IMPLEMENTATION OF VERTICAL GREEN SYSTEMS IN COMMERCIAL BUILDINGS IN MALAYSIA

BY

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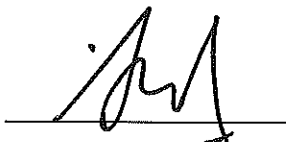
DECLARATION

I, LIEW CHIEW YEE (ID: I12001416) confirm that the work in this report is my own work and the appropriate credit has been given where references have been made to the work of other researchers.



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ABSTRACT

This research is to investigate the major challenges of implementing vertical green systems (VGS) in the commercial buildings in Malaysia. Due to rapid urbanization, it caused in loss of greenery and created a host of environmental issues. To achieve more sustainable patterns of life, greening systems are frequently used as an aesthetical feature in buildings and make part of a sustainable strategy for urban canyon. Hence, VGS become a growing trend to replace greenery back to buildings with the integration of greenery on the surfaces or walls of a building.

First, with the information obtained in the reviewed literature some key aspects are clarified, such as the classification systems, the plant species, benefits and difficulties when working with VGS. In addition, qualitative research methodology has been used to investigate the perspective and difficulties of implementing such system from the perception of professionals in Malaysia. It is important to understand the main matter in development of VGS in current market.

The result reveals 4 out of 5 interviewees agree that VGS is suitable being implemented in Malaysia. Through combination with a proper design and new technologies in this era, VGS is worth to be used as passive tool for energy saving in buildings. However, the main difficulty that restricts the implementation of this system is the cost effectiveness. Clients must have the willingness and commitment to look after the planting and pay for the services as it requires a high maintenance budget. Moreover, it is better to have manufacturer for the VGS components in Malaysia as most of the modular are imported oversea.

Hence, there is a need to further studied and examined some aspects in depth, such as which species are the most suitable for each system, life span of plants, effects on energy saving of the facade orientation and maintenance issue for VGS in Malaysia.

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CHAPTER 1

INTRODUCTION

1.1 Background

Rapid urbanization had change city features and converts them to concrete jungle (Safikhani et al., 2014). Mitigation into urban areas and increasing population lead to some problems like air, water and noise pollution, lack of vegetation, increasing urban heat island etc. Thus, these environmental consciousness increments has led towards sustainable development in the urban systems and building design. Sustainable building in the form of greenery systems is being hyped as an effective way to mitigate some of these drawbacks (Manso and Castro-Gomes, 2015).

Basically, there are two main greenery systems which are green roofs and vertical green systems (VGS), integrate vegetation into a building. In fact, in the case of vertical greenery of buildings, when applied in a significant urban area can improve the urban environment by contributing to urban air quality (Pugh et al., 2012), reducing temperature, mitigate the heat island effect (Gago et al., 2013) and aesthetics improvement (Ozgur and Elif, 2013). For example, Singapore applied greenery designs to enhance livability and as aesthetical feature in building (Mithraratne and Low, 2014).

However, the use of VGS have a greater potential than green roofs since the surface area of façade greening is always greater than or double the area of roof (Kohler, 2008). According to Mir MA (2011), control temperature by using vertical green systems is a fresh idea and needs more consideration. Specifically, VGS require special technique in implementing into buildings, where these systems will be more challenges in act as a passive tool for energy savings in buildings (Perez et al., 2014).

A result shows that the investigations of green walls are not equally distributed around the world, being basically concentrated in Europe and Asia (Perez et al., 2014). Furthermore, lack of awareness of environmental issues and public information about benefits of vertical green systems cause people not conscious enough about this topic. Therefore, the purpose of this research is to investigate the challenges and difficulties in implementing vertical green systems and whether they are suitable being implemented in Malaysia.

1.2 Aim

- To determine the challenges and methods of implementing vertical green systems for commercial buildings in Malaysia.

1.3 Objectives

- To investigate the application of vertical green systems in commercial buildings in Malaysia.
- To discuss strategies for adapting vertical green systems to commercial buildings in Malaysia.

1.4 Problem Statement

In this present concrete complex of numerous developed and developing countries, such as Malaysia has experienced an expected loss of green space due to rapid urbanization resulted in altering of natural vegetation with buildings, pavement and others. Thus, create a host of environmental issues which had led to a growing of sustainable concept awareness in Malaysia construction practices (Zainul Abidin, 2010). These environmental sustainability movements have brought a new wave of interest in integration of plants into the building design (Wood, Bahrami and Safarik, n.d.).

Incorporating of plants into vertical surfaces of architecture had developed the concept of green walls, which become famous in recent years through the 'vertical gardens' of French botanist, Patrick Blanc (Blanc, 2008). In addition, there is a report written by researchers at the University of British Columbia about the latent feasibility and factors of applying vertical green system (Shiah, Kim and Oldridge, 2011). Therefore, vertical green systems have become an important design and

concept for architects who with the innovation in integrate greenery into existing facades and the new construction for buildings (Wood, Bahrami and Safarik, 2014).

1.5 Key Questions

- What type of green walls is being applied for commercial building in Malaysia?
- What are the barriers encountered during implementation of Vertical Green Systems?
- What are the strategies for adapting Vertical Green Systems to commercial buildings in Malaysia?

1.6 Importance of Study

Malaysia had been known as one of the fast growing developing countries in the East. Since independence 1957, the rapid urbanization and urban growth have caused a huge migration of people from countryside to urban area (Zaid et al., 2009). According to the National Urbanization Policy 2006, the rate of urbanization for Peninsular Malaysia has experienced a massive growth and is expected to increase in the future (TCPD, 2006). As a nation with the vision to become a developed country by year 2020, several problems will arise along the rapid development process.

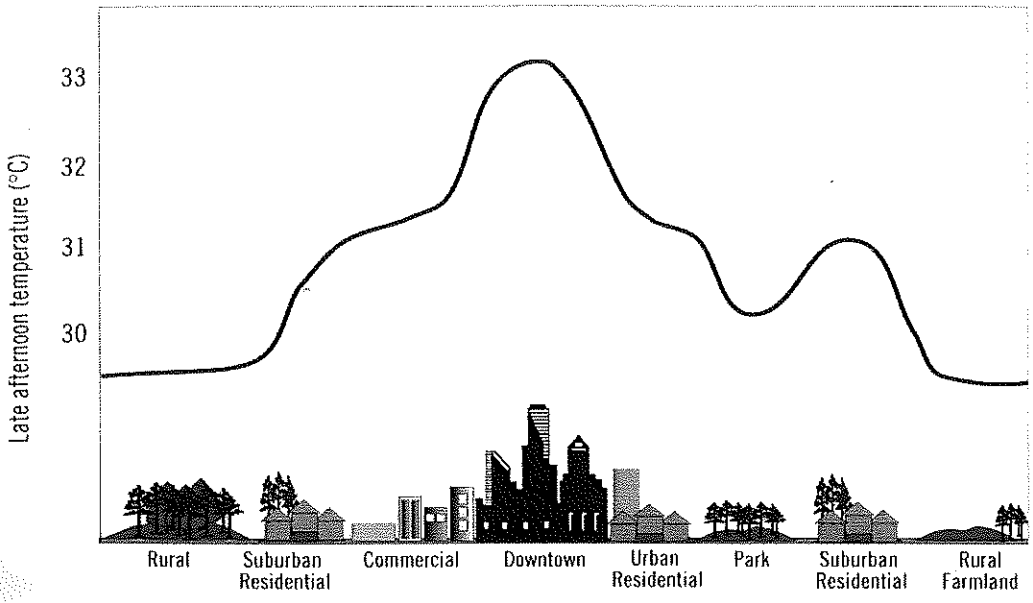

Figure 1.1: Urban Heat Island (UHI) (Nrcan.gc.ca, 2013)

Urbanization and urban growth negatively impacts the environmental mainly by the production of pollution, covering of the soil surface, and rapid rate of urbanization. Summary from all these impacts, a cumulative effect is presented, the urban heat island (UHI). According to National Geographic Society (1996-2015), an urban heat island or UHI, is a metropolitan area that is significantly warmer than its surrounding rural areas due to general human activities and overdevelopment. As figure below shown that the urban surface absorbs heat and tall buildings prevent heat from dissipating and thus reduce air flow. At the same time, there is little vegetation to provide shade and evaporative cooling, results a rise in temperature of the area comparatively to the surrounding area.

Nowadays, UHI has become a tradition in a prosperity country and the heat index has a rapidly increased over these years. High demand and supply to fulfill human desire, high populations and heavy industrialization has considered as a significant impact of resulting in UHI. The heat index in Malaysia's major cities, such as, Penang, Kuala Lumpur, and Selangor has been experiencing an

extreme change in urban expansion due to growth in industrial and residential areas (Sin and Chan, 2014). There is a case in the city of Sydney, rapid urbanization in the city has resulting in less green space, as a result, the major council have recognized vertical green systems as green space to be part of the planning process (Mark, 2011). This acknowledgement is the kick start of the encouragement and awareness of the status of green walls in prosperous cities where urban development is growing wild concurrently.

Chiang and Tan (2009) stated that vertical green systems are the combination of vegetation into built forms in the city, any surface or area of the structure. Vertical greening concepts can be divided into two broad categories; they are green facades and living wall. Green Roofs Organization (2008), a rapidly growing not-for-profit industry association working to promote the industry throughout North America, stated that green facades serve as a support system because the climbers and creepers grow vertical to cover specially designed supporting structure. While for the living wall, it can be serves as a carrier system. Such system comprises of pre-vegetated modules, vertical panels or planted blankets that are fixed to a structural wall vertically in order to get a formation of greater diversify of plants, including ferns, grasses or groundcovers.

Vertical green system has becomes a strategy to green the city by manipulating larger wall spaces available in urban area and functions as a sustainable approach in which reduce heat, energy saving, and increase cooling effect on all areas around the building. Application of VGS can enhance thermal comfort in both internal and external of building by reducing heat transfer to and from building wrapper (Stec, 2005). Plants absorb an amount of solar radiation for photosynthesis, shade building from solar radiation and re-radiation to atmosphere (Wong, 2010).