

TROPICAL FOREST MAPPING AND MONITORING IN MALAYSIA

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BACKGROUND

The most important ecological resource which is most affected in the pursuit of economic advancement is the rainforest of Malaysia. Between the years 1971-1980 a total of 866,058 ha of forest lands were cleared for agricultural growth caused by government-supported land development scheme. In the 80's a further 647,374 ha were cleared. Altogether for this land scheme a total of 1,513,432 ha of forest land were opened up. The land scheme has resettled a total of 119,300 families comprising 715,800 persons.

Degradation and deforestation of forest land is also attributed to the timber industry that produced a total of 7.4 million a meters in 1997 and earned MR352 million. The timber industry has 907 timber mills, employing 61,000 people. In 1997 export of value added timber products were worth MR200 million.

FOREST COVER

Data on forest cover in Malaysia differ according to different sources. However, two reliable sources are quoted in this paper. Forestry Department quoted 19.15 million ha or 58.2% of the total land area is covered with forest. The detail of the distribution and extent of natural forest by major forest types in Malaysia in 1992 is given in table 1 below.

TABLE 1: Distribution and Extent of Natural Forest by Major Forest Types in Malaysia, 1992 (million ha.)

Region	Land area	Dipterocarp	Swamp	Mangrove Total forested land	Total forested land	Percentage total of forested land
Peninsular Malaysia	13.6	5.55	0.30	0.11	5.96	45.3
Sabah	7.37	3.93	0.19	0.32	4.44	60.2
Sarawak	12.33	7.33	1.25	0.17	8.75	71.0
Malaysia	32.86	16.81	1.74	0.60	19.15	58..2

Source: Masran M.S. et al di dlm. Haron A. Hassan et al (ed) Multiple Resource Inventory and Monitoring of Tropical Forest, ASEAN Inst. Of Forest management 1994.

The National Conservation Strategy report (1993) gave the following statistics for total forest cover in Malaysia.

TABLE 2: Natural Forest Cover in Malaysia

State	Total land area (sq km)	Total forest cover (sq km -%)
Malaysia	330,433	184,000 – 55.7
Peninsula	132,750	55,000 – 16.7
Sarawak	123,985	84,500 – 25.6
Sabah	73,620	44,400 – 13.4
Labuan	78	-

Source: Malaysian National Conservation Strategy (1993)

Table 3 below gives the breakdown of forest by states in Malaysia

TABLE 3: Forest resources in Malaysia (1991) (million ha.)

Region	Pen. M'sia	Sabah	Sarawak	Whole M'sia
Productive PFE	2.81	3.00	5.42	11.23
Productive PFE	1.90	0.35	0.58	2.83
Total PFE	4.71	3.35	6.00	14.06
National & Wildlife Parks	0.74	0.39	0.47	1.60
Stateland Forest	0.67	0.70	2.23	3.60
TOTAL FOREST	6.12	4.44	8.70	19.26

Total Land Area: 32.9 million ha.

Source: Anon (1992)

Sabah and Sarawak have higher proportion of forest land than Peninsular Malaysia.

Dipterocarp forest constitutes over 85% of the forested area in the country concentrating at the lowland region below 1200 m above sea level. In the lowland, for dipterocarp forest alone, a total of 820 species of trees over 1 cm diameter at breast height were recorded in the 50 ha area. This indicates that the forest types in Malaysia are biologically very diverse.

Malaysia has also set aside a total of 14.05 million ha of forest land as Permanent Forest Estate (PFE). Approximately 11.22 million ha of the PFE are

productive forest with the remaining 283 million ha being protective forest. Malaysia has also set aside extensive area of about 1.41 million ha as conservation area comprising of National Park, Wildlife Reserves and sanctuaries.

In recent years, plantation forest has gained hectarage and occupied 135,300 ha of total land area. This plantation forest is made up of fast growing species such as *Gmelina arborea*, *Acacia mangium* and *Paraserianthes falcataria*.

The maps of forested area in Peninsular Malaysia is given separately.

Responsible Agency in Managing Forest

Every States in Malaysia has its own Forestry Department and under the constitution the State is empowered to enact the forest law and develop forest procedures. The Federal Forestry Department advises and provides technical assistance to each state, thus providing a well formulated and coordinated approach to forest management and protection. Meanwhile, wild life sanctuaries and Wildlife Researches and National Park are governed by the Department of Wildlife and National Park Malaysia.

FOREST PROTECTION AND CONSERVATION

Forest protection and conservation are important to Malaysia. The aim of the sustainable forest management is the designation of Permanent Forest Estate to ensure substantial natural forest cover to maintain the quality and stability of the environment which are essential for the conservation of genetic resources, including soil and water resources. To fulfill this aim forest laws of both State and Federal provide for the gazettelement of forest area as Permanent Forest Estate.

To date, the most comprehensive environmental law in Malaysia is provided under the Environmental Quality Act of 1974. The amendment of this Act is 1985 listed 19 prescribed activities which include forest land (see Table 4). This prescribed activities allow forest land to be converted to other landuses provided that an Environmental Impact Assessment (EIA) is carried out. As a result, extensive forest areas are cleared to give way to other uses like the construction of Hydroelectric dam,

agriculture and logging activities. The EIA is prepared and submitted but the measures recommended are rarely enforced. Table 4 gives the prescribed activities pertaining to forest land that can be converted to other uses.

TABLE 4: Prescribed Activities that Involve Conversion of Forest Lands

i)	Land development schemes converting an area of 500 ha or more of forest land into a different land use
ii)	Drainage of wetland, wildlife habitat or virgin forest covering an area of 100 ha or more
iii)	Land-based aquaculture projects accompanied by clearing of mangrove forests covering an area of 50 ha or more
iv)	Conversion of hill forest land to other land use covering an area of 50 ha or more
v)	Logging or conversion of forest land to other land-use within the catchment area or reservoirs used for municipal water supply, irrigation or hydro-power generation or areas adjacent to state and national parks, and national marine parks
vi)	Logging covering an area of 500 ha or more
vii)	Conversion of mangrove forests for industrial, housing or agricultural use covering an area of 50 ha or more
viii)	Clearing of mangrove forests on islands adjacent to national marine parks; and
ix)	Other activities which may effect forest, such as coastal reclamation, and hydro-power projects.

In 1984 the National Forestry Act was implemented. This Act provides an excellent legal basis for defining and recognizing forest areas according to a range of uses and services that they provide. This Act provides for the classification of the Permanent Forest Estate (PFE) into the following categories.

- a) Timber production Forest under sustained yield
 - Soil protection forest
 - Soil reclamation forest

Flood control forest Water
catchment forest Forest
sanctuary for wildlife Virgin
jungle reserve forest
Amenity forest
Education forest
Research forest
Forest for federal proposes

To ensure that forest stays permanent as forest in Malaysia, the state governments must designate the above PFE in their respective states. The 1984 Act ensures that such PFE will be permanently protected.

Thus state governments have an urgent need to designate their forest as provided by the law. Mapping and monitoring such forest by their functions become the priority in these states.

FOREST RESOURCES MONITORING

In order to monitor changes in the forest resources Malaysia has developed an efficient and effective continuous forest Resources Monitoring System. The system is based on a three phased approach consisting of the following as given by Masran (1994).

Phase 1 : The use of satellite imagery, basically Landsat TM for the establishment of a fixed grid of monitoring points over the entire forested area. A 2.5 minute grid has been adopted for the identification of all types of natural forest and plantation.

Phase 2 : Establishment of a Geographic Information System (GIS) to describe in detail, at any time, the past and present forest situation at these grid points. Apart from providing the information on total forested area, the system will also record changes in the forest cover, due to legal or illegal human activities.

Phase 3 : Field sampling on a continuous basis, of all the forest types on a randomly selected number of grid points according to predetermined accuracy standards. This sampling will keep the stand and stock table data of the various types updated.

Since 1996 the European Union has been providing financial and technical assistance to support the Malaysian Government initiatives to develop their computerized information and mapping system. The project uses the latest computer technology to store, analyse and present forest resource data in the form of tables, maps and graphics. At present this project which is called Information Technology and Computerized Mapping in the Forestry Department is near completion. Monitoring of forest and cover landuse changes comes under Thematic Maps section. The CD-ROM atlas for these maps are also planned.

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