HAZARD TO PRICE VALUATION MODEL

According to Walsh, Griffiths, Guignet, and Klemick (2017), the hedonic property value equation postulates that the price of a home or housing bundle is a function of the individual attributes composing that bundle, including characteristics of the home and parcel (H_{it}) as well as its location and neighbourhood (L_{it}). The model also takes into account the location of the property to the water resources. However, for this research, location to the CBD, accessible roads, etc. need to be considered. Other attributes that need to be included is D_i, which is dummy variables denoting different distance buffers that could also represent scalar measure such as linear or inverse distance. P_{it} represents the price of home when it was sold in period t. The hedonic function based on Walsh et al. (2017) is represented as follows:

$$P_{it} = P\left(H_{it}, L_{it}, WQ_{ir}, T_t\right)$$

where P_{it} is the price of home, H_{it} the characteristics of the home and parcel, L_i the location and neighbourhood characteristics, D_{it} the flood hazard and T_t the time of sale.

This model will allow the influence of flood hazard that will affe tesidential property value by interacting with flood hazard. The model can be written as:

$$\mathrm{Ln}\left(P_{it}\right) = \beta_0 + H_{it}\beta_1 + L_{it}\beta_2 + T_{it}\beta_3 + D_{it}\beta_4\gamma + \varepsilon_{it}$$

where the dependent variable $\mathrm{Ln}(P_{it})$ is the natural log of the price of home i sold in period t, and ε_{it} is an assumed normally distributed disturbance. The coefficient

vectors to be estimated are β_k for $k = 0, \ldots, \gamma$. For the purpose of this research, several modifications need to be done in order to suit the local environment and flood hazard condition (Walsh et al., 2017).

RESULTS AND DISCUSSIONS

The findings from the assessment and observation will be discussed on a location basis to show the clear difference between the impact of flood hazard and the Langat River area property market performance. The focus will be on residential property based on the type of property. Figs. 1.1 and 1.2 exhibit the findings from transaction volume for two different areas which are sub-urban areas and villages areas. From Fig. 1.1, the transaction volume over the period January 2014 to December 2018 has seen a fluctuating trend but overall increasing patterns for flood low houses. This indicates for the Langat River residents, although the location of the property is in the flood hazard area, the trend is increasing. The range percentage of transaction volume of residential houses in the case study area ranges between 0.02% and 0.19%.

Fig. 1.2 depicts that trend of transaction volume for residential properties in village areas close to the Langat River case study area. Similar to the sub-urban area, the trend also shows variance over the period January 2014 to December 2018. Nevertheless, unlike in sub-urban areas, the trend of house transaction sales seems to decrease in village areas with downward movement. Interestingly, the difference between flood low houses and non-flood low houses is rather relative in low percentages for sub-urban areas and −0.08% to 0.35% in village areas. Moreover, in village areas, it can be seen in certain months that the number of monthly transactions of residential properties that are located in non-flood low

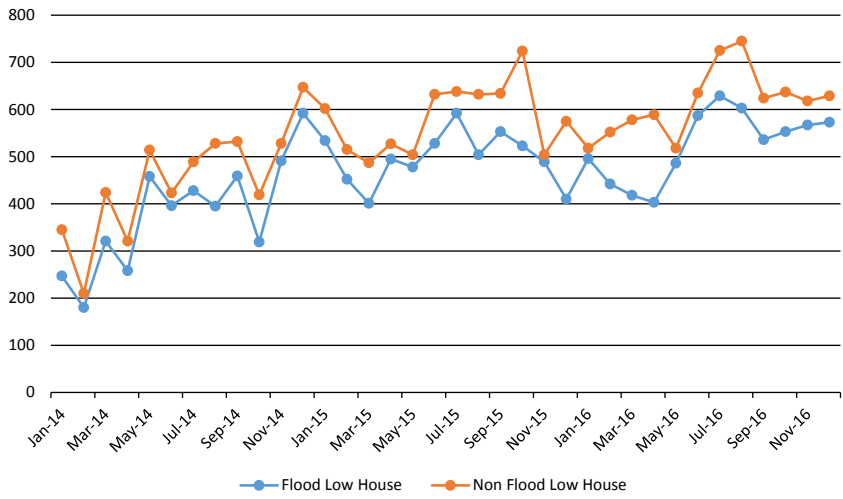

Fig. 1.1. Housing Transaction Volume in Langat River Sub-urban Area.

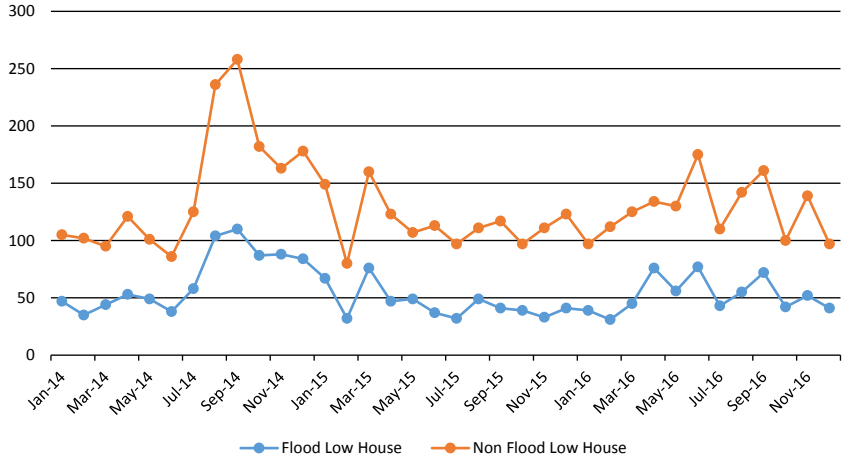

Fig. 1.2. Housing Transaction Volume in Langat River Village Area.

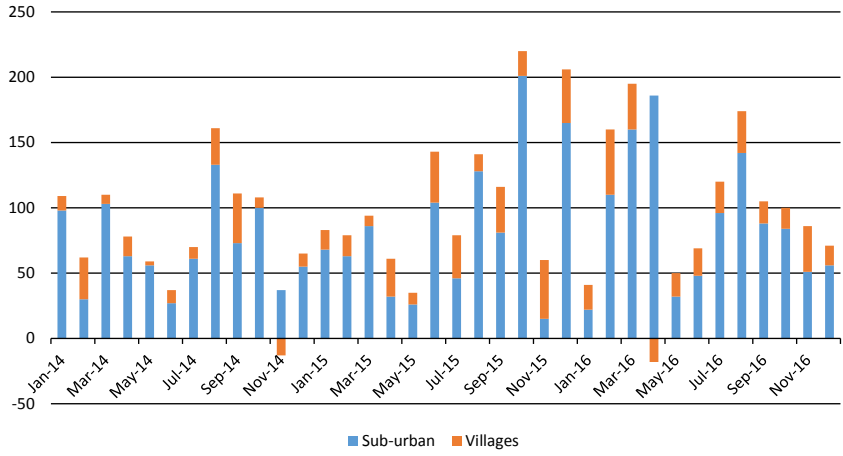

Fig. 1.3. Monthly Price Difference of Non-flood Low Houses versus Flood Low Houses for Sub-urban and Village Areas.

area is higher than in low flood area. This indicates that the flood hazard factor to the village areas along the Langat River is not as pronounced in the area. The record also shows residential sales for both flood and non-flood areas showed a declining trend in sales transaction volume from January 2014 to December 2018 Over the 24 months' observation period, the decrease in transaction volume for the residential non-flood-affected village areas was 0.04%, with the flood free recording decrease in transaction volume also with the same percentage (0.04%).

Fig. 1.3 shows the monthly price difference of non-flood houses and flood houses for both sub-urban and village areas from January 2014 to December