SUSTAINABLE FUTURE URBAN PATTERNS AND SOCIO-ECONOMIC ACTIVITIES OF TROPICAL WETLANDS IN SOUTHEAST ASIA

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Summary

Poor control of development in urban areas of Peninsular Malaysia has created major problems for the existing tropical wetlands. The shift of national economic development since the 1980s from agriculture and mineral resources to industrial production is the reason for rapid urbanisation and its consequent environmental degradation. Forest clearing and land reclamation activities for urban development are two major factors that have degraded the wetlands. The high level of soil erosion is a direct consequence of forest clearing and wetland reclamation, with constant flooding a secondary effect of deforestation.

Since the period of colonisation, there has been active land reclamation and draining for foreign plant life, especially rubber and palm trees. It is the goal of this article to examine the different built environments of villages that exist in the tropical wetland zones of Malaysia. It will be shown that the stereotypical “village” is only one of several village settlement types which could be used as models for environmentally sustainable growth in these regions in Malaysia. We will examine the “fishing village” as a model of low-rise but high-density built environments. Further research is needed to ensure that traditional housing patterns and houseforms are seen as potential alternative solutions to housing development in urban areas in Malaysia.

1. Introduction

Rapid growth of urban areas has been experienced in Peninsular Malaysia (see Figure 1) since 1980s due to drastic growth of the economy. The growth indirectly threatens the existing tropical wetlands, as most of the urban developments are located within a few kilometres from the coast line along the river system. One of the reasons for the development is to provide houses and public infrastructure for the urban population, which inevitably increases in urban areas due to rural-urban migration. In 1921, the urban population in Malaysia constituted 10.7% of the total population, but by 1990 the population had increased to 49%. Kuala Lumpur, the capital city, has experienced the highest increase of urban population and annual rates of urban growth. For example, the total population of Kuala Lumpur in 1901 was 32 380 and the area was 8 square miles. By 1957, the population had grown to 316 230 with an area of 36 square miles. In 1985, the population had increased to 1 139 500 over an area of 94 square miles (*General Report of the Housing Census*, 1995). The population in this capital city is currently (2004) more than 4 million. Terraced houses are the most popular house type in Malaysia. There were 2.63 million housing units in 1980, but by 1991 the total units had almost doubled to 4.09 million. In other words, the number of houses had increased by 155% between 1980 and 1991. Housing development reached its peak in the 1990s. This increase is primarily in the cities and towns, which have become centres for industry, administration and trades.

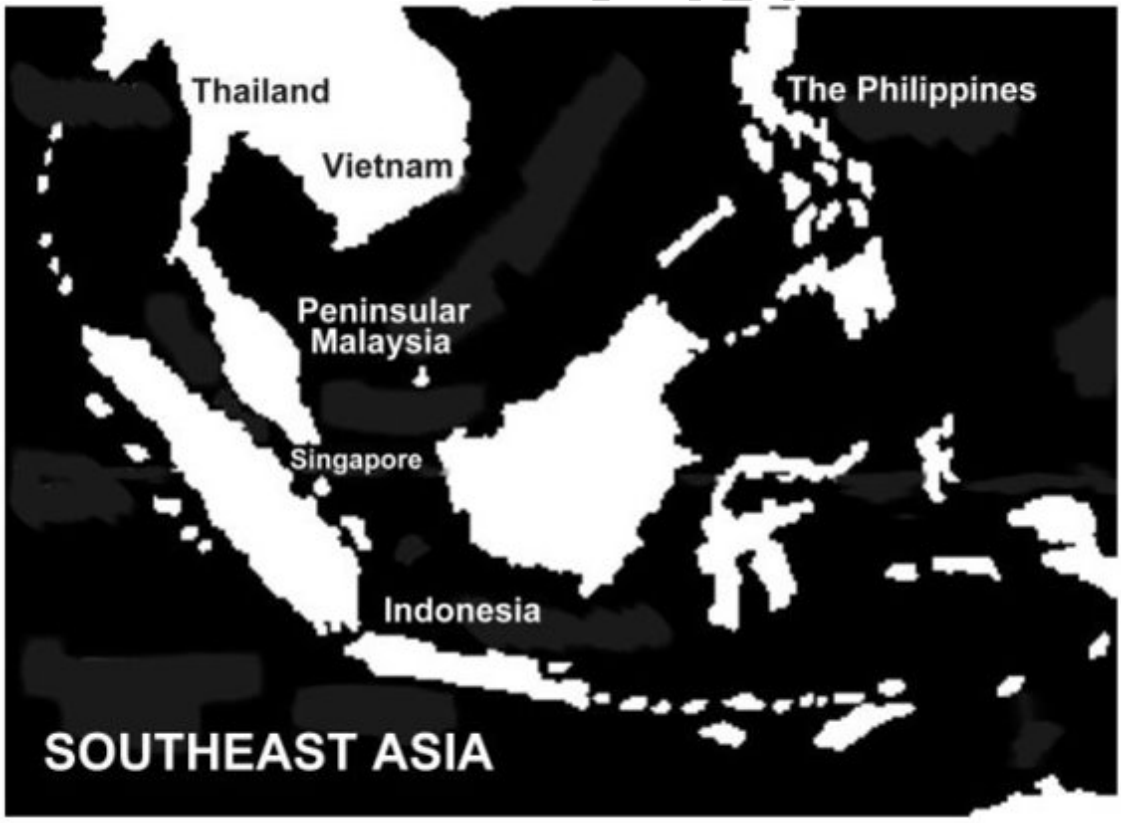

Figure 1:Location of Peninsular Malaysia in Southeast Asia

In Peninsular Malaysia, wetlands are one type of tropical rainforest. The formation of wetlands is influenced by climate, distance from the sea and river system. The region has a tropical climate with high annual rainfall of more than 1900 mm. It is surrounded by ocean with nowhere being more than 200 kilometres from the sea (see Figure 2). There are more than 100 rivers with about 1800 sub-rivers and tributaries in Peninsular Malaysia with a total length of more than 38 000 km. The tropical wetland ecosystem in this region is now one of the most vulnerable and most threatened of any on earth, because the riverside areas offer the best facilities for the origin and growth of towns. In terms of planning and construction perspectives, earthwork activities for urban development are major causes of degradation of the existing wetlands.

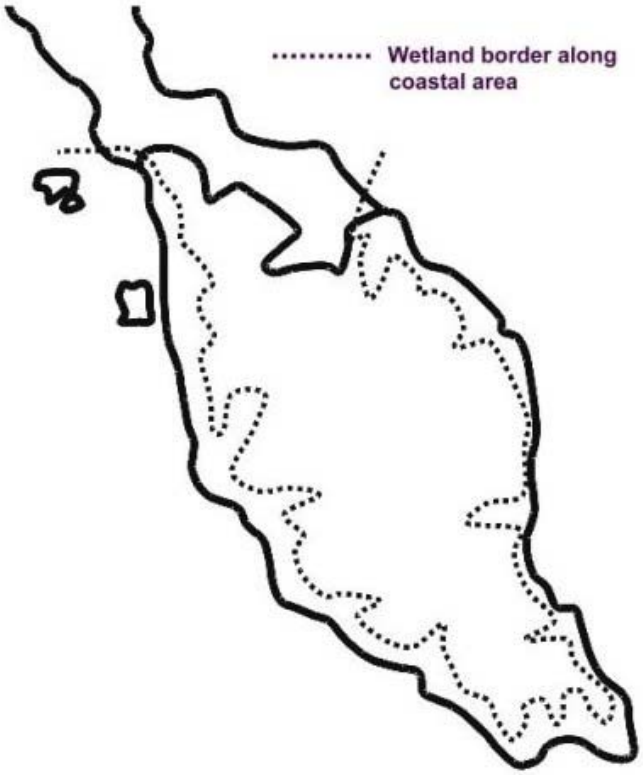

Figure 2: Area of wetlands in Peninsular Malaysia

The two major factors of the earthwork activities are forest clearing and land reclamation. Large areas are being converted because of urbanisation needs, without firstly determining their suitability for this purpose or considering the importance of their existing role in local, regional and global environmental functions and processes. Wetland areas are greatly affected because it is usually taken for granted that almost all settlements and cities should be constructed along the river system.

The result of these activities causes high concentrations of suspended sediment in downstream stretches of the rivers. The lower stretches of the rivers are characterised by heavy silt loads, especially after heavy rains. This development is a direct consequence of clearing wetlands for land reclamation for cash-cropping.

The development causes high levels of soil erosion, especially during the rainy season, and an increase in flood-prone areas. This high level of soil erosion is one of the many reasons that twenty-five rivers in Malaysia are classified as flood-prone; consequently, the government had spent a total of RM930 million (US$250 million) for flood mitigation programmes (see Abdullah K., 1999).

The problem is that, today, many wetlands are reclaimed for development. Although man-made drainage systems, multi-purpose dams and reservoirs were built, these structural measures are not able to stop floods or droughts from frequently occurring in those affected areas. The construction of drainage systems, multi-purpose dams and reservoirs has instead posed many environmental issues.

The role of the wetlands in sustaining ecosystems is very crucial. Some areas in the tropics are naturally covered in wetlands in order to sustain the river system and its surrounding environment. The wetlands, including mangrove, peat, palm and freshwater swamp forest, function as a giant sponge to prevent floods from happening on flood-prone areas in upper dry regions. When the region receives excessive rainwater, especially during the rainy season, and the river is unable to drain such a large quantity of water at one time to the sea, the water is trapped on the wetland.

The wetlands absorb the water and this prevents flooding in the more densely settled areas. On the other hand, during the dry season, the soil structure of the wetlands shrinks to release water to the river so that the river does not dry up; this provides irrigation and drinking water to all ecosystems. The wetlands are also responsible for balancing the level of water in the river. Another important role of the wetlands is to provide a buffer zone for the river system against intrusion of salty seawater.

The differences can be identified with the changes of pH level of each type of wetland, from the high alkaline level of water in the mudflats, mangrove and palm forest, to the neutral pH level of water in the freshwater forest, to the acidity of water in peat forests. The differences in the pH levels help to filter pollutants while they are carried by the river to the sea. In other words, the natural role of wetlands is to support diverse plant and animal species and human beings, and to maintain the regional topography, ecosystem and ecological process.

It is the goal of this research to propose an alternative solution to the current development of urban areas and to construction practices which are not sensitive to sustainable development based on the existing environment of the region. The proposed model is based on the patterns of the local fishing villages and the concept of the traditional house-form.

The study proposes suggestions that contribute to planning and design based on traditional patterns so that the proposals can be adopted by the national housing industry. Changes are crucial because development of the patterns is concerned with social and environmental aspects. Further research is needed to ensure that traditional housing patterns and houseform are potential alternative solutions to housing development in urban areas in Malaysia.

2. Traditional Socio-economic Activities

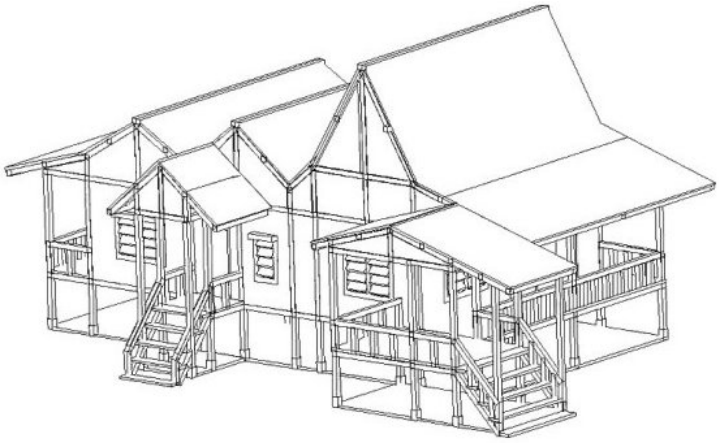

Figure 3: A traditional house in Peninsular Malaysia (CAD drawing)

A house is one of the three most basic human needs besides food and clothes. It provides its occupants with comfort, health and safety. The traditional houseform (see Figure 3) embodies patterns of socio-economic activities of society in tropical wetlands. It symbolises the culture of the people, and it functions as a place of survival for those who live in this environment—not only economic survival for the inhabitants but also natural survival of the ecosystem, as argued by Rapoport (1969).

Types of flora commonly found in traditional coastal wetland settlements are casuarina, palm, gelam (*Melaleuca*), mangrove (*Avicennia, Bruguiera* and *Rhizophora*), 'penaga laut' (*Calophyllum*), 'ketapeng' (*Terminalia catappa*), pandanus, and thorns while types of fauna are prawns, crabs, squirrels, monkeys, egrets and other shore birds, deer, aquatic insects, cockles, and fishes. He asserts that the design is due to regional and climatic factors which typify the influences of geographical conditions in shaping houseform and culture of various indigenous peoples in the world. Patterns of living have evolved out of environmental adaptation, in particular to a relationship to economic activities, and rivers play an important role in the development, as noted by Lim (1987).

Traditional villages are built in groups because it is impossible for one family to live isolated from the community in the rainforest environment. Each village is self-sufficient, having been intentionally planned on the assumption that there would be no frequent economic dependency on basic economic resources from other villages. The villagers rely on mixed agriculture and raise animals for their daily food. The rainforest and wetland topography creates a barrier between villages so preventing the people from having great outside contact for economic purposes. Communication is only possible through the river system. There are two types of traditional villages—villages in paddy fields, and fishing villages. Each village evolves on the unique topography which has shaped the villager's socio-economic patterns. Villages in paddy fields are inland agricultural settlements located along river systems and their tributaries, whereas fishing villages typify settlements along coastal regions where fishery is a major socio-economic activity.

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Biographical Sketch

Associate Professor Dr. Ahmad Sanusi Hassan is a lecturer in the Architecture Programme at the School of Housing, Building and Planning, University of Science Malaysia (USM), Penang, Malaysia. He earned a Bachelor and Master of Architecture (B. Arch & M. Arch) degrees in 1993 and 1995 respectively from the University of Houston, Texas, USA. At the age of 29, he was awarded a Doctor of Philosophy (Ph. D) degree in 1998 from the University of Nottingham, United Kingdom. His research is focused on sustainable architecture and construction, and urban design for Southeast Asian tropical wetlands. He is one of the nine regional writers, three of each from Asia, Africa and South America, who have been involved in the preparation of *Guideline: Agenda 21 for Sustainable Construction in Developing Countries: A Discussion Document* edited by Chrisna du Plessis, published by The International Council for Research and Innovation in Building and Construction (CIB), and United Nations Environment Programme International and Environmental Technology Centre (UNEP-IETC), which was launched at *The Earth/World Summit*, Johannesburg in September, 2002. At the university, he lectures in courses related to sustainable urban design, sustainable architecture and construction, Computer Aided Design (CAD), and computer movie animation. He has integrated all these specialisations into his research, teaching, consultation and publications. He is very active in paper publications, having written more than 30 conference and journal papers, and five books since he started working as a lecturer in 1998.