

UNIVERSITI TEKNOLOGI MARA

**OUTDOOR WIND BEHAVIOUR
AND WIND COMFORT
OF COASTAL RESORTS IN
MALAYSIA**

**WAN MOHD TAUFIQ BIN WAN
JABARUDIN**

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AUTHOR'S DECLARATION

I declare that the work of this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

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Name of Student	Wan Mohd Taufiq Bin Wan Jabarudin
Student I.D. No.	2010790843
Programme	MSc in the Specialism of the Built Environment - AP780
Faculty	Faculty of Architecture, Planning and Surveying
Thesis Title	Outdoor Wind Behaviour and Wind Comfort of Coastal Resorts in Malaysia
Signature of Student
Date	July 2016

ABSTRACT

The existence of buildings inevitably changes the external micro-climate within the surrounding where the wind pressure, wind speed and air temperature are the main driving forces. Planning factors should not only focus on improving indoor air condition but to include its effect on the outdoor environment particularly exploiting the wind for pedestrian wind comfort and safety. This aim of the study is to supplement knowledge on the prediction of the outdoor wind behaviour as an improvement to pedestrian comfort using wind forces in buildings along coastal regions of Malaysia. The objectives set out to study on the wind behaviour around the building and the wind effect on human achieving outdoor comfort and suggesting a suitable planning layout based on the study. This research scope focus on the outdoor wind around the beach resort which was used as the case studies and their layouts were remodelled and simulated using PIV in the wind tunnel and CFD. The microclimates data taken from meteorological station and data for surrounding surface roughness for coastal area were used to simulate boundary condition. The case studies namely, Merang Sutra Beach Resort (MSBR), Sematan Palm Beach Resort (SPBR) and Lexis Port Dickson (LPD) differ from one another in terms of building arrangement, geographical locations and prominent wind directions. The result on Discomfort Indoor and Outdoor Probability indicated that wind is sufficient to achieve the outdoor wind comfort. However, it does not conform in long exposure areas where the hourly wind speed probability be less than 80% acceptability. The P_{\max} for Safety and Wind danger indicates that the wind is still in preferable condition. The conclusion drawn from the PIV simulation showed the channelling of wind between buildings resulted in an increase in velocity. In most cases, a suitable layout for beach resort face prevailing wind from the sea, but, in some region, the prevailing wind comes from the land. It is recommended that a study on the microclimate need to be carried out on the new development for sustainability

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 INTRODUCTION

Wind is one of the main climatic factors influencing the design of buildings. Its most disastrous effects were seen in the collapse of structures such as in the most recent local tragedies where downpour and strong winds wreaked havoc in several areas in Shah Alam and Kajang. The storm damaged several buildings, including school roof which was ripped apart, advertising billboard come crashing down and excavators and cranes were moving with the wind.

In Malaysia the effect is rapidly increasing. Therefore, it is a need to address wind disaster in design consideration. The design of buildings to withstand wind loads has been a subject of many researchers. The environmental aspect of the pattern and flow around the building include ventilation, noise and air pollution, heat gain and loss, daylight, solar radiation, rain penetration and the micro-climate among the buildings has its effect on pedestrians. It is a concerned of architects and town planners in designing the forms and layout to provide safe and comfortable conditions especially in open pedestrian conditions to nullify its exposure to strong winds reflected by the physical elements. These elements, in nature, are an obstacle to the wind. The pattern around the building depends upon the characteristics of the prevailing winds, the nature of the surrounding, the size and forms of the buildings. With the existence of building and other physical forms, might also bring changes to the condition of the surrounding micro-climate which either is favourable or non-favourable. This outdoor climate's change will effect in three ways as shown on *Figure 1.1*