

WIND HAZARD MAPPING IN PENINSULAR MALAYSIA USING
GEOGRAPHICAL INFORMATION SYSTEM

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Thesis submitted in fulfillment of the requirements for the award of the degree of
B. Eng (Hons.) Civil Engineering

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LIST OF ABBREVIATIONS

GIS Geographical Information System

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ABSTRACT

Recently the increasing of wind related disaster numbers are frequently being reported in Malaysia. Wind hazard map distributions are widely used in wind engineering filed in estimating the potential of the risk specific area. However, most of the wind hazard map only considering extreme wind without incorporating other factors such as topographic and land use land cover. Therefore, this study presented the result of wind hazard map that integrated with other relevant factors. Three factors including extreme wind speed, hill slope and land cover type were used in this study. GIS based model used for generating the wind hazard map. The wind related damage inventory which has a total of 93 locations was created based on numerous resources such as a national newspaper archive. From the result in clearly shown that the skewness analysis given negative result which is means the tendency of the damage location are located at the high wind prone area. The validation of the result also shows that integrated wind hazard with others relevant factors give improved results compare to the conventional wind speed. For that reason this present wind risk map produce in this study would be useful for a hazard mitigation purpose and regional planning.

ABSTRAK

Dewasa ini meningkatkannya angka bencana yang berkaitan angin sering dilaporkan di Malaysia. Peta bencana angin digunakan secara meluas dalam bidang kejuruteraan angin dalam menganggarkan dan mengenal pasti potensi kawasan risiko tertentu yang berlaku bencana angin. Walau bagaimanapun, kebanyakan daripada peta bencana angina hanya mengambil kira angin maksima atau angin ekstrem tanpa menggabungkan faktor-faktor lain seperti kedudukan topografik dan liputan penggunaan tanah. Oleh itu, kajian ini membentangkan hasil peta bencana angin yang menggabungkan dengan faktor-faktor lain yang berkaitan. Tiga faktor termasuk kelajuan angin yang melampau, cerun bukit dan jenis liputan tanah telah digunakan dalam kajian ini. Model berasaskan GIS digunakan untuk menjana peta bencana angin. Kejadian kerosakan yang berkaitan dengan bencana angina telah direkodkan dari tahun 2007 hingga tahun 2015 iaitu sebanyak 93 lokasi kejadian. Ia berdasarkan sumber-sumber yang sahih seperti berita dari akhbar tempatan. Dari keputusan jelas menunjukkan bahawa analisis kecondongan mendapati keputusan adalah negatif yang bermakna kecenderungan lokasi kerosakan adalah terletak di kawasan angin yang tinggi terdedah. Pengesahan keputusan juga menunjukkan bahawa bahaya angin bersepadu dengan factor-faktor lain yang berkaitan memberi keputusan yang lebih baik berbanding dengan kelajuan angin konvensional. Atas sebab itu, peta risiko angina yang dihasilkan didalam kajian ini akan berguna untuk tujuan pengurangan bahaya dan perancangan wilayah yang lebih holistik.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Extreme wind is one of the major natural hazards experienced in Malaysia. 80% of natural disaster economic losses in the world are caused by extreme wind and its relevant events, in example combined effects of wind and water (Tamura, 2005). In Malaysia, recently numbers of damage and injuries has been reported due to wind hazard in past few years had increase in Malaysia. The impact of incident, the level of awareness among the respective people especially wind hazard have a great deal of influence on building design and the design of the other kinds of civil engineering structure. There are very little emphasizes of design building structure such a roof and cladding to minimize wind-induced damage to building. Many whole structures or parts of structure that fail do so because inadequate thought was given to wind action at the design stage (C. Dyrbye and S.O. Hansen, 1997).

Strong winds are the most common means of destruction associated with hurricanes. Their sometimes continuous barrage can uproot trees, knock over buildings and homes, sink or ground boats, and flip cars. (Department of Atmospheric Sciences, 2010).

Generally, most of the possibility risk of wind hazard is based on recent wind-induced damage to buildings structure in Malaysia is due to the thunderstorm. Wind load and geographical regions have a great deal to be considering on building design and the design of the other kind of civil engineering structures. Several study had made by previous researches in Malaysia. From the study made there are several factors are founded to contribute damage to building component. It can be concluded most of the failures cause by lack of the consideration due to wind effect during stage.

Currently in Malaysia, there are so many reports from mass media show that extreme wind events not only blew off roofs, damage the components of the building, uprooted tree but also the affects could possible extend to secondary damage such as cause injury and claim life to the human. Recently, the paperwork is to review extreme wind events occurrences in all over Malaysia from year 2000 to 2013. According to Mohd Fairuz Bachok (2012), summaries of 681 occurrences which contains of 681 locations and dates, 463 times and 147 durations indicated that extreme wind can be expected in Malaysia each year.

Based on Malaysian Metrological Department, usually thunderstorms can occur throughout the year but are most likely to happen in the inter-monsoon periods, namely April to May and October to November. Over the land, thunderstorms are more frequent at night.

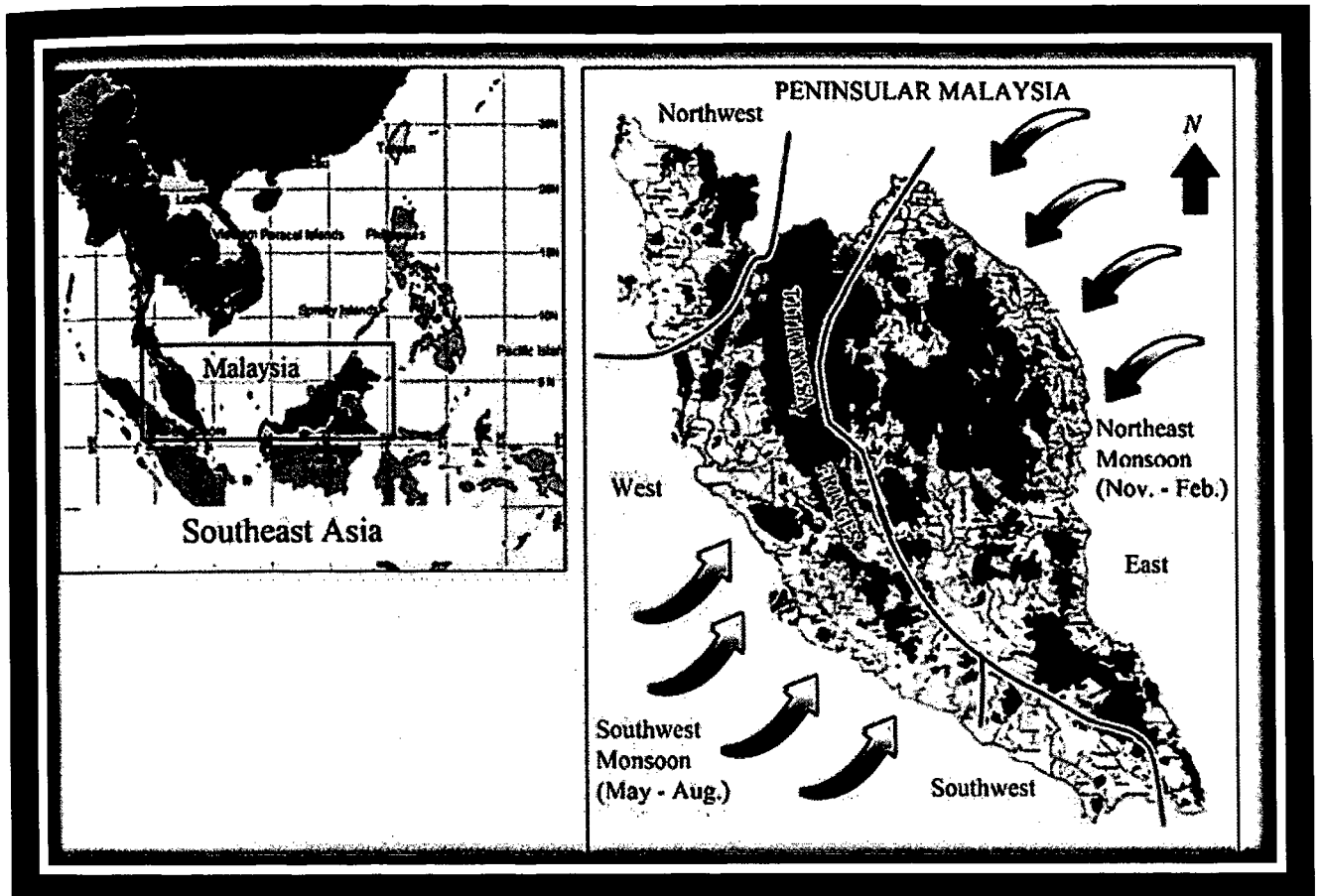


Figure 1.1: Monsoon in Peninsular Malaysia

The extreme wind is been determine base on ' probabilistic method that maximum wind speed can occur in a specific return period. However, there are still many factors that can contribute to wind hazard. The surround affect such topography and roughness had been neglected by the danger. Eventually, it seems important to consider the effect of surrounding. Currently, there certain highlighted issues already to surrounding effect to the structure can contribute hazarding by wind. According to Choi (2009), the wind speed is zero at ground surface and it increase with height above the ground within the atmospheric boundary layers (ABL).

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