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## **Ecological Landuse Planning and Sustainable Management of Urban and Sub-urban Green Areas in Kota Kinabalu, Malaysia**


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## **1.0 Introduction**

### **1.1 General Background**

Malaysia has been identified as one of the world's mega diverse countries being extremely rich in biodiversity. Tropical rainforests, the oldest and most biologically diverse ecosystems on earth cover an average 60 % of the country (Soepadmo, 1998). Malaysia rainforests are estimated to contain about 12,500 species of flowering plants, and more than 1,100 species of ferns and fern allies (Ministry of Science, Environment and Technology, 1998). The dominating plant family is dipterocarp trees, many of which produce commercial timber and native to Borneo (and also to Peninsular Malaysia, Indonesia, Philippine, Thailand etc). Large portions of these species are endemic and unique to the Malaysian archipelago.

There is also great diversity in fauna, including about 300 species of wild mammals, 700-750 species of birds, 350 species of reptiles, 165 species of amphibians and more than 300 species of freshwater fish. Endemism in fauna is also high, and much of the traditional knowledge about the endemic flora and fauna are heritage of many traditional societies and communities that are dependent on them for their very survival (Soepadmo, 1998).

In line with the Malaysian economic development, native plant resources have been tapped and new plants are introduced to support certain industries. Rubber and oil palm, for example, are both introduced and became the two most commercially important crops. In term of land coverage, Malaysia covers an area of about 32.86 million hectares, these include Sabah, with an area of 7.37 million hectares, and Sarawak, with about 12.33 million hectares, bordering Indonesia's Kalimantan territory. Peninsular Malaysia covers an areas of about 13.16 million hectares bordering Thailand in the north and Singapore to the south.



Figure 1: Map of Malaysia (*Sources: Anonymous, 1999*)

With the population of approximately at 25.6 million in 2004, Malaysia is a multi-racial country comprising main racial groups of Malays, Chinese, Indians, and a very diverse group of indigenous tribes. Sabah's indigenous groups include the Kadazandusun, Bajau, Murut, Rungus, Lotud, Orang Sungei, Kadayan, Bisaya and many other subgroups. While in Sarawak, the Ibans forms the largest indigenous group with others such as the Bidayus, the Melanaus and the Orang Ulu's. Meanwhile in Peninsular Malaysia, the Orang Asli are the aborigines with an estimated population of over 60,000 peoples. Bahasa Malaysia (or Malay Language) is chosen as the national language eventhough English is widely spoken by the people. Islam is the national religion, but the Malaysian Constitution guarantees freedom of worship to all Malaysians.

## 1.2 Malaysian Constitution: land is a state matter

Since Malaysia is a federation, the reservation and revocation of the protected and conservation areas are effected by state legislation. However, the relevant federal authorities provide technical advice and guidance while the harmonization of state legislation and policies are achieved through the National Land Council and the National Forestry Council. In this context, the National Forestry Policy, 1978 (Revised 1992) and the National Forestry Act, 1984 (Amended 1993) provide the basis for systematic management, development and conservation of the forest resources as the latter stipulates the preparation of forest management plans and the classification of forest into various functions (Chin, 1999). Table 1 shows the distribution and extent of major forest types in Malaysia.

Table 1: Distribution of Major Forest Types in Malaysia, 1998 (Million ha)  
(Source: Ministry of Primary Industries, 1998)

Region	Land Area	Dipterocarp Forest	Swamp Forest	Mangrove Forest	Plantation Forest	Total Forested Land	Percentage Total of Forested Land
Sabah	7.37	3.80	0.19	0.34	0.13	4.46	60.5
Sarawak	12.44	8.84	1.25	0.18	0.01	10.28	82.6
Peninsula Malaysia	13.16	5.36	0.30	0.11	0.07	5.82	44.2
<b>Malaysia</b>	<b>32.97</b>	<b>17.99</b>	<b>1.74</b>	<b>0.63</b>	<b>0.21</b>	<b>20.56</b>	<b>62.4</b>

Sabah Land Ordinance, Sarawak Land Ordinance and the National Land Code (NLC) of Peninsula Malaysia form the basis of land laws and administration in Malaysia. The Land Capability Classification (LCC), similar in all three regions, was introduced between 1963 and 1976. The LCC divides land use into five categories based on its potential productivity and economic yield: mining, agriculture (wide range of crops possible), agriculture (restricted range of crops possible), forestry and conservation in a declining order of priority.

Malaysia's land use policy is "use-oriented", i.e. designed for maximum utilisation and development. Thus, conversion of land for urbanisation, industrial, agricultural, mining and forestry development have higher priority than that of conservation. This is because it brings a much more higher rate of return on investment.

Since its implementation, the LCC has introduced major land use changes that have been financially rewarding, and have done much to address problems of rural poverty and social inequality. However, the LCC's weakness is its limited application to adequately addressing biodiversity and conservation issues (Ministry of Science, Environment and Technology, 1998).

### **1.3 Sabah Forest Decline**

The rapid development of Malaysia in recent times has resulted in a significant increase in economic growth and the quality of life of people living in urban areas. Yet poverty is still a problem at the root of several environmental problems. Urban expansion has increased the exploitation of natural resources and has changed the land use and land cover patterns. Much of Sabah's natural vegetations has been altered and degraded due to destructive human practices. The existence of this precious natural heritage continues to be threatened. Certain forest types are in danger of being totally lost from Sabah, while many plant species will likely to disappear before they are ever described. The fragmentation of natural forests also threatens the viability of various wildlife populations, including the Sumatran Rhino, Orang Utan, Asian Elephant, Proboscis Monkey and the Hornbill.

Rapid developments are still undergoing, and transformation from rural to urban areas accelerates. Beaman et al. (1985) noted that the establishment of around 2 million ha of mono-cultural oil palm plantation on forest areas have led to considerable losses of natural habitats in Sabah. The threatening of Wildlife is a major concern related to biodiversity conservation in Sabah. Since 1983, forest fires have caused unprecedented damage to Sabah's forest. At least 1 million hectares were burnt in 1983, of which 85%

was logged-over forest. Less widespread but very damaging fires occurred again in 1987, 1989 and in the early 1990's (Payne, 1997). Fire risk is evidently higher in logged forests than in unlogged forests, due to the presence of more dead wood and enhanced access to people, who accidentally or deliberately start forest fires.

The most important land ecosystems in Sabah are the forests and croplands. The general trend in land use patterns is characterised by deforestation and expansion of cropland. Forest have been converted to cropland and state reserves, and state land to alienated land with 25.6 % and this is expected to continue in the following decades. Figure 2 shows, how the Virgin forest area in Sabah have dwindled by 90% due to excessive cutting and indiscriminate logging practices between 1970 until 1995 (Sabah State Government, 1998).

Humans are said to be the main agents of extinction of the natural environment. They caused it by altering habitats (mainly forests, but also fresh waters and wetlands), overexploiting and introducing exotic species to places where they out-compete or will undermine the growth of the native species. Apart from that, activities such as unsustainable land use practices like shifting cultivation are categorised as the most serious problem threatening indigenous forests from day to day. Other causes threatening the environment are commercial logging, agricultural expansion, mining and quarrying followed by infrastructures development which results in great losses of the natural habitats.

### **1.3.1 Shifting cultivation**

Shifting cultivation is a very common land use practice in Sabah, especially in the upland areas where permanently cultivable land can rarely be found. As estimated by Manshard and Morgan (1985) approximately 44,000 ha of lands are affected which constitute mostly the unclassified and degraded forests.

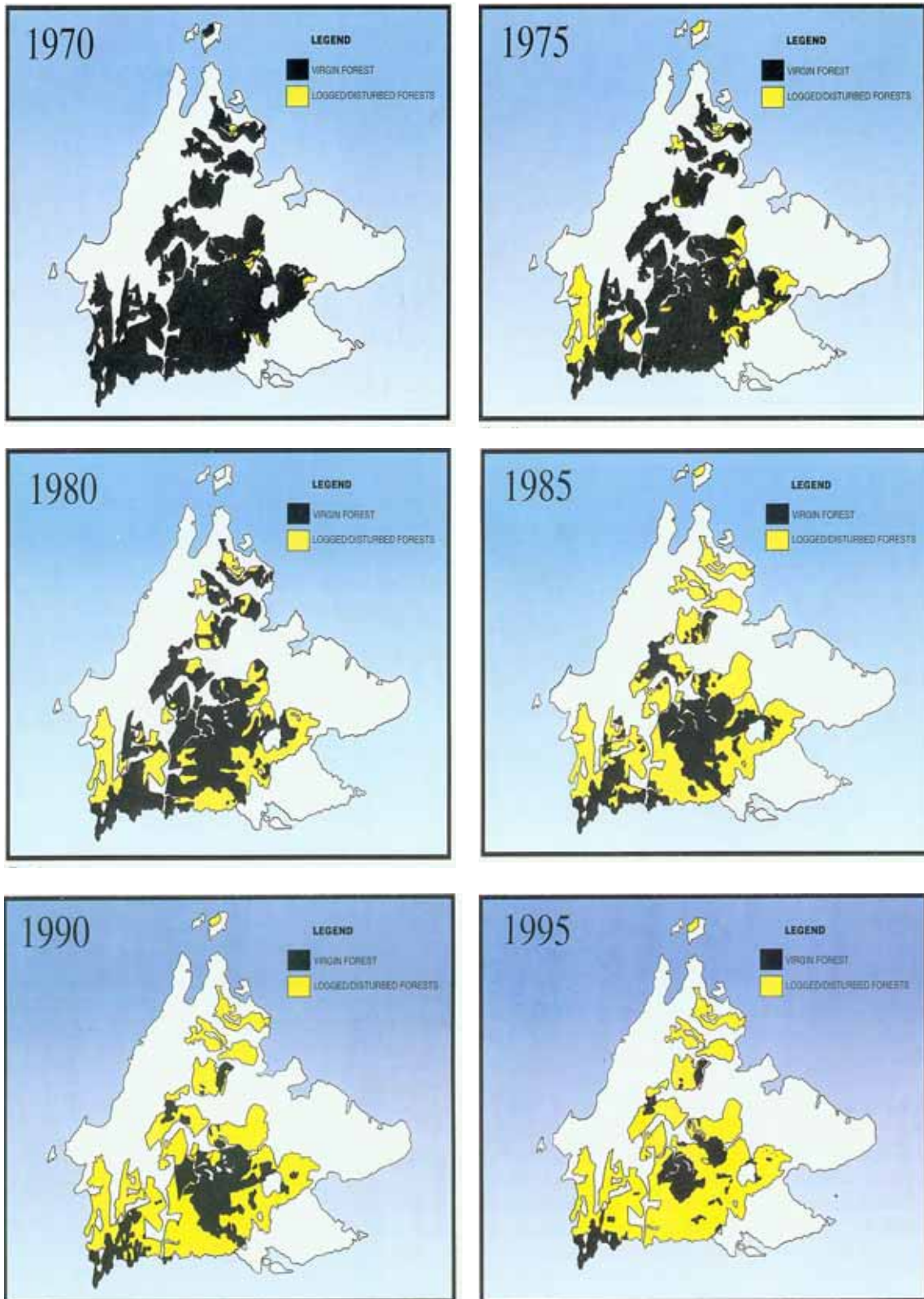


Figure 2: Decline of Virgin forest areas in Sabah from 1970 to 1995  
 (Source: Sabah State Government, 1998)

This kind of land use has long been considered as a poor system causing permanent deforestation and damaging the environment. According to FAO (1984), the essential characteristics of shifting cultivation are that an area of forest is cleared, usually rather incompletely, the debris is burnt, and the land is cultivated for few years, usually less than five, then allowed to revert to forest or other secondary re-grown vegetation to be cleared and used again.

As the population grows and expands, and the available forest area shrinks, shifting cultivation can lead to a high level of habitat fragmentation, the complete removal of natural forests, and an insufficient period of time for cleared fields to recover before being cut again. All these factors lead to a gradual impoverishment of the ecosystem and to declining per capita yields (Dearden et al., 1996).

### **1.3.2 Logging**

Logging is the source of timber exports, which provide income for the country. Over the past 17 years, forestry in Sabah has contributed an average of RM 2.69 (Euro 0.58) billion per year in terms of foreign exchange earnings through export of forest products, while the revenue from forest resources was at an average of RM 717.5 (Euro 155) million per year (Sabah State Government, 1998).

Commercial logging has had a most devastating impact on tropical deforestation worldwide. Along with the direct impact of cutting down trees, commercial logging has an indirect impact because it involves the building of roads. Landless farmers then use the roads to gain access to rainforest areas that they can clear by slashing and burning. The direct physical effects of the removal of logs include damage during felling operations, damage during skidding, clearing for log dumps and the destruction of drainage system during tract construction. In addition, microclimate changes can occur when extensive areas of the canopy are disturbed. This may adversely affect epiphytes, particularly in high altitude logging operations where the greatest diversity of epiphytic plants occurs.



### **1.3.3 Agricultural expansion**

Some forest lands are also clear-felled for the establishment of cash crops plantation of various categories like rubber, oil palm, sugar, banana, coconut, coffee and tea. Intensive and expanding cultivation of cash crops have been a significant cause of deforestation and degradation of land and water. At the end of 2000, a total of about 220,000 ha of agriculture plantations were established in Malaysia. Of this total, about 81,000 ha were established in Sabah (Chan, 2004).

The State development goals of achieving high levels of economic growth have been a major influence on land and agriculture policies, which in turn, impact forest resources. Commercial plantations often do not provide the non-timber forest products of primary forests, particularly the resources used for housing, household items, food, fuel, handicraft and medicines. This results in restrictions on livelihood and people's use of non-timber products, and causes the total extinction of certain species in areas developed as plantations.

### **1.3.4 Mining and quarrying**

Mining and quarrying cause localised deforestation, while access roads and site works associated with this type of industry can cause pollution and more clearance of land. Commercial mining and quarrying often release many toxins into local waterways in the form of metal compounds.

Small-scale mining is often more damaging than the commercial kind. Large areas of land are often cleared by using explosives to get at the metal ores. This can cause large-scale soil erosion. Large areas of forests have also been removed to allow massive hydro-electric power schemes to be built and valleys containing forests have been flooded in order to create reservoirs. With an ever-increasing population, the demand for water and power has grown significantly.

### **1.3.5 Infrastructure development**

Developing infrastructure such as road networks in areas with tropical rainforest can also lead to increasing deforestation. Most of the clearing occurs within a few miles of major road networks. Cutting roads through untouched rainforest opens them up for development from logging companies and agriculture. Whilst cutting hill slopes can increase the area susceptible to landslides and soil erosion.

## **1.4 Problem statement and objectives**

In order to conserve and manage the remaining biodiversity as best as possible, it is a prerequisite to develop situational familiarity and understanding focused on the individual ecosystem. It is essential to know the composition of at least part of the biodiversity in each geographical area and to recognize that the different elements/components of diversity are likely to be affected by limitations of size, shape, surrounding land-use, isolation, fragmentation of populations, and residual influences from past history.

The collection and interpretation of basic data are needed for efficient future management. In addition to inventories, research is needed on the functional interrelationships and dynamics of the ecosystems as a basis for conservation strategies. These are needed both at the national level, and at various subordinate levels, cumulating in the formulation of management plans for specific areas which include biodiversity conservation objectives and the criteria for monitoring their achievement.

In Sabah, most challenges in managing suburban and urban areas usually deals with biodiversity conservation within these areas, wildlife habitat control, habitat improvement, recreation management and urban development. External management problems are mostly coming from local people or so called natural resources dependent people, and also from related agencies. There are conflicts resulting from illegal settlements and agriculture fields in designated buffer zones.