

## MOROCCO



Source: esri

### General

Morocco - officially known as the Kingdom of Morocco - is located in the Maghreb Region of North Africa. It is bordered by Spain in the North, Algeria in the East, and Western Sahara in the South. Since Morocco controls most of Western Sahara, its *de facto* southern boundary is with Mauritania. The area of the country is 44.7 Mha (million hectares) with, in 2024, a population of 38.0 million, or 0.85 persons per ha (Wikipedia and United Nations, 2024).

### Climate and geography

Morocco has a Mediterranean climate in the northern and central mountain ranges, giving way to drier conditions and inland deserts further Southeast. The coastal plains experience moderate temperatures even in summer, owing to the effect of the cold Canary Current off the Atlantic coast. In the Rif, Middle and High Atlas Mountains, there exist several different types of climates. Mediterranean along the coastal lowlands, giving way to a humid temperate climate at higher elevations. Southeast of the Atlas mountains, near the Algerian border, the climate becomes very dry, with long and hot summers. Extreme heat and low moisture levels are pronounced in the lowland regions east of the Atlas range due to the rain shadow effect of the mountain system (source: Wikipedia).

Geographically, Morocco is characterised by a rugged mountainous interior, large tracts of desert and a lengthy coastline along the Atlantic Ocean and Mediterranean Sea. The southeastern-most portions of Morocco include parts of the Sahara Desert, where sand dunes and rocky plains are dotted with oases (source: Wikipedia).

### Existing polders

Because of frequent flooding by the Sebou River of irrigated areas in the Rharb Plain flood protection works have been implemented around 1982 protecting in total 43,000 ha (Figure 1) (Group Polder Development, 1982; Enneking and Vierhout, 1983). In this way in fact polders have been created. The dikes were designed based on a chance of occurrence of flooding of 1/50 per year, with a crest level of 0.70 m above the design flood level. With respect to this uncertainty in the flood level as well as settlement have been taken into account. Enneking and Vierhout (1983) also show principle cross sections of the proposed dikes (Figure 2). Based on Google Earth there is a good possibility that a much larger area nowadays is protected against flooding.

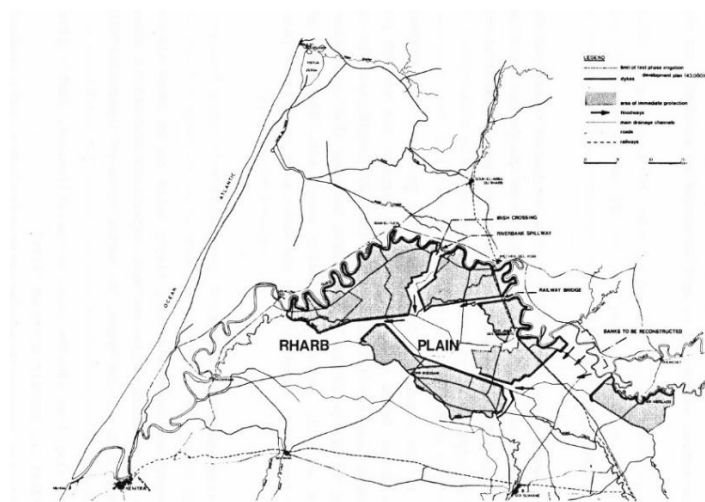


Figure 1. Map of the Rharb Plain with lay out of the flood protection measures (Enneking and Vierhout, 1983)

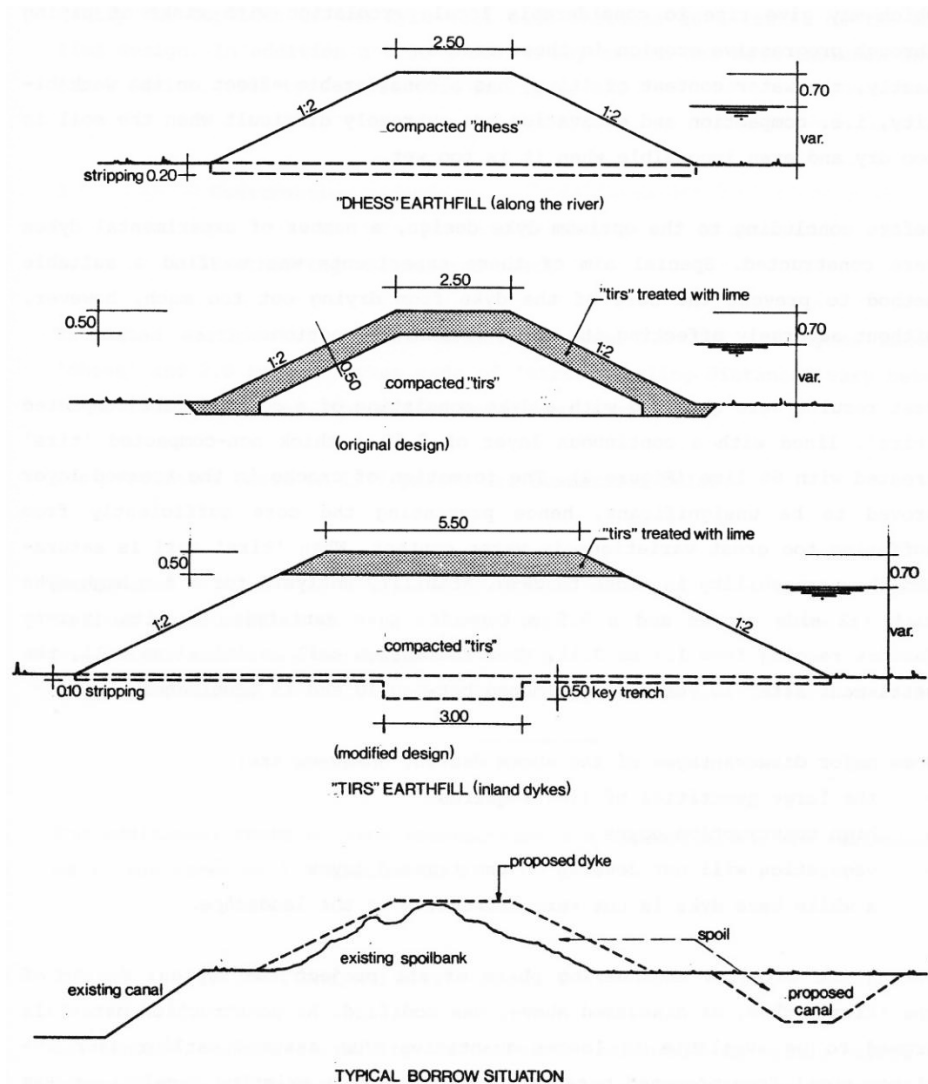


Figure 2. Typical cross-sections of the different types of dikes in the Rharb Plain (Enneking and Vierhout, 1983)

General characteristics of the polders in Morocco are shown in Table I. Characteristics of the water management and flood protection system of the polders in Morocco are shown in Table II.

### Proposed polders

No proposed polders could be identified.

### Location of the polders in Morocco as shown on the World polder map

The location of the polders in Morocco is shown in Figure 3.

### References

- Enneking, J.J.L.M. and M.M. Vierhout, 1983. *Design and construction of flood control dykes around 43,000 ha of irrigation areas in the Rharb Plain, Morocco*. In: Proceedings International Symposium 'Polders of the World'. International Institute for Land Reclamation and Improvement, Wageningen, the Netherlands.
- 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. 2024. *World population prospects, medium prognosis. The 2024 revision.* New York, USA.

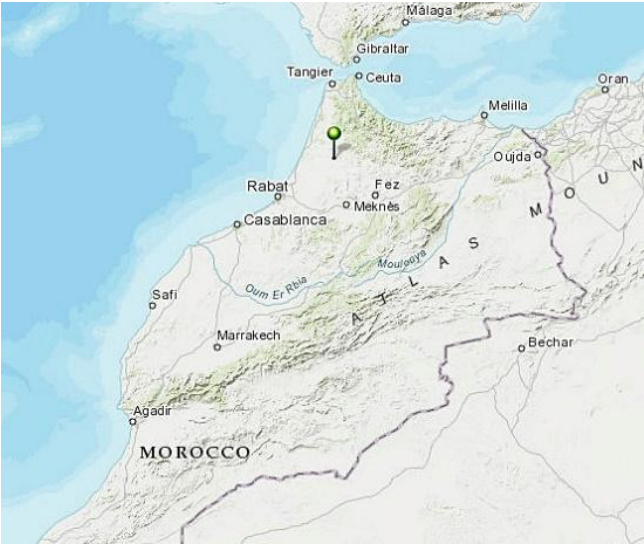


Figure 3. Location of the polders in Morocco (source: esri – Batavialand)

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Table I. General characteristics of existing polders in Morocco

| Name                            | Reclamation | Area in ha | Type *) | Latitudes | Longitudes | Elevation in m+MSL | Land use    |
|---------------------------------|-------------|------------|---------|-----------|------------|--------------------|-------------|
| Polder areas in the Rharb Plain |             | 43,000     | RLL     | 34° 33' N | 6° 04' W   | 10                 | Agriculture |
| Total                           |             | 43,000     |         |           |            |                    |             |

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

Table II. Characteristics of the water management and flood protection system of the existing polders in Morocco

| Name                            | Design criteria in chance of occurrence/year |                  |                          |                    |        |                                 |       |       |
|---------------------------------|--|------------------|--------------------------|--------------------|--------|---------------------------------|-------|-------|
|                                 | Water management                             |                  |                          |                    |        | Flood protection in chance/year |       |       |
|                                 | Type   | Design criterion | Percentage of open water | Discharge capacity |        | Irrigation                      | Rural | Urban |
|                                 |  |                  |                          | m <sup>3</sup> /s  | mm/day |                                 |       |       |
| Polder areas in the Rharb Plain | RLL  |                  |                          |                    |        | 1/50                            |       |       |