Malaysia Country Report 2012: Wind Related Disaster Risk Reduction and Wind Environmental Issues

T.A. Majid [a], Noram I. Ramli [a,b], M. I. Ali [b] ,M. Syamsyul H. Saad [b]

[a] *Disaster Research Nexus,School of Civil Engineering, Universiti Sains Malaysia, Engineering Campus, Nibong Tebal,Pulau Pinang, Malaysia*
[b] *Faculty Civil and Earth Resources Engineering, Universiti Malaysia Pahang, Kuantan, Pahang, Malaysia*

ABSTRACT:

This country report describes recent domestic activities and developments in the field of wind engineering. It includes activities from several agencies and organization in Malaysia. Furthermore this paper also highlights recent wind related disaster and wind environmental issue in Malaysia.

KEYWORDS: Wind Engineering, Wind Hazard, Wind Environmental, Malaysia

1 INTRODUCTION

The severity and increased frequency of wind-related disaster events over the last five years in Malaysia has shifted the attention from the several researchers towards to investigate the effect of wind effect to building structure in Malaysia. The further understanding related to disastrous wind events in Malaysia are very significant to towards the improvement of national and international wind standards and building codes. The research effort produced valuable outcomes which become a references and basis for the engineer and researchers regarding wind related disaster.

1.1 *Recent damage of extreme wind event.*

Currently in Malaysia, Wind Related Disasters is not being given priority due to lack of expertise and awareness among the Malaysian. Incidences of damaged houses have been reported in daily Newspapers. From the reported news, it is observed that most of the damage occurs in northern region on peninsular Malaysia. The climate change in the world has resulted in significant increasing in the numbers of incidences of freak wind storm in Malaysia. It is of vital that study be carried out to under the characteristics of such freak wind storm. Such basic understanding is important in the formulation of suitable practical solution to minimize damages to buildings due to freak wind storm and more importantly avoiding tragic loss of human life as flying debris such as flying zinc metal sheets are deadly weapon. Numbers of damage of wind related disaster has been recorded in Malaysia.

Damage due to wind occurs due to lack of concern regarding wind effect to building structure. Moreover most codes of practice do not reflect much the structural system and materials used in Malaysia practice. It is clearly shown that repeated type of damage occurs at different places in Malaysia. However, no concrete measure has been seen to be taken to address such potential dangerous hazard. Therefore Disaster Research Nexus (DRN) and Faculty of Civil Engineering & Earth Resources, University Malaysia Pahang had established wind storm division to investigate the potential of freak wind storm.

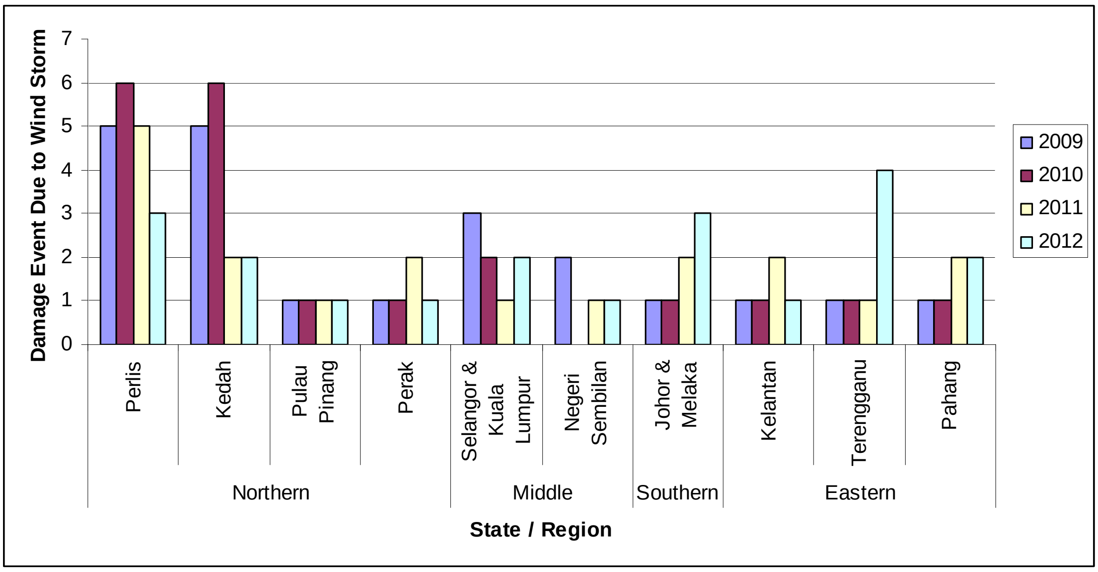

Figure 1: Statistic of damage due to Wind Storm for Peninsular Malaysia (Jan 2009 – June 2012)

1.2 *Intensity of the Thunderstorm*

Malaysia is located near the equator. In general, the wind climate is dominated by the two monsoon seasons and the inter-monsoon thunderstorms. The northeastern monsoon blows from December to March, usually accompanied by heavy rains. Around June to September, there blows the southwestern monsoon which is slightly tranquil. Thunderstorms frequently occur during the inter-monsoon periods. Although thunderstorms are localized phenomena, they often produce significant strong and gusty surface winds. These winds from thunderstorms are relatively stronger and more turbulent than those of monsoon winds. (Choi, 1999) Unlike in cyclone prone region, the thunderstorms in Malaysia occurs in micro scale (Yusoff , 2005). Despite their small size and short duration of thunderstorm which is about 15 to 30 minutes. Every thunderstorm produces lightning which has the potential to kill people. H Heavy rain from thunderstorms can lead to flash flooding and landslides. Strong winds and hail are also dangers associated with some thunderstorms

The result had greatly impact to building structure in Malaysia especially for low rise building. From 80 damage cases related to thunderstorm in Peninsular Malaysia, it is clearly identified that most of the damage is occurred related to roofing system. Damage to roof tiles, steel sheet roofing, destructive of roof truss are been recorded recur. From the result 47 % damage in steel sheet roofing,30 % damage on truss system, 13 % damage of roof tiles and 20 % for other related damage are been identified. Base on the investigation also found that the wind speed are been identified up to 37m/s to 49m/s (Majid et al. 2011 , Lee et. al. 2008).

1.3 *Application of GIS Technique to Identify Wind Hazard Potential.*

The risk of wind hazard problems due to wind storm is become important *issues* in Malaysia. The lack of information regarding wind hazard are rigorously needed in order to reduce the risk reduction. The lack of information had result the weakness consideration in design stage. Therefore Wind Engineering Research Group (WERG) Faculty of Civil Engineering & Earth Resources, University Malaysia Pahang, have initiated to establish the wind hazard database and also the developed the wind hazard index by considering the effect of wind speed, topographic and roughness length by using GIS and Remote Sensing Technique. GIS allows users to perform complex analysis by linking data layers and overlaying different data sets to a spatial perspective.

1.4 *The Effect of Wind Hazard on Rural Roofing System*

Numbers of damage of wind related disaster has been recorded in Malaysia. The numbers of damage is constantly increasing yearly with rapid growth of development. From the numbers the major damage occurred in rural area where lack of concern regarding wind effect to building structure. From the previous study carried out, it is found that most of the failure occurred in structural system such as roof and truss. Uplifting of roof system during wind storm has caused damage to the buildings. Generally failure occurred at two points either at roof to wall connection or at roof sheeting frame. The initiative had been carried out by Disaster Research Nexus (DRN) to reduce the wind hazard risk especially for rural area. Further than that DRN has proposed the research project regarding thus matters. As a result 60,000 US Dollar have awarded to conduct this study. The main objectives of the proposed project are as follows:

1. To investigate the roof structure system that frequently fails during thunderstorm.
2. To analyse the performance of typical roofing system under wind load in accordance with Malaysian construction industry practices.
3. To obtain the relationship between pull-out resistance of fastening system used in normal roof sheeting system.
4. To obtain the relationship between pull-out resistance of fastening system used in roof to wall connection.

2. WIND ENVIRONMENTAL

This part of report highlights some relevant aspect of wind environmental in Malaysia.

2.1 *Outdoor Air Quality*

The DOE monitors the country's ambient air quality through a network of 51 continuous monitoring stations. These monitoring stations are strategically located in residential, urban and industrial areas to detect any significant change in the air quality which may be harmful to human health and the environment. The air quality status is reported in terms of Air Pollutant Index (API) (http://www.doe.gov.my). The air quality in Malaysia is described in terms of Air Pollutant Index (API). The API is an indicator of air quality and was developed based on scientific assessment to indicate in an easily understood manner, the presence of pollutants and its impact on health. The API system of Malaysia closely follows the Pollutant Standard Index (PSI) developed by the United States Environmental Protection Agency (US-EPA). The air pollutant index scale and terms used in describing the air quality levels are as follows: API scale Air quality,0 – 50, Good,51 – 100, Moderate,101 – 200, Unhealthy, 201 – 300, Very unhealthy,301 and above Hazardous

The air pollutants used in computing the API are ozone (O1), carbon monoxide (CO), nitrogen dioxide (NO2), sulphur dioxide (SO2) and particulate matter of less than 10 microns in size (PM10).

Table 1 : Malaysia Ambient Air Quality Guidelines (Outdoor)

Pollutant	Averaging Time	Malaysia Guideline	
		Ppm	($\mu g/m^3$)
Ozone	1 hour	0.10	200
	8 hour	0.06	120
Carbon Monoxide	1 hour	30.0	3.5
	8 hour	9.0	
Nitrogen Dioxide	1 hour	0.17	320
	24 hour	0.04	10
Sulphur Dioxide	1 hour	0.13	350
	24 hour	0.04	105
Particulate Matter (PM_{10})	24 hour		150
	12 months		50
Total Suspended Solid (TSP)	24 hour		260
	12 months		90
Lead	3 months		1.5

2.2 *Indoor Air Quality*

Good indoor air quality is desired for a healthy indoor environment. Poor indoor air quality can cause a variety of short-term and long term health problems. Health problems commonly associated with poor IAQ include allergic reactions, respiratory problems, eye irritation, sinusitis, bronchitis and pneumonia. IAQ problems arise in non-industrial buildings (an indoor or enclosed work space that is served by a common ventilating and/or air conditioning system where there are person at work, but does not include premises that are used primarily as manufacturing and production facilities and vehicles) when there is an inadequate quantity of ventilation air being provided for the amount of air contaminants present in that space. Hence, IAQ and heating, ventilation and air-conditioning systems (HVAC) are closely related. Therefore the government of Malaysia had replaced the previous code of Practise on Indoor Air Quality. This Industry Code of Practice is known as the Industry Code of Practice on Indoor Air Quality 2010 approved by the Minister on 30 August 2010 and will replace the Code of Practice on Indoor Air Quality launched by the Minister on July 2005

Table 2 : List of Indoor Air Contaminants and the Maximum Limits

Indoor Air Contaminants	Eight Hour Time Weighted Average Airborne Concentration	
	ppm	mg/m^3
Carbon dioxide	C1000	
Carbon monoxide	10	
Formaldehyde	0.1	
Respirable particulates		0.15
Total volatile organic compounds	3	

Where

- C is the ceiling limit
- mg/m^3 is milligrams per cubic meter of air at 25° Celsius and one atmosphere pressure.
- ppm is part of vapour or gas per million parts of contaminated air by volume

CONCLUSION

Wind Hazard is not sound noted in construction industry in Malaysia. Further study work should be carried out to gather more information for better understanding of wind characteristic in Malaysia. Moreover most of the codes of practice used in Malaysia do not reflect much the structural system and materials used in Malaysia practice. Further work and collaboration between agencies need to be enhances in order to resist wind hazard impact. The commitment from the government regarding wind environmental issues are very impress where the new act amendment has been force to ensure the air quality in indoor and outdoor workplace.

ACKNOWLEDGEMENT

The author would like to thank the all respective persons for their supports in information for writing this report. Furthermore we would like also to our

REFERENCES

1. E.C.C Choi "Extreme Wind Characteristic Over Singapore – An Area in the Equatorial Belt " Journal of Wind Engineering and Industrial Aerodynamic, Volume 83, Issues1-3 November 1999, Pages 61–69
2. T.A. Majid, S.S. Zaini, and Noram I. Ramli "Collapse Analysis of Car Porch SteelStructure due Wind Storm" International Journal of Civil Engineering and Geo-Environment (2011) pp71-74
3. Yusoff A., "A study on the characteristics of thunderstorm at Telekom Malaysia communication center, Seberang Jaya, Penang"., MSc Dissertation, School of Civil Engineering, Universiti Sains Malaysia. (2005)
4. Lee Sid Hwa "Failure of Roof Structure due to Wind Load" MSc Thesis, Faculty of Civil Engineering, Universiti Teknologi Malaysia, (2007)
5. Act 1441"Environmental Quality – amendment act 2012" Law of Malaysia (2012)
6. MS1553:2002 "Malaysia Standard Code of Practice on Wind Loading for Building", Department of Standards Malaysia
7. Malaysian Meteorological Department Annual Report (2011)