INDIA

Source: esri

General

India - officially the Republic of India - is the second-most populous country in the world. It is bounded by the Indian Ocean on the South, the Arabian Sea on the Southwest, and the Bay of Bengal on the Southeast. It shares land borders with Pakistan in the West, China, Nepal and Bhutan in the Northeast, and Myanmar and Bangladesh in the East. In the Indian Ocean, India is in the vicinity of Sri Lanka and the Maldives. India's Andaman and Nicobar Islands share a maritime border with Thailand and Indonesia. The area of India is 329 Mha (million hectares) with, in 2022, a population of 1420 million, or 4.3 persons per ha (Wikipedia and United Nations, 2022).

Climate and geography

The Indian climate is strongly influenced by the Himalayas and the Thar Desert, both drive the summer and winter monsoons. The Himalayas prevent cold Central Asian winds from blowing in, keeping the bulk of the Indian subcontinent warmer than most locations at similar latitudes. The Thar Desert plays a crucial role in attracting the moisture-laden south-west summer monsoon winds that, between June and October, provide the majority of India's rainfall. Four major climatic groupings predominate: tropical wet, tropical dry, subtropical humid, and montane. Temperatures in India have risen by 0.7 °C between 1901 and 2018. Climate change is often thought to be the cause. The retreat of Himalayan glaciers has adversely affected the flow rate of the major Himalayan rivers, including the Ganges and the Brahmaputra (source: Wikipedia).

India accounts for the major part of the Indian subcontinent, lying atop the Indian tectonic plate, a part of the Indo-Australian Plate. Immediately south of the Himalayas, plate movement created a vast trough that rapidly filled with sediment and now constitutes the Indo-Gangetic Plain. The original Indian plate makes its first appearance above the sediment in the ancient Aravalli range, which extends from the Delhi Ridge in a south-westerly direction. In the west lies the Thar Desert. The remaining Indian Plate survives as peninsular India, the oldest and geologically most stable part of India. It extends as far north as the Satpura and Vindhya ranges in central India. These parallel chains run from the Arabian Sea coast in Gujarat in the West to the Chota Nagpur Plateau in Jharkhand in the East. In the south, the remaining peninsular landmass, the Deccan Plateau, is flanked on the West and East by coastal ranges known as the Western and Eastern Ghats (source: Wikipedia).

India's coastline measures 7,520 km; of this distance, 5,420 km belong to peninsular India and the remaining to the islands. The mainland coastline consists of 43% sandy beaches; 11% rocky shores, including cliffs; and 46% mudflats or marshy shores (source: Wikipedia).

Major rivers originating in the Himalayas flowing through India include the Ganges and the Brahmaputra, both of which discharge via Bangladesh into the Bay of Bengal. Important tributaries of the Ganges include the Yamuna and Kosi rivers; the latter's extremely low gradient, caused by long-term silt deposition, leads to severe floods and course changes. Major peninsular rivers, whose steeper gradients prevent their waters from flooding, include the Godavari, the Mahanadi, the Kaveri, and the Krishna, which also discharge into the Bay of Bengal; and the Narmada and the Tapti, which discharge into the Arabian Sea. Coastal features include the marshy Rann of Kutch in western India and the Sundarbans delta in eastern India; the latter is shared with Bangladesh.

The Centre for Civil Engineering Research and Codes (CUR) and Ministry of Transport, Public Works and Water management (1993) describe that in the deltaic areas of the Ganges in India (Sunderbans in West-Bengal), islands have been reclaimed by the local farmers through constructing bunds or ring dikes. In many cases, the elevation of these lands is not higher than 1.5 to 2.0 m below high tide level. As a result, the conditions for gravity drainage are poor, there are many difficulties in closing breached dikes and considerable damage may occur through flooding. Reclamation of such land is therefore considered untimely or premature. According to the Indian regulations no land can be reclaimed, until its elevation is higher than 0.3 to 0.5 m below high water.

Existing polders

According to Babu (1992) the entire land water complex of the Kuttanad area is often called *the Holland of Kerala*. The Group Polder Development (1982) describes that the Kuttanad polders have an area of about 10,000 ha and a surface area upto 1.5 m-MSL (mean sea level). The Centre for Civil Engineering Research and Codes (CUR) and Ministry of Transport, Public Works and Water management (1993) mention that the Kuttanad polder in Kerala can be up to 3.0 m-MSL. James (2004) describes that there are 1231 polders with a total area of 55,000 ha. Gopakumar *et al*. (2007) and Schultz *et al*. (2013) give an overview of the development of the area (Figure 1). Gopakumar *et al*. (2007) describe that the total area is 110,800 ha, of which 28% is located at about 1 m+MSL, 60% located at 0.6 – 2.2 m-MSL and 12% consists of interlinking water bodies. This would imply that about 66,000 ha are polders. They also describe that there were frequent problems with flooding during the wet monsoon and salinity intrusion during the dry monsoon. To encounter these problems the government of Kerala State initiated in 1950 a comprehensive scheme for the development of Kuttanad. The scheme included the Thottapally spillway (1955) for diversion of a part of the floodwaters from the upper Kuttanad directly to the sea; the Thanneermukkom Barrage (1975 – 1981) salt water barrier across the narrow portion of the Vembanad Lake, and a lock on the southern boundary of the lowland to prevent the entry of saline water from the southern side. Since then there have been new reclamations, of which the most recent are located in water at 2.5 m-MSL.

Figure 1. Location of the Vembanad-Kuttanad area (Gopakumar et al., 2007)

The Food and Agriculture Organisation of the United Nations (FAO) mentions that the Kuttanad Wetland Agriculture System is unique, as it is the only system in India that favours rice cultivation below sea level in the land created by draining delta swamps in brackish waters. This system also allows fisheries systems, livestock and home garden to be grown.

In its report the Department of Public Works (1978) presents a general description and a situation map of the Bhal Reclamation Scheme, According to the Group Polder Development (1982) the scheme consists of some 22,000 ha that is protected against the sea. In the region regularly salinity problems are being encountered.

The Group Polder Development (1982) also mentions that in the Lagoon of Koshia there is an impoldered area of 50,000 ha and in the Western Sunderbans an area of about 360,000 ha.

The total area of the Salt Lakes near Calcutta is about 12,000 ha. Of the area about 7,000 ha has been reclaimed as a polder (Group Polder Development, 1982).

The Group Polder Development (1982) also mentions that about 80,000 ha coastal lands have been reclaimed in the State of Maharastra.

They also mention that there are existing and proposed polders in the deltaic areas of the rivers along east coast of India, but don't specify the reclaimed area. Mention is made of the Cauvery Delta, Godavari Delta, Krishna Delta and Mahanadi Delta.

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

Proposed polders

There is a long standing plan to close of the Gulf of Khambat and to reclaim tidal areas in the gulf. However, so far construction has not yet started.

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

The location of the polders in India is shown in Figure 2.

Figure 2. Location of the polders in India (source: esri – Batavialand)

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

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Bart Schultz

Lelystad, July 2023

Table I. General characteristics of existing polders in India

Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
Kuttanad Polders	1834-1984	66,000	RLL	9° 21' N	76° 24' E	18	Agriculture and nature
Polders in Lake Vambanad	1920-1975	719	DL	9° 40' N	76° 27' E	1	Agriculture
Bhal Reclamation Scheme		22,000	LGS	21° 51' N	72° 13' E	16	Agriculture
Polders along the east coast:							
• Cauvery Delta			RLL	11° 21' N	79° 48' E	14	Agriculture
• Godavari Delta			RLL	16° 36' N	82° 2' E	14	Agriculture
• Krishna Delta			RLL	15° 47' N	80° 55' E	23	Agriculture
• Mahanadi Delta			RLL	20° 16' N	86° 10' E	21	Agriculture
Polders in the Lagoon of Koshia		50,000	LGS	9° 56' N	76° 17' E	20	Agriculture
Reclaimed coastal lands in Maharashtra		80,000	LGS	19° 08' N	72° 56' E	2	Agriculture
Reclaimed Salt Lakes		7,000	DL				
Vavakkad paddy polder			RLL	10° 09' N	76° 11' E	0	Rice
Western Sunderbans		360,000	RLL	9° 40' N	76° 27' E	20	Agriculture and nature
Total		585,719					

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

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

			
A4 001/IV.4.1 Water buffaloes	A5 001/IV.5.1 Lowland area, presumably in India	A5 002/IV.5.2 Lowland area, presumably in India	A7 001/IV.7.1 Group picture in front of the Taj Mahal, Prof. Adriaan Volker second from left in front. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, India
			
A7 002/IV.7.2 Prof. Adriaan Volker at a reception. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, India	A7 003/IV.7.3 Central Office ICID New Delhi. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, India	A7 004/IV.7.4 Central Office ICID New Delhi. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, India	A7 005/IV.7.5 Central Office ICID New Delhi. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, India

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

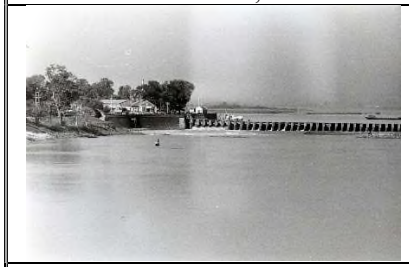
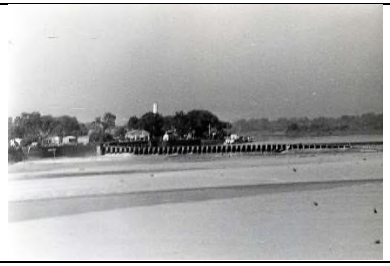
			
A7 006/IV.7.6 Central Office ICID New Delhi. Picture taken during the 6th Congres of the International Commission on irrigation and Drainage (ICID), 4-13 January 1966 New Delhi, in India	A7 007/IV.7.7 Maquette of the delta area	A7 008/IV.7.8 Maquette of the delta area	A7 009/IV.7.9 Maquette of the delta area
			
A7 010/IV.7.10 Barrier in river or sea arm	A7 011/IV.7.11 Barrier in river or sea arm	A7 012/IV.7.12 Barrier in river or sea arm	A7 013/IV.7.13 Barrier in river or sea arm

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

			
A7 014/IV.7.14 Small dike in delta area	A7 015/IV.7.15 Discharge sluice in delta area	A7 016/IV.7.16 Enslosing Dam with movable attachment	A7 017/IV.7.17 Enslosing Dam with movable attachment
			
A7 018/IV.7.18 Enslosing Dam with movable attachment	A7 019/IV.7.19 Enslosing Dam with movable attachment	A7 020/IV.7.20 Enslosing Dam with movable attachment	A7 021/IV.7.21 Enslosing Dam with movable attachment
			
A7 022/IV.7.22 Enslosing Dam with movable attachment	A7 023/IV.7.23 Enslosing Dam with movable attachment	A7 024/IV.7.24 Enslosing Dam with movable attachment	A7 025/IV.7.25 Mobile machine for placing and removing the attachments

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

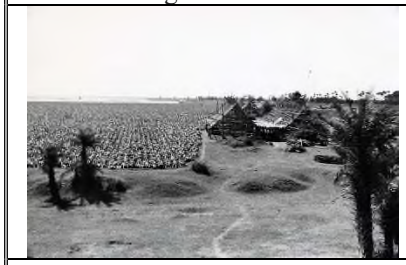
			
A7 026/IV.7.26 Mobile machine for placing and removing the attachments	A7 027/IV.7.27 Mobile machine for placing and removing the attachments	A7 028/IV.7.28 Landscape in delta area	A7 029/IV.7.29 Landscape in delta area
			
A7 030/IV.7.30 Landscape in delta area	A7 031/IV.7.31 Mobile machine for placing and removing the attachments	A7 032/IV.7.32 Barrier in a river mouth in the same or another lowland area	A7 033/IV.7.33 Barrier in a river mouth in the same or another lowland area
			
A7 034/IV.7.34 Barrier in a river mouth in the same or another lowland area	A7 035/IV.7.35 Barrier in a river mouth in the same or another lowland area	A7 036/IV.7.36 Barrier in a river mouth in the same or another lowland area	A7 037/IV.7.37 Barrier in a river mouth in the same or another lowland area

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

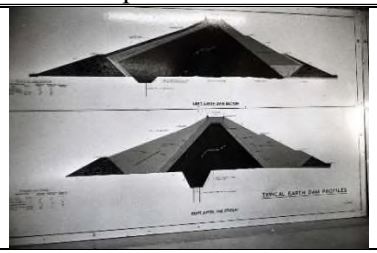
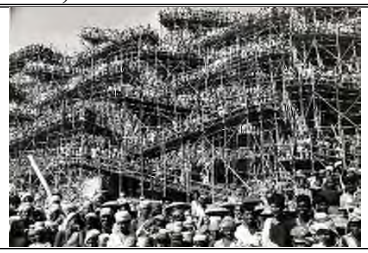
			
A7 038/IV.7.38 View of a dam	A7 039/IV.7.39 Scheme of the cross-section of a dam	A7 040/IV.7.40 Construction of a dam	A7 041/IV.7.41 Construction of a dam with many labourers
			
A7 042/IV.7.42 Labourers for the construction of a dam	A7 043/IV.7.43 Labourers for the construction of a dam	A7 044/IV.7.44 Labourers for the construction of a dam	A7 045/IV.7.45 Labourers for the construction of a dam
			
A7 046/IV.7.46 Presumably barrier with movable attachments in a lowland area	A7 047/IV.7.47 Presumably barrier with movable attachments in a lowland area	A7 048/IV.7.48 Presumably barrier with movable attachments in a lowland area	A7 049/IV.7.49 Presumably barrier with movable attachments in a lowland area

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

			
A7 050/IV.7.50 Discharge sluice, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 051/IV.7.51 Discharge sluice, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 052/IV.7.52 Discharge sluice, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 053/IV.7.53 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 054/IV.7.54 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 055/IV.7.55 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 056/IV.7.56 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 057/IV.7.57 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 058/IV.7.58 Barrier, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 059/IV.7.59 Barrier, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 060/IV.7.60 Traditionele sailing ship in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 061/IV.7.61 Dike in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme

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

			
A7 062/IV.7.62 Destroyed section in dike in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 063/IV.7.63 Destroyed section in dike in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 064/IV.7.64 Dike in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 065/IV.7.65 Dike in lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 066/IV.7.66 Name plate at Bagjola discharge sluice of Bagjola Ghui I Jatragachi Drainage Scheme	A7 067/IV.7.67 Bagjola discharge sluice of Bagjola Ghui I Jatragachi Drainage Scheme	A7 068/IV.7.68 Steamer at river, presumably near Bagjola Ghui I Jatragachi Drainage Scheme	A7 069/IV.7.69 Traditional fishing boats, presumably near Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 070/IV.7.70 Traditional boat, presumably near Bagjola Ghui I Jatragachi Drainage Scheme	A7 071/IV.7.71 Vishermen, presumably near Bagjola Ghui I Jatragachi Drainage Scheme	A7 072/IV.7.72 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 073/IV.7.73 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme

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

			
A7 074/IV.7.74 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 075/IV.7.75 Traditional fisher boats, presumably near Bagjola Ghui I Jatragachi Drainage Scheme	A7 076/IV.7.76 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 077/IV.7.77 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 078/IV.7.78 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 079/IV.7.79 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 080/IV.7.80 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 081/IV.7.81 Lowland area Sunderbans, test section for dike with protection of the outer slope with stone blocks
			
A7 082/IV.7.82 Lowland area Sunderbans, test section for dike with protection of the outer slope with stone blocks	A7 083/IV.7.83 Lowland area Sunderbans, test section for dike with protection of the outer slope with stone blocks	A7 084/IV.7.84 Lowland area Sunderbans, test section for dike with protection of the outer slope with stone blocks	A7 085/IV.7.85 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme

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

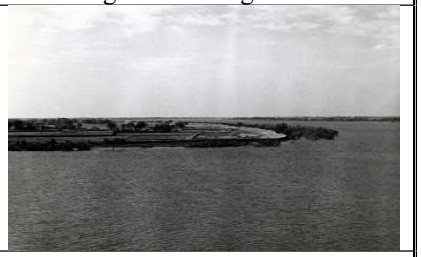
			
A7 086/IV.7.86 Lowland area Sunderbans, test section for dike with protection of the outer slope with stone blocks	A7 087/IV.7.87 Children at water pump, presumably in Bagjola Ghui I Jatragachi Drainage Scheme	A7 088/IV.7.88 Small dike along lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 089/IV.7.89 Damaged dike along lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 090/IV.7.90 Traditional sailing boat, presumably near Bagjola Ghui I Jatragachi Drainage Scheme	A7 091IV.7.91 Traditional water lifting device, presumably in Bagjola Ghui I Jatragachi Drainage Scheme	A7 092/IV.7.92 Small dike, presumably langs Bagjola Ghui I Jatragachi Drainage Scheme	A7 093/IV.7.93 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme
			
A7 094/IV.7.94 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 095/IV.7.95 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 096/IV.7.96 Lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 097/IV.7.97 Traditional sailing boat, presumably near Bagjola Ghui I Jatragachi Drainage Scheme

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

			
A7 098/IV.7.98 Dike along lowland area, presumably Bagjola Ghui I Jatragachi Drainage Scheme	A7 099/IV.7.99 Lowland area 30 km northeast of Calcutta, Bengal. Small parcels, about 1000 persons per km^2	A7 100/IV.7.100 Lowland area with damaged dike in Bengal	A7 101/IV.7.101 Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal
			
A7 102/IV.7.102 Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal	A7 103/IV.7.103 Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal	A7 104/IV.7.104 Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal	A7 105/IV.7.105 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978
			
A7 106/IV.7.106 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 107/IV.7.107 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 108/IV.7.108 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 109/IV.7.109 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978

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

			
A7 109/IV.7.110 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 111/IV.7.111 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 112/IV.7.112 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978	A7 113/IV.7.113 Construction of a barrier in Shindoga River near Mul Dwarka 9 October 1978
			
A7 114/IV.7.114 Tidal regulator in the mouth of the Madhuvanti River	A7 115/IV.7.115 Tidal regulator in the mouth of the Madhuvanti River	A7 116/IV.7.116 Tidal regulator in the mouth of the Madhuvanti River	A7 117/IV.7.117 Lowland, ploughing with oxen, 12 October 1978
			
A7 118/IV.7.118 Lowland, ploughing with oxen, 12 October 1978	A7 119/IV.7.119 Ghogma sea dike, 12 October 1978	A7 120/IV.7.120 Ghogma sea dike, 12 October 1978	A7 121/IV.7.121 Bhal Scheme NEDECO

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

			
A7 122/IV.7.122 Bhal Scheme NEDECO	A7 123/IV.7.123 Bhal Scheme NEDECO	A1 5 001/A.1.5.1 Kuttanad area	A1 5 002/A.1.5.2 Kuttanad area
			
A1 5 003/A.1.5.3 Kuttanad area	A1 5 004/A.1.5.4 Kuttanad area	A1 5 005/A.1.5.5 Kuttanad area	A1 5 0061/A.1.5.6 Kuttanad area
			
A1 5 007/A.1.5.7 Kuttanad area	A1 5 008/A.1.5.8 Kuttanad area	A1 5 009/A.1.5.9 Kuttanad area	A1 5 010/A.1.5.10 Kuttanad area

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

			
A1 5 011/A.1.5.11 Kuttanad area	A1 5 012/A.1.5.12 Kuttanad area	A1 5 013/A.1.5.13 Kuttanad area	A1 5 014/A.1.5.14 Kuttanad area
			
A1 5 015/A.1.5.15 Kuttanad area	A1 5 016/A.1.5.16 Kuttanad area	A1 5 017/A.1.5.17 Kuttanad area	A1 5 018/A.1.5.18 Kuttanad area
			
A1 5 019/A.1.5.19 Kuttanad area	A1 5 020/A.1.5.20 Kuttanad area	C4 3 001/C.4.3.1 Stone bank protection along the coast. September presumably 1982	C4 3 002/C.4.3.2 Fishing boats near the coast. September presumably 1982

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

			
C4 3 003/C.4.3.3 Canal in lowland area. September presumably 1982	C4 3 004/C.4.3.4 Detail of discharge sluice (??). September presumably 1982	C4 3 005/C.4.3.5 Bridge over discharge sluice (??). September presumably 1982	C4 3 006/C.4.3.6 People at the beach. September presumably 1982
			
C4 3 007/C.4.3.7 Houses. September presumably 1982	C4 3 008/C.4.3.8 Discharge sluice. September presumably 1982	C4 3 009/C.4.3.9 Rice field. September presumably 1982	C4 3 010/C.4.3.10 Rice field and irrigation canal. September presumably 1982
			
C4 3 011/C.4.3.11 Rice field. September presumably 1982	C4 3 012/C.4.3.12 Canal. September presumably 1982	C4 3 013/C.4.3.13 Canal. September presumably 1982	C4 3 014/C.4.3.14 Canal. September presumably 1982

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

			
C4 3 015/C.4.3.15 Canal. September presumably 1982	C4 3 016/C.4.3.16 Canal. September presumably 1982	C4 3 017/C.4.3.17 Low dike. September presumably 1982	C4 3 018/C.4.3.18 Low dike. September presumably 1982
			
C4 3 019/C.4.3.19 Discharge sluice. September presumably 1982	C4 3 020/C.4.3.20 Small canal. September presumably 1982	C4 3 021/C.4.3.21 Drilling. September presumably 1982	C4 3 022/C.4.3.22 Geo-electric research with large interest. September presumably 1982
			
C4 3 023/C.4.3.23 River. September presumably 1982	C4 3 024/C.4.3.24 Rain gauges. September presumably 1982	C4 3 025/C.4.3.25 Bank protection. September presumably 1982	C4 3 026/C.4.3.26 Bank protection. September presumably 1982

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

			
C4 3 027/C.4.3.27 River. September presumably 1982	C4 3 028/C.4.3.28 River. September presumably 1982	C4 3 029/C.4.3.29 Segment of a discharge sluice. September presumably 1982	C4 3 030/C.4.3.30 Shiplock. September presumably 1982
			
C4 3 031/C.4.3.31 Road over discharge sluice. September presumably 1991	C4 3 032/C.4.3.32 Shiplock. September presumably 1982	C4 3 033/C.4.3.33 Discharge sluice. September presumably 1991	C4 3 034/C.4.3.34 Dike along river. September presumably 1991
			
C4 3 035/C.4.3.35 Installation of a drain. September presumably 1991	C4 4 001/C.4.4.1 House in lowland area	C4 4 002/C.4.4.2 Presumably drain in lowland area	C4 4 003/C.4.4.3 Presumably drain in lowland area

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

			
C4 4 004/C.4.4.4 Agriculture in lowland area	C4 4 005/C.4.4.5 Possibly irrigation canal in lowland area	C4 4 006/C.4.4.6 Possibly irrigation canal in lowland area	C4 4 007/C.4.4.7 Traditional boat
			
C4 4 008/C.4.4.8 Road along canal, probably also dike	C4 4 009/C.4.4.9 Road along canal, probably also dike	C4 4 010/C.4.4.10 Probably dike along canal	C4 4 011/C.4.4.11 Road along canal, probably also dike
			
C4 4 012/C.4.4.12 Probably dike along canal	C4 4 013/C.4.4.13 Presumably river	C4 4 014/C.4.4.14 Lake in lowland area	C4 4 015/C.4.4.15 Road in lowland area

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

			
C4 4 016/C.4.4.16 Bay	C4 4 017/C.4.4.17 Bananas in lowland area	C4 4 018/C.4.4.18 Bananas in lowland area	C4 4 019\C.4.4.19 Lowland area
			
C4 4 020/C.4.4.20 Canal and rice field	C4 4 021/C.4.4.21 Bananas in lowland area	C4 4 022/C.4.4.22 Physical model of delta area	C4 4 023/C.4.4.23 Observation platform at a construction site
			
C4 4 024/C.4.4.24 Physical model of a dam	C4 4 025/C.4.4.25 Dam under construction	C4 4 026/C.4.4.26 Presumably irrigation canal	C4 4 027/C.4.4.27 Discharge sluice

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

			
C4 4 028/C.4.4.28 Discharge sluice	C4 4 029/C.4.4.29 Discharge sluice	C4 4 030/C.4.4.30 Dike with raised wall	C4 4 031/C.4.4.31 Dike with raised wall
			
C4 4 032/C.4.4.32 Dike with breach in the raised wall	C4 4 033/C.4.4.33 Dike with breach in the raised wall	C4 4 034/C.4.4.34 Dike with breach in the raised wall	C4 4 035/C.4.4.35 Dike with breach in the raised wall
			
C4 4 036/C.4.4.36 Dike with breach in the raised wall	A9 001/D1.IX.1 Coastal protection	A9 002/D1.IX.2 Probably Tottapalli spillway	A9 003/D1.IX.3 Probably Tottapalli spillway

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

			
A9 004/D1.IX.4 Probably detail Tottapalli spillway	A9 005/D1.IX.5 Probably shiplock in the Tottapalli spillway	A9 006/D1.IX.6 Probably Tottapalli spillway	A9 007/D1.IX.7 Probably Tottapalli spillway
			
A9 008/D1.IX.8 Probably Tottapalli spillway	A9 009/D1.IX.9 Probably shiplock in the Tottapalli spillway	A9 010/D1.IX.10 Landscape in Kuttanad area	A9 011/D1.IX.11 Traditional water transport in Kuttanad area
			
A9 012/D1.IX.12 Traditional water transport in Kuttanad area	A9 013/D1.IX.13 Traditional boat in Kuttanad area	A9 014/D1.IX.14 Dike and landscape and waterafvoerpunt in the Kuttanad area	A9 015/D1.IX.15 landscape in the Kuttanad area

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

			
A9 016/D1.IX.16 Bank protection in the Kuttanad area	A9 017/D1.IX.17 Small dike en landscape in the Kuttanad area	A9 018/D1.IX.18 Processing of the rice yield in the Kuttanad area	A9 019/D1.IX.19 Pumping staion and small dike in the Kuttanad area
			
A9 020/D1.IX.20 Small dike in the Kuttanad area	A9 021/D1.IX.21 Pumping staion and small dike in the Kuttanad area	A9 022/D1.IX.22 Bank protection in the Kuttanad area	A9 023/D1.IX.23 Bank protection before houses in the Kuttanad area
			
A9 024/D1.IX.24 Bank protection and a pumping station in the Kuttanad area	A9 025/D1.IX.25 Probably Tottapalli spillway	A9 026/D1.IX.26 Movable vertical gate	A9 027/D1.IX.27 Movable vertical gate

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

			
A9 028/D1.IX.28 Probably Tottapalli spillway	A9 029/D1.IX.29 Probably Tottapalli spillway	A9 030/D1.IX.30 Probably Tottapalli spillway	A9 031/D1.IX.31 Probably detail Tottapalli spillway
			
A9 032/D1.IX.32 Volker receives an explanation on the Tottapalli spillway	A9 033/D1.IX.33 Inauguration plate Tottapalli spillway	A9 034/D1.IX.34 Probably detail Tottapalli spillway	A9 035/D1.IX.35 Traditional water transport in Kuttanad area
			
A9 036/D1.IX.36 Traditional water transport in Kuttanad area	A9 037/D1.IX.37 Landscape and pumping station in the Kuttanad area	A9 038/D1.IX.38 Landscape and pumping station in the Kuttanad area	A9 039/D1.IX.39 Landscape and pumping station in the Kuttanad area

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

			
A9 040/D1.IX.40 Landscape and pumping station in the Kuttanad area	A9 041/D1.IX.41 Landscape in the Kuttanad area	A9 042/D1.IX.42 Landscape in the Kuttanad area	A9 043/D1.IX.43 Bank protection in the Kuttanad area
			
A9 044/D1.IX.44 Bank protection in the Kuttanad area	A9 045/D1.IX.45 Canal in the Kuttanad area	A9 046/D1.IX.46 Movable vertical gate in the Kuttanad area	A9 047/D1.IX.47 Landscape in the Kuttanad area
			
A9 048/D1.IX.48 Probably drain in the Kuttanad area	A9 049/D1.IX.49 Probably drain in the Kuttanad area	A9 050/D1.IX.50 Probably drain in the Kuttanad area	A9 051/D1.IX.51 Landscape in the Kuttanad area

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

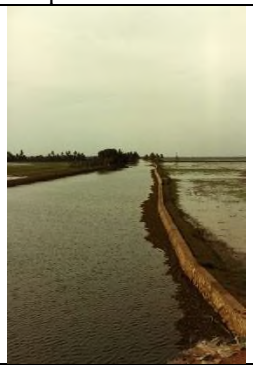
			
A9 052/D1.IX.52 Landscape in the Kuttanad area	A9 053/D1.IX.53 Landscape in the Kuttanad area	A9 054/D1.IX.54 Ferry in the Kuttanad area	A9 055/D1.IX.55 Landscape in the Kuttanad area
			
A9 056/D1.IX.56 Landscape in the Kuttanad area	A9 057/D1.IX.57 Landscape in the Kuttanad area	A9 058/D1.IX.58 Landscape in the Kuttanad area	A9 059/D1.IX.59 Primary canal in the Kuttanad area
			
A9 060/D1.IX.60 Primary canal in the Kuttanad area	A9 061/D1.IX.61 Primary canal and landscape in the Kuttanad area	A9 062/D1.IX.62 Primary canal and landscape in the Kuttanad area	A9 063/D1.IX.63 Primary canal and landscape in the Kuttanad area

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

			
A9 064/D1.IX.64 Primary canal and landscape in the Kuttanad area	A9 065/D1.IX.65 Landscape in the Kuttanad area	A9 066/D1.IX.66 Watertransport of coco nuts in the Kuttanad area	A9 067/D1.IX.67 Bank protection in the Kuttanad area
			
A9 068/D1.IX.68 Traditional boat in the Kuttanad area	A9 069/D1.IX.69 Traditional boat in the Kuttanad area	A9 070/D1.IX.70 Primary canal in the Kuttanad area	A9 071/D1.IX.71 Office of the Grondwater Department
			
A9 072/D1.IX.72 Traditional lifting defice	A9 073/D1.IX.73 Traditional lifting defice	A9 074/D1.IX.74 Small irrigation canal in the Kuttanad area	A9 075/D1.IX.75 Discharge point in Kuttanad area

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

			
A9 076/D1.IX.76 Bank protection in Kuttanad area			