

Malaysia

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Location and area

Malaysia is a federation of 13 states, forming a constitutional monarchy in South East Asia, comprising two distinct regions separated by some 650 km of the South China Sea:

- Peninsular Malaysia (131,598 km²/ 132,750 km²), formerly known as West Malaysia, comprising 11 states that occupy the southern half of the Malay Peninsula, and
- The states of Sarawak (123,985 km²) and Sabah (73,620 km²), formerly known as East Malaysia, that occupy the northern third of the island of Borneo
(www.geoanalytics.com/bims/my.htm).

The sultanate of Brunei forms a coastal enclave in northern Sarawak.

Malaysia has a total land area of 329,758 km² (Microsoft Encarta Encyclopedia 2002).

Topography

The topography of Peninsular Malaysia is dominated by mountain ranges, running from the north down half the length of the peninsula. Heavily populated coastal lowlands border the ranges on the west; on the east the coastal lowlands are narrower and forested. In the south, the peninsula is relatively level. (Microsoft Encarta Encyclopedia 2002).

Climate

Malaysia's climate is hot and humid, except in the higher mountains. Rainfall is generally high and distributed throughout the year. The exposed northern slopes of Sarawak and Sabah receive as much as 5,000 mm of rainfall per year. Average rainfall for the peninsula is about 2,500 mm. (Microsoft Encarta Encyclopedia 2002).

Wetlands

There are currently about 865 km² of reserved mangrove in Peninsular Malaysia, while in Sabah and Sarawak mangroves account for about 840 km² and 1,730 km² respectively. There are concerns that the total area of mangroves is decreasing at an alarming rate especially in statelands. Protected mangroves are said to be small, inadequate and not represented by all mangrove habitats (National Workshop on Mangrove, 15-17 July 2003, Ipoh, Perak Darul Ridzwan, first announcement).

Peatlands

Peatlands in Sarawak were **first** described by Charles Hofe between the Madang and Kalabit districts and in the western part of the Kalabat district. Frank Hatton mentioned an important peatland in the Lambag district in the basin of the Kinabatang River (Wichmann 1909).

Peat soils occur both in the highlands and lowlands, however, the highland organic soils are not extensive. The lowland peat occurs almost entirely in low-lying, poorly drained depressions or basins in the coastal areas. In Peninsular Malaysia, they are found in the coastal areas of the east and west coasts, especially in the coastal areas of West Johore,

Kuantan and Pekan districts, the Rompin-Endau area, northwest Selangor and the Trans-Perak areas in the Perak Tengah and Hilir Perak districts.

In Sarawak, peat occurs mainly between the lower stretches of the main river courses (basin peats) and in poorly drained interior valleys (valley peats). They are found in the administrative divisions of Kuching, Samarahan, Sri Aman, Sibuan, Sarikei, Bintulu, Miri and Limbang.

In Sabah, the organic soils are found on the coastal areas of the Klias peninsula, Krah swamp in Kota Belud, Sugut and Labuk estuaries and Kinabatangan floodplains (www.mardi.my).

Fig. 1: Distribution of “lowland peatlands” in Malaysia

(www.mardi.my/ver2/info_pack/tropical_peat/peat_in_malaysia.htm).

Daar niet meer. Misschien in *extracted from the Proceedings of the International Symposium on Tropical Peatland, 6-10 May 1991, in Kuching, Sarawak*

Coulter (1957) mentions a “peatland” area of 8,000 km² for Western Malaysia. Anderson (1964) estimates the “peat swamp” area of Sarawak to be 14,660 km² (5,660 sq miles), whereas Anderson 1973 estimates the “peatland” area of Sarawak and Brunei on 15,600 km².

Chew & Joseph (1976) mention a total area of “peat soils” in Malaysia to be 23,610 km², composed of 8,090 km² in Peninsular Malaysia, 14,660 km² in Sarawak, and 860 km² in Sabah (they actually write 23,510 km² as the sum value, but this is apparently a calculation mistake). Schneider (1980) also presents a “peatland” area of 23,610 km² (he also quotes the incorrect 23,510 km², but does present the individual values of 8,090 km² for Peninsular Malaysia, 14,660 km² for Sarawak - also mentioned in Schneider 1976 -, and 860 km² for Sabah correctly). Schneider & Schneider (1990) and Pfadenhauer et al. (1993) use the corrected figure.

Kivinen & Pakarinen (1980, 1981) quoting Coulter (1957) estimate the peatland area in West Malaysia on appr. 10,000 km² and arrive, also quoting Anderson (1973) at a total peatland area for Malaysia of 23,600 km². Shrier (1985), quoting Kivinen & Pakarinen (1981), mentions 23,600 km² of „mire area“ and „peat deposits“ in Malaya, Sarawak, and Brunei. Markov et al. (1988) use that figure both for the peatland area (> 30 cm peat) and for the area of „peat resources“ (peat thickness not mentioned) in Malaysia.

According to Bord na Mona (1985) “peat deposits” cover an area between 22,500 and 25,000 km². Andriess (1988) estimates the extent of organic soils in Malaysia to be 25,000 km². Also Ambak & Che (1996) estimate the recent peatlands to cover approximately 25,000 km². For Peninsular Malaysia they give an area of 9,845 km² of peatlands after Abdul Jamil et al. (1993), whereas for Sarawak and Sabah they give an area of 15,000 km².

According to Yonebayashi et al. (1997) tropical swamp forests or tropical peatland (coastal lowlands, and small areas in the highlands) on Sarawak cover 16,600 km² and 8,000 km² in Peninsular Malaysia. Rieley et al. (1996a) estimate the extent of peat swamps in Malaysia at 22,500–27,300 km², whereas Rieley (1997) presents the same range for the Malaysian “undisturbed peatland” area.

Paramanathan & Lulie Meling (1999) estimate organic soils in Malaysia to occupy about

26,000 km². Their estimates however exclude organic clays and mucks, which in some cases qualify as organic soils, and the organic soils, which occur at high altitudes. One of the problems faced in the mapping and estimation of the extent of organic soils in Malaysia is the different definitions used to define organic soils in Peninsular Malaysia, Sabah and Sarawak.

On Peninsular Malaysia, the system is based on the USDA Soil Taxonomy (Soil Survey Staff 1990): Soil is only considered peat when it has a loss on ignition (= organic content) of more than 65 %. The category 35-65 % loss on ignition is called „muck“, 22-35 % loss on ignition is called “organic clay“ (Law & Selvadurai 1968).

In Sarawak peat soils are classified based on the thickness of the peat and the nature of the underlying mineral material („Igan“, „Mukah“, „Anderson“, „Limbang“). The minimum peat thickness in „Mukah“ is 25 cm (Andriess 1972). On Sabah (Paramanathan et al. 1984) peatland mapping has been based (mainly) on the FAO/UNESCO Legend for Soil Map of the World (www.mardi.my).

Recent government sources (www.did.sarawak.gov.my/peat/peat_main.html) give a total area of 27,305 km² of “peat and organic soils” in Malaysia, of which 16,600 km² (elsewhere on a similar site is written 16,980 km² of “peat soil”) are located in the deltas and coastal plains of Sarawak (see fig. Xxx), 9,845 km² in Peninsular Malaysia, while Sabah has 860 km² (Tab. 1). Of the 1.66 million ha of peat in Sarawak, 15,000 km² (or 89%) are deep peat. In Peninsular Malaysia, approximately 8 km² (or 89%) are deep peat, the remainder being organic clay and muck. No estimates on the depths of peat are available for Sabah (www.did.sarawak.gov.my/peat/peat_main.html). A distribution per state is presented in Table xxx.

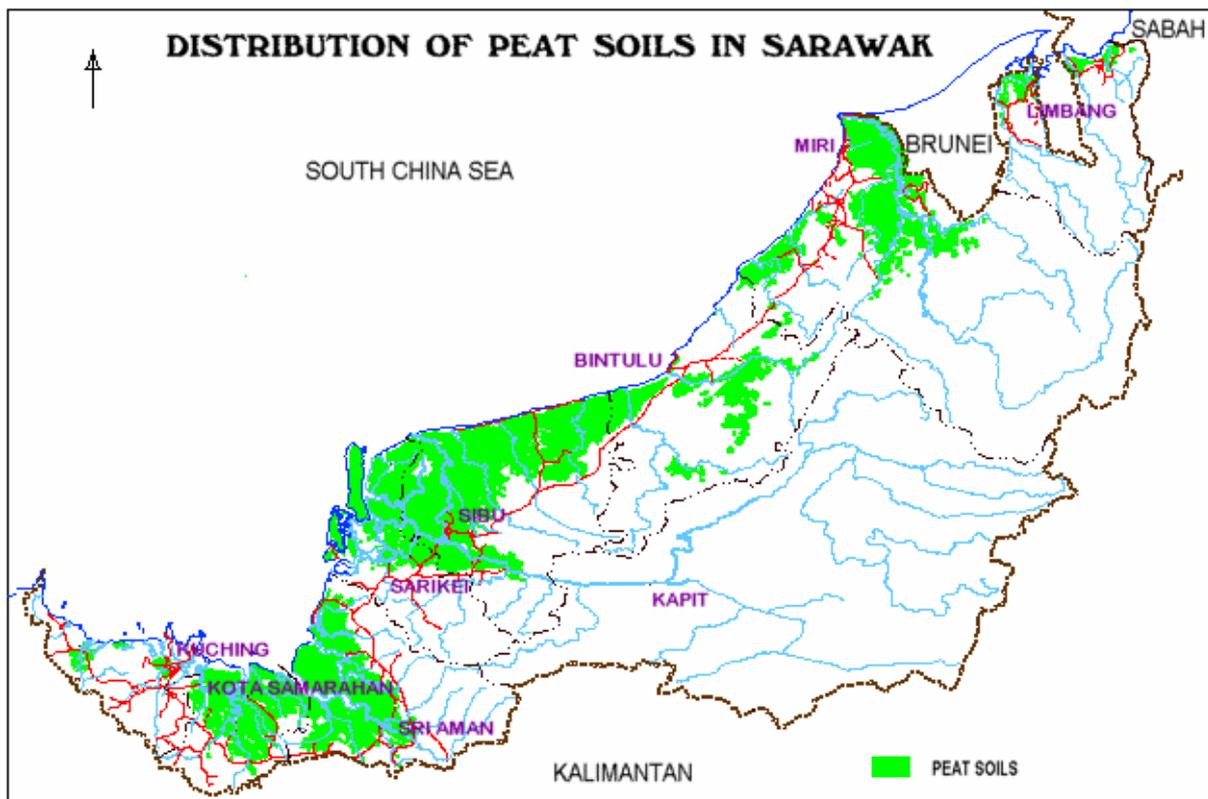


Fig. Xxx: Distribution of peat soils in Sarawak (www.did.sarawak.gov.my/peat/peat_main.html)

Table 1: Extent and distribution of peat and organic soils in Malaysia (in ha, corrected after: www.mardi.my)

State	Peat (> 65% organic)	Org. clay and muck	Total peat and organic soils
Peninsular Malaysia¹⁾			
Johore	228,960	69,540	298,500
Negeri Sembilan	6,300	-	6,300
Selangor	194,300	-	194,300
Perak	107,500	-	107,500
Pahang	219,561	62,939	282,500
Terengganu	81,245	6,755	88,000
Kelantan	7,400	-	7,400
Subtotal	845,266	139,234	984,500
Sarawak²⁾			
Kuching Admin. Div.	23,059	-	
Samarahan Admin. Div	192,775	-	
Sri Aman Admin. Div.	283,076	-	
Sibu Admin. Div.	540,800	-	
Sarikei Admin. Div.	169,900	-	
Bintulu Admin. Div.	146,121	-	
Miri Admin. Div.	276,579	-	
Limbang Admin. Div.	25,300	-	
Subtotal	1,657,600		1 657 600
Sabah³⁾			
Sabah	86,000	-	
Total for Malaysia	2,588,866	139,234	2,728,100

¹⁾ After Law & Selvadurai (1968)

²⁾ After Wong (1991)

³⁾ After Acres et al. (1975)

According to the interpreted World Soil Map (Van Engelen & Huting 2002) 21,674 km² of histosols exist in Malaysia and 23,796 km² of gley soils.

Mire and peatland losses

Since the 1950s clear-felling of *Shorea albida* has spread throughout Sarawak (Bruenig 1990).

Peat soils are highly suitable for a wide range of crops with shallow rooting and fibrous root systems including oil palm, pineapples, vegetables, cassava, Liberica coffee, mulberry, banana, sago etc. The 1984 land use statistics show, that approximately 3,136 km² of peatland in Peninsular Malaysia has been developed for agriculture, representing 32% of the total peat area (Table xxx). In 1966 the agricultural area was still only 1,791 km² (18%) (Ahmad-Shah & Soepadmo 1989).

Out of this 3,136 km², about 2,805 km² (comprising 28% of the total peat area in the peninsula) are found in the west coast states. In the east coast states only about 331 km² have been utilized for agriculture (Table 2).

The major crops grown are oil palm, rubber, coconut, rice, pineapple and mixed horticulture. The major proportion of 1,330 km² of oil palm is found in Perak, Selangor and Johore. The other major crops of rubber, coconut and pineapple are predominantly grown in Johore with areas of 733 km², 282 km² and 140 km² respectively. Most padi areas on peat are found in Perak, Selangor and Terengganu

(www.mardi.my/ver2/info_pack/tropical_peat/peat_in_malaysia.htm). Rice is the staple food crop, produced entirely by smallholders. Rubber (introduced in 1876), palm oil (1917), and cocoa (1950s) are the main export crops. Malaysia produces half the world's palm oil and ranks third and fourth respectively in rubber and cocoa production. (Microsoft Encarta Encyclopedia 2002).

Safford & Maltby (1998) state, that between 1971 and 1983 50% of the undisturbed peat swamps in Peninsular Malaysia have been logged. The surviving major areas include the North Selangor Peat Swamp, the South Selangor Peat Swamp, and a continuous block extending from Kuantan to Endau along the east coast

In Sarawak, approximately 560 km² or 3% of peat land have been used for agricultural development (Table 2). In Sabah, the peat areas are relatively undeveloped (www.mardi.my/ver2/info_pack/tropical_peat/peat_in_malaysia.htm).

Table 2: Percentages of peat utilized for agriculture in the different states of Malaysia 1984 (www.mardi.my/ver2/info_pack/tropical_peat/peat_in_malaysia.htm)

State	Total area (km ²)	Area used for agriculture	
		km ²	%
Peninsular Malaysia			
Johore	2,985	1,459	49
N. Sembilan	63	50	79
Selangor	1,943	599	31
Perak	1,075	697	65
Pahang	2,825	171	6
Terengganu	880	139	16
Kelantan	74	21	28
Total	9,845	3,136	32
Sarawak	16,576	560	3

Recent, rapid decreases in the peatland area following forest removal, drainage and utilisation for land settlement and conversion to agriculture (Baer 2001) have made these peatland inventories for Malaysia outdated and inaccurate (Maltby et al 1996). Radzali et al. (1992) state that “there is an increasing pressure to develop peatland”.

Ambak & Che (1996) estimated the “recent mire area” (mainly swamp and shrub forests) in Peninsular Malaysia to be 6,428 km². 3,159 km² (32%) of the peatlands is reported to be used for agriculture (Ambak & Che 1996, Safford & Maltby 1998) and 1 km² for peat extraction with an annual production of 20,000 –30,000 m³ (Ojaniemi 1992).

The WorldWildLifeFound 2001 calls peat swamp forests on Peninsular Malaysia with an area of 3,600 km² “critical/endangered ecosystems”
(www.worldwildlife.org/wildworld/profiles/terrestrial/im/im0145_full.html).

On Sarawak and Sabah “development has been minimal and most of the peatland area remains intact“ (Ambak & Che 1996). Over the last few years, however, interest in organic soils in Sabah and Sarawak has increased following the successful cultivation of oil palms on these soils in Peninsular Malaysia (Safford & Maltby 1998, Paramanathan & Lulie Meling 1999). In Sarawak, relatively large areas of the peat swamps are bearing species of valuable timber such as the "Ramin" (*Contystylus bancanus*). The expansion of commercial logging since the 1980s, mainly in Sarawak, has made Malaysia one of the world’s largest timber exporters (Microsoft Encarta Encyclopedia 2002).

According to Parish (2002) more than 10,000 km² of “peatland” has been put into agricultural use in Malaysia. The total peatland area of Peninsular Malaysia was estimated at 9,000 km² (Mohd-Ali 1989), but pristine peatlands amounts to less than 500 km². The major remaining areas of peat swamp are the North Selangor Peat Swamp, Kuala Langat (South Selangor), and Southeast pahang peat Swamp (from Kuantan to Endau along the east coast (Parish 2002).

Table 3 shows the decrease in area of major peatland related ecosystems in Malaysia.

Table 3: Distribution of wetlands in Malaysia (after www.geoanalytics.com/bims/my.htm).

	Original distribution ^{*)} (km ²)	Current distribution	
		km ²	%
Freshwater swamps	6,905	3,160	46
Mangroves	8,998	2 327	26
Peat swamps	13 806	5 703	41

^{*)} = before human influence

According to official Sarawak sources 12,620 km² of the peat land in Sarawak is still (29 Dec 2002) covered by peat swamp forest
(www.did.sarawak.gov.my/peat/peat_papt/peat_landuse.htm).

Pictures of Malaysian peatlands can be found under:
www.mardi.my/ver2/info_pack/tropical_peat/peat_in_malaysia.htm

Still to be checked:

Tay, T.H. 1969. The distribution, characteristics, uses and potential of peat in West Malaysia. *Journal of Tropical Geography* 29:58-63.

Tie, Y.L. and Kueh, H.S. 1979. A review of lowland organic soils of Sarawak. Department of Agriculture, Technical Paper 4, Research Branch, Sarawak, Malaysia.