MALAYSIA



Source: esri

General

Malaysia is a federal constitutional monarchy in Southeast Asia. It consists of 13 states and 3 federal territories separated by the South China Sea into two regions, Peninsular Malaysia and East Malaysia (Malaysian Borneo). Peninsular Malaysia shares a land and a maritime border with Thailand in the North, and maritime borders with Singapore in the South, Vietnam in the Northeast and Indonesia in the West. East Malaysia shares land and maritime borders with Brunei and Indonesia and maritime borders with the Philippines and Vietnam. Brunei forms what is almost an enclave in Malaysia, with the state of Sarawak dividing it into two parts. The area of

Malaysia is 33.1 Mha (million hectares) with, in 2022, a population of 33.9 million, or 1.02 persons per ha (Wikipedia and United Nations, 2022).

Climate and geography

The local climate in Malaysia is equatorial and characterised by the annual southwest (April to October) and northeast (October to February) monsoons. The temperature is moderated by the presence of the surrounding oceans. Humidity is usually high, and the average annual rainfall is 2500 mm. The climates of the Peninsula and the East differ, as the climate on the peninsula is directly affected by wind from the mainland, as opposed to the more maritime weather of the East. Local climates can be divided into three regions, highland, lowland, and coastal. Climate change is likely to affect sea levels and rainfall, increasing flood risks and leading to droughts (source: Wikipedia).

The two parts of Malaysia, separated from each other by the South China Sea, share a largely similar landscape in that both Peninsular and East Malaysia feature coastal plains rising to hills and mountains. Peninsular Malaysia, containing 40% of Malaysia's land area, extends 740 km from North to South, and its maximum width is 322 km. It is divided between its east and west coasts by the Titiwangsa Mountains. The coastal plains surrounding the peninsula reach a maximum width of 50 km, and the peninsula's coastline is nearly 1,931 km long. East Malaysia, on the island of Borneo, has a coastline of 2,607 km. It is divided between coastal regions, hills and valleys, and a mountainous interior. Around the two halves of Malaysia are numerous islands, the largest of which is Banggi (source: Wikipedia).

The Group Polder Development (1982) describes that over the past 50 years many lowlands and swamps located along the coasts have been reclaimed and converted to rice polders. The reclamation works concerned the construction of dikes, discharge sluices and drains. They also mention that the rice polders generally have an area from 1200 to 4800 ha.

Zakaria (1982) studied water management in deep peat soils. One of the aspects was land subsidence. Although she did not specifically refer to the polders in her country, due to the large area of peat soils her result will undoubtedly be of importance for the polders as well.

Dorai (1983) presents a schematic lay out of the drainage system of a rice polder (Figure 1). He also describes in quite some detail how the tidal drainage works can be simulated.

Ghazali *et al.* (2018) describe that in the 1940s and 1950s, rice planting was intensified as part of a strategy to increase rice production. To enable this, large tracts of coastal land above high tide were reclaimed to create polders. Irrigation and drainage schemes were built in support of agriculture and were protected by coastal dikes. These dikes were built 200–400 m behind the seaward edge of the mangrove belt to prevent salinity intrusion. They also describe the result of a study on expected sea level rise along the coast of Malaysia by 2040 and 2100. The values range from respectively 0.08 to 0.26 m by 2040 and from 0.29 to 1.06 m by 2100. In addition they have analysed for the north-western part of the coastline the expected damage due to tsunamis in light of the expected sea level rise. They conclude with a general description of the measures that will be required in due time.



Figure 1. Lay out of a typical rice polder in Malaysia (Dorai, 1983)

Existing polders

The Group Polder Development (1982) states that between 1932 and 1975 a total of 155 schemes covering a gross area of 340,000 ha have been constructed. In addition they show 14 polders larger than 1,000 ha (Figure 2) with a total area of 414,000 ha.



Figure 2. Main polder areas in Malaysia (Group Polder Development, 1982)

The polders as shown in Figure 2 are:

- 1. *Muda Irrigation Scheme (96,000 ha)*. A coastal dike and river dikes protect the area from tidal intrusion;
- 2. *Muda River Scheme (6,500 ha)*. This is a pumped irrigation scheme for rice cultivation. The area is protected against tidal intrusion and river floods;
- 3. *Krian Irrigation Scheme (23,600 ha)*. The area is protected by coastal and river dikes;
- 4. *Trans-Perak Scheme (30,000 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was 9500 ha rice cultivation and 21,500 ha trees;
- 5. Bagan Datch Scheme (2,500 ha). The area is protected by a coastal dike;
- 6. *North-west Selangor Scheme (43,000 ha).* The area is protected by coastal and river dikes. At the time of the publication the land use was 20,000 ha rice cultivation and 43,000 ha trees;
- 7. *Klang-Kuala Langat Scheme (15,000 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was trees;
- 8. *West Johore Scheme (146,800 ha).* The area is protected by coastal and river dikes. At the time of the publication the land use was trees;

- 9. *Tumpat-Pengkalan Kubor Scheme (7,000 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was trees;
- 10. *Balai Besar Scheme (1,200 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was rice;
- 11. Nonok Scheme (9,000 ha). At the time of the publication the land use was rice and trees;
- 12. *Kabung Nyabur Scheme (4,500 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was trees;
- 13. *Daro-Loba Balu Scheme (5,000 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was rice and trees;
- 14. *Klias Scheme (3,000 ha)*. The area is protected by coastal and river dikes. At the time of the publication the land use was trees.

Zakaria (1992) shows a figure of the Benut Polder (Figure 3).



Figuur 3. Lay out van de Benut polder

General characteristics of the polders in Malaysia are shown in Table I.

Proposed polders

No proposed polders have been identified.

Location of the polders in Malaysia as shown on the World polder map

The location of the polders in Malaysia is shown in Figure 4.



Figure 4. Location of the polders in Malaysia (source: esri – Batavialand)

The pictures by Prof. Adriaan Volker are shown in Table II.

References

- Dorai, M., 1983. *Design considerations for the drainage of padi polders*. In: Proceedings International Symposium 'Polders of the World'. International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands.
- Ghazali, N.H.M., N.A. Awang, M. Mahmud and A. Mokhtar, 2018. Impact of sea level rise and tsunami on coastal areas of North-West Peninsular Malaysia. *Irrigation and Drainage*. 67.S1, 119-129.

Group Polder Development, Department of Civil Engineering, Delft University of Technology, 1982. Polders of the World. Compendium of polder projects. Delft, the Netherlands

- United Nations, Department of Economic and Social Affairs, Population Division. 2022. World Population Prospects, medium prognosis. The 2022 revision. New York, USA.
- Zakaria, S., 1992. *Water management in deep peat soils in Malaysia*. PhD Thesis. Cranfield Institute of Technology. Cranfield, United Kingdom.
- Zakaria, S., A. Yusol, M. Hashin and A MD. Jan, 1994. The magnitude of problems with the sustainable developments of coastal plains in Malaysia: research needs and related priorities. Bangkok, Thailand.

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Lelystad, October 2023

No	Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
	155 polders	1932-1975	340,000	RLL				
1	Muda Irrigation Scheme		96,000	RLL	6° 06' N	100° 20' E	4	Agriculture
2	Muda River Scheme		6,500	RLL	5° 28' N	100° 24' E	2	Agriculture
3	Krian Irrigation Scheme		23,600	RLL	5° 04' N	100° 27' E	2	Agriculture
4	Trans-Perak Scheme		23,000	RLL	4° 05' N	100° 58' E	4	Agriculture
5	Bagan Datch Scheme		2,500	RLL	3° 54' N	100° 47' E	5	Agriculture
6	North-west Selangor Scheme		43,000	RLL	3° 33' N	101° 06' E	2	Agriculture
7	Klang-Kuala Langat Scheme		15,000	RLL	3° 01' N	101° 25' E	-8	Agriculture
8	West Johore Scheme		146,800	RLL	1° 38' N	101° 17' E	2	Agriculture
9	Tumpat-Pengkalan Kubor Scheme		7,000	RLL	6° 12' N	102° 06' E	2	Agriculture
10	Balai Besar Scheme		1,200	RLL	4º 22' N	102° 28' E	5	Agriculture
11	Nonok Scheme		9,000	RLL	1° 32' N	110° 39' E	3	Agriculture
12	Kabung Nyabur Scheme		4,500	RLL	1° 54' N	111º 11' E	7	Agriculture
13	Daro-Loba Balu Scheme		5,000	RLL	2° 44' N	111° 37' E	14	Agriculture
14	Klias Scheme		3,000	RLL	5° 23' N	115° 39' E	11	Agriculture
	Benut Polder			RLL	1° 37' N	103° 15' E	7	Agriculture
	Total		726,100					

Table I. General characteristics of existing polders in Malaysia

*) RLL = reclaimed low-lying land; LGS = land gained on the sea; DL = drained lake



Table II. Pictures of polders and lowlands in Malaysia by Prof. Adriaan Volker



Table II. Pictures of polders and lowlands in Malaysia by Prof. Adriaan Volker (continued)

A2 026/I.2.26	A2 027/I.2.27	A2 028/I.2.28	A2 029/I.2.29
Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977
A2 030/I.2.30	A2 031/I.2.31	A2 032/I.2.32	A2 033/I.2.33
Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Creek at high tide. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977	Sungei Hj Dorani sluice. Most probably also Tanjung Karang Irrigation Scheme, 3 March 1977
A2 034/I.2.34	A2 035/I.2.35	A2 036/I.2.36	A2 037/I.2.37
Tanjung Karang Irrigation Scheme			

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the D5 2 063/D.5.2.63 D5 2 065/D.5.2.65 D5 2 066/D.5.2.66 D5 2 064/D.5.2.64 Culvert, probably in a drain Movable weir, probably in a drain Movable weir, probably in a drain Movable weir, probably in a drain D5 2 068/D.5.2.68 D5 2 069/D.5.2.69 D5 2 070/D.5.2.70 D5 2 067/D.5.2.67 Movable weir, probably in a drain Movable weir, probably in a drain Movable weir, probably in a drain Endiked river D5 2 071/D.5.2.71 D5 2 072/D.5.2.72 D5 3 001/D.5.3.1 D5 3 002/D.5.3.2 Endiked river Water course in lowland area Discharge sluice in lowland area Rice fields in lowland area

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