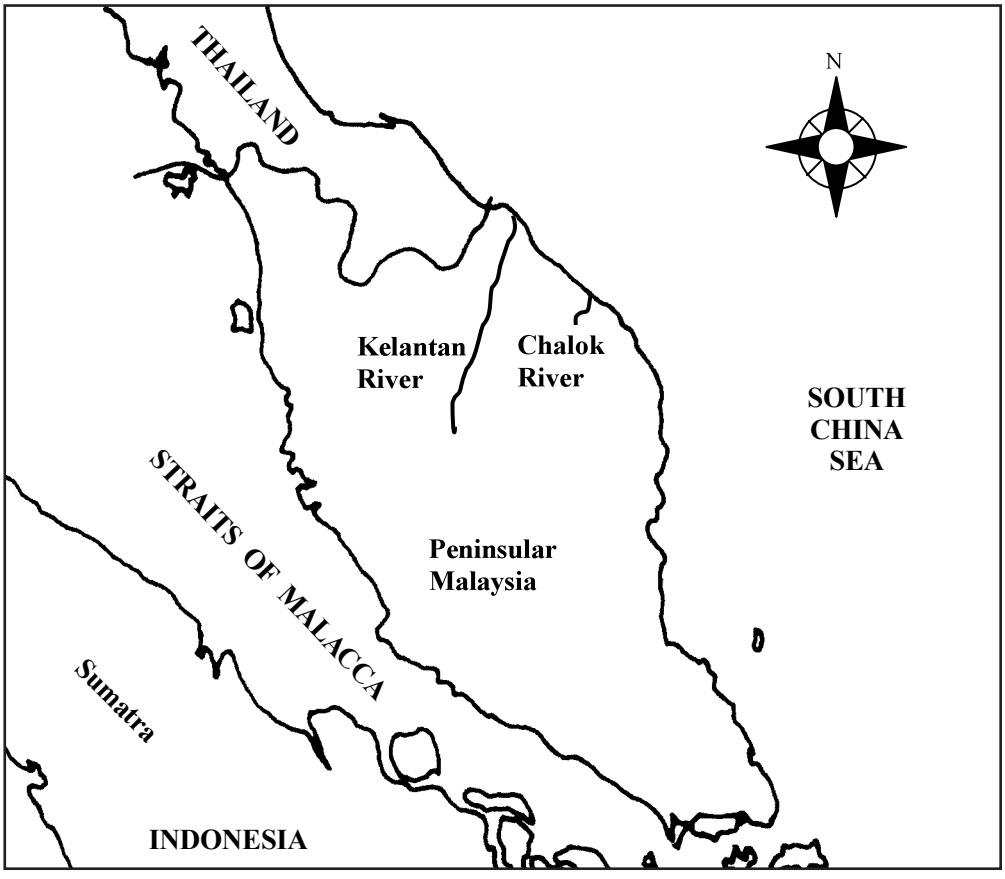
Malaysia

Malaysia-3: Kelantan River

Malaysia-4: Chalok River



Introduction

Malaysia is situated in the heart of Southeast Asia, just north of the equator. It has a total land area of 330,434 km^2 and is divided into two distinct regions: Peninsular Malaysia, which extends from the Thai border down to the island nation of Singapore: and, across the South China Sea on the northern coast of Borneo, the two states of Sabah and Sarawak which are bordered by Indonesia to the south and the Philippines to the east.

Being in the tropical region, the climate is hot and humid throughout the year. The mean annual rainfall is 2,500 mm and the temperature ranges from 21°C to 32°C. Out of a total population of about 20 million (1997), approximately 16.9 million live in Peninsular Malaysia whilst 3.1 million live in Sabah and Sarawak. The population come from a variety of ethnic backgrounds. The majority of Malays, Chinese and Indians live in Peninsular Malaysia whereas Iban, Kadazan and Bidayuh are the main indigenous ethnic groups in Sabah and Sarawak.

The rivers catalogued in this volume are the Kelantan River, Kelantan, and the Chalok River in Trengganu.

At 248 km, the Kelantan River is the longest river in Kelantan State and drains an area of 13,100 km^2. The river originates in the Tahan mountain ranges and flows northwards to discharge into the South China Sea. The basin is mainly in tropical rain forest and has a mean annual rainfall of about 2,505 mm. Its mean annual discharge measured at Guillermard Bridge is about 557.5 m^3/s

The Chalok River, by contrast, is a small coastal basin of 20.5 km^2 that drains directly to the South China Sea with a mean flow of 1.22 m^3/s. It is a representative basin and the main land use is rubber plantation. The basin receives an annual rainfall of about 2,700 mm/y.

Acknowledgements

A collaborative working group of institutes and individuals was established to prepare this contribution to the Catalogue of Rivers. The working group consisted of:

Ir. Dato' Hj. Keizrul bin Abdullah, Chairman of Malaysian National Committee for IHP
Ir. Liew Chin Loong, Secretary, Malaysian National Committee for IHP
Ir. Low Koon Sing, Water Resources Engineer, Department of Irrigation and Drainage Malaysia
Mdm Zimah Ibrahim, Technical Assistant, Department of Irrigation and Drainage Malaysia

The organisations that have contributed by providing data include: the Malaysian Meteorological Services, the Department of Agriculture Malaysian and the Geological Survey Department of Malaysia.

Financial support was provided by the Malaysian Government.

Kelantan River

Map of River

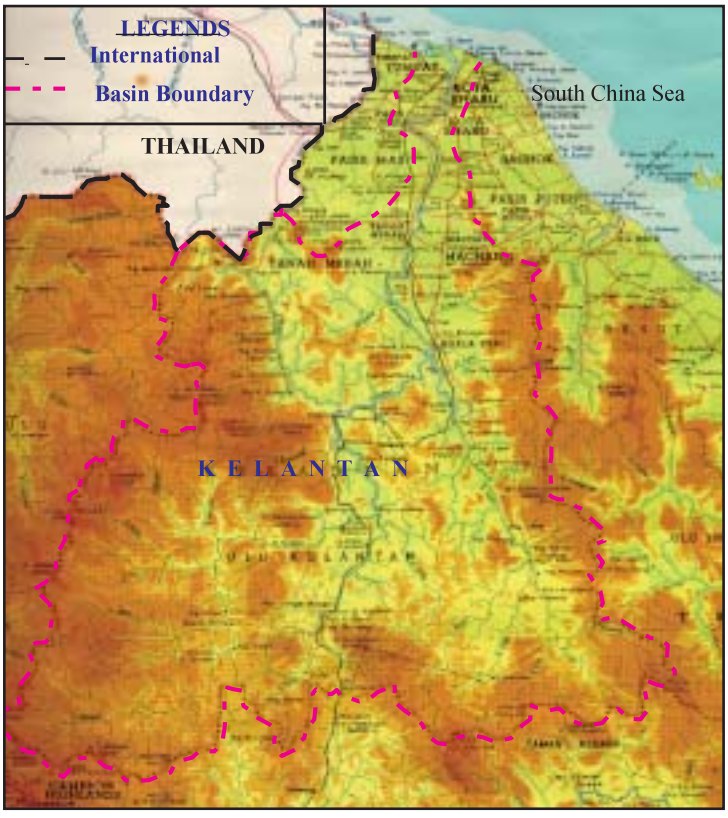


Table of Basic Data

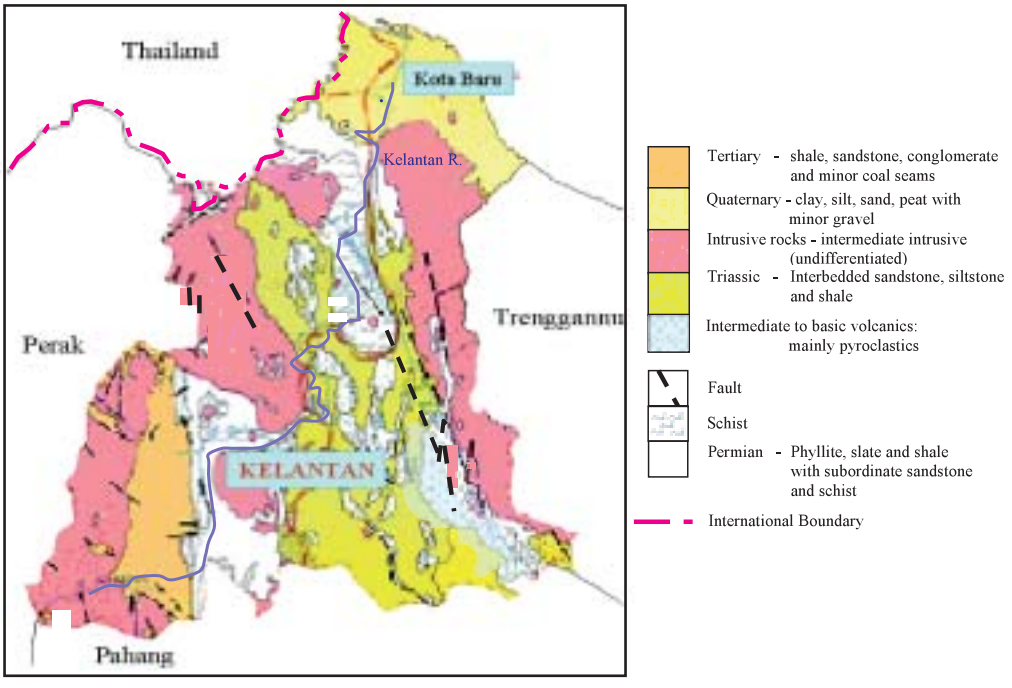
Name: Kelantan River		**Serial No. :** Malaysia-3
Location: Guillemard Bridge	N 4° 40' ~ 6° 12'	E 101° 20' ~ 102° 20'
Area: 11,900 km^2	**Length of main stream:** 248 km	
Origin: Mt.Ulu Sepat (2,161 m)	**Highest point:** Mt. Korbu (2,183 m)	
Outlet: South China Sea	**Lowest point:** River mouth (0 m)	
Main geological features: shale, mudstone, limestone		
Main tributaries: Lebir river (2,430 km^2), Galas river (7,770 km^2)		
Main reservoirs: Nil		
Mean annual precipitation: 2,505 mm (1970 - 1997)		
Mean annual runoff: 557.5 m^3/s at Guillemard Bridge (1950 - 1990)		
Population: 810,000	**Main cities:** Kota Bharu	
Land use: virgin jungle, rubber, paddy, oil palm, tobacco, other agriculture, urban		

1. General Description

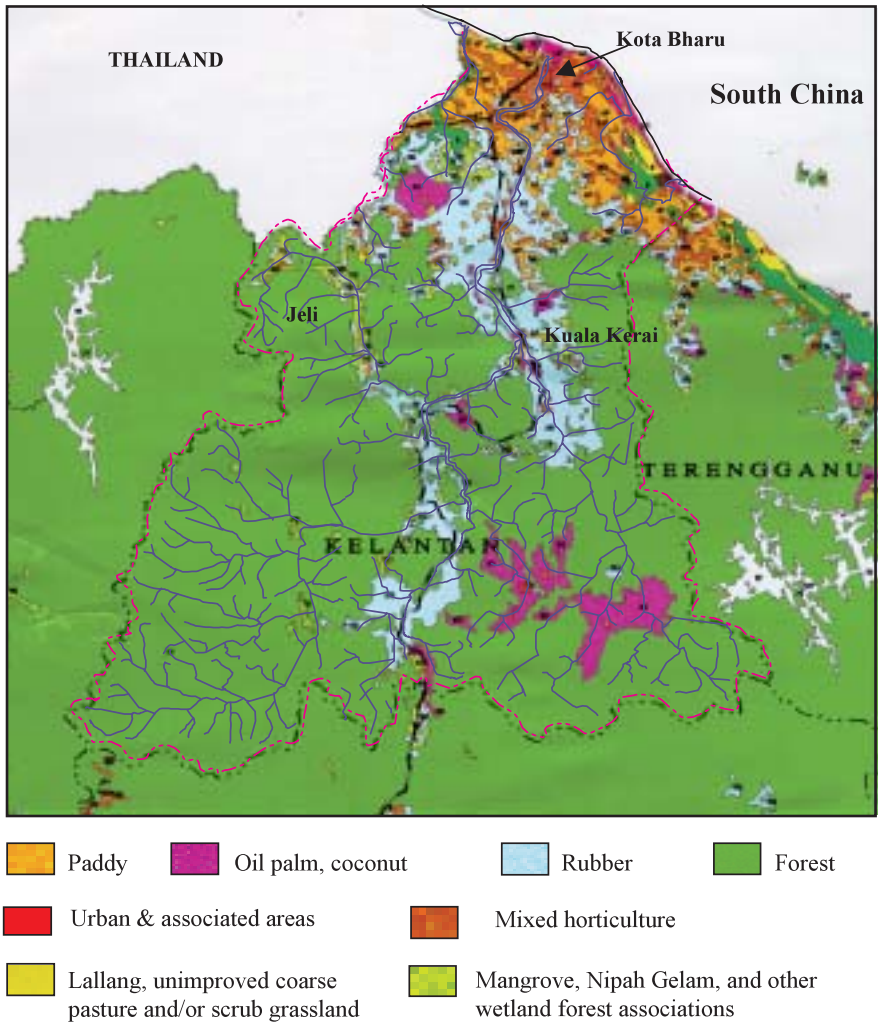
The Kelantan River basin is located in the north eastern part of Peninsular Malaysia between latitudes 4° 40' and 6° 12' North, and longitudes 101° 20' and 102° 20' East. The maximum length and breadth of the catchment are 150 km and 140 km respectively. The river is about 248 km long and drains an area of 13,100 km^2, occupying more than 85% of the State of Kelantan. It divides into the Galas and Lebir Rivers near Kuala Krai, about 100 km from the river mouth. The Galas River is formed by the junction of the Nenggiri and Pergau Rivers. The Nenggiri River originates in the south western part of the central mountain range (Main Range). The Lebir River originates from the Tahan mountain range. The Kelantan River system flows northward passing through such major towns as Kuala Krai, Tanah Merah, Pasir Mas and Kota Bharu, before finally discharging into the South China Sea. About 95% of the catchment is steep mountainous country rising to a height of 2,135 m while the remainder is undulating land. The mountainous areas are covered with virgin jungle while rubber and some paddy are planted in the lowlands. The eastern and western portions, consisting of mountain ranges, have a granitic soil cover consisting of a mixture of fine to coarse sand and clay. The soil cover is a metre or so deep but depths of more than 18 m may be encountered in localised areas. A fine sandy loam soil is found in the extreme east and west of the southern half of the basin. Its depth seldom exceeds a few metres. The remaining portion, comprising almost one-third of the catchment, is cloaked by a variable soil cover that varies in depth, from a few metres to more than 9 m. The basin has an annual rainfall of about 2,500 mm much of which occurs during the North-East Monsoon between mid-October and mid-January. The mean annual temperature at Kota Bharu is 27.5° C with mean relative humidity of 81%. The mean flow of the Kelantan River measured at Guillemard Bridge is 557.5 m^3/s.

2. Geographical Information

2.1 Geological Map



2.2 Land Use Map



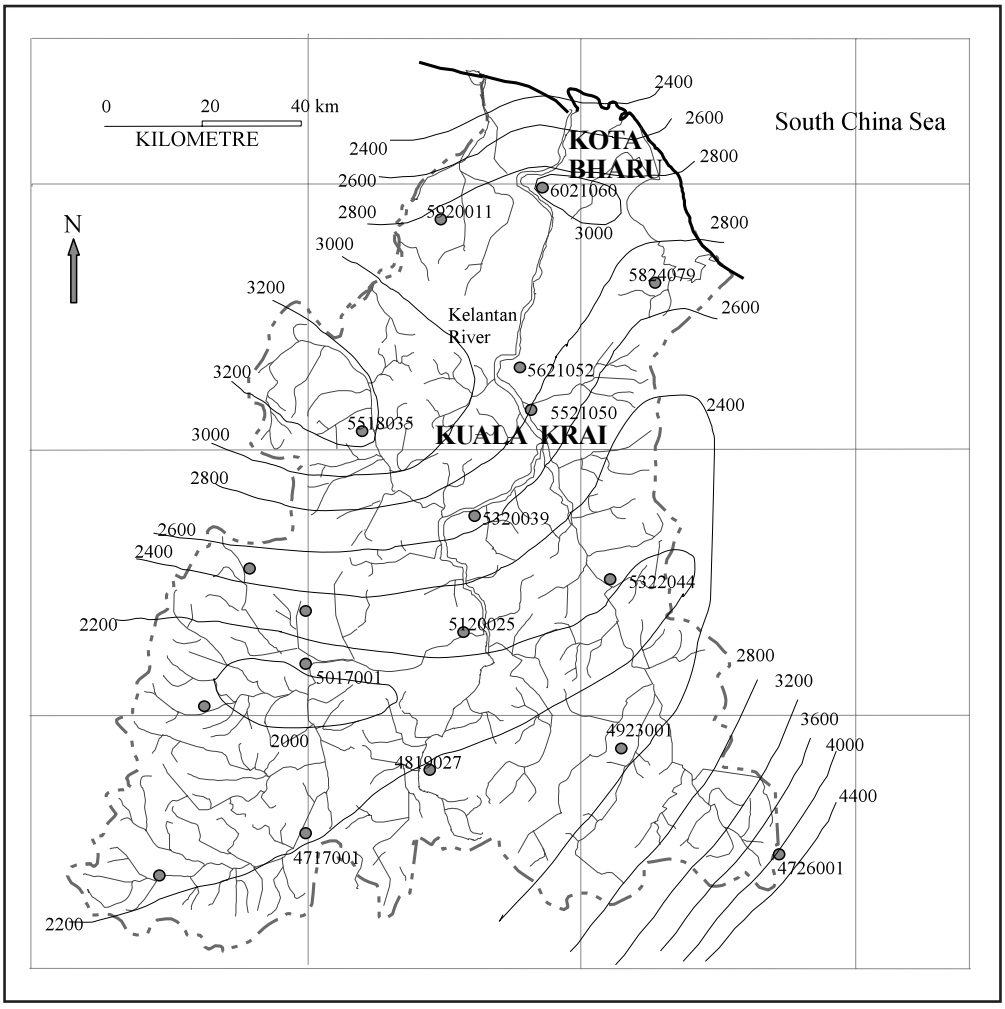
2.3 Characteristics of the River and the Main Tributaries

No.	Name of river	Length [km] Catchment area [km^2]	Highest peak [m] Lowest point [m]	Land use [%] (1990)
1	**Kelantan River** (Main river)	248 11,900	Mt.Korbu (2,183 m)	F (73.2), U (0.1), L (10), OP (4), R (10), P (2.2), A (0.5)
2	**Galas River** (Tributary)	178 7,770	Mt Setong (1,422 m)	F (85), OP (2), R (4), L (9).
3	**Lebir River** (Tributary)	91 2,430	Cintawasa Hill (1,185 m)	F (66), OP (12), R (13), L (9)

A: Other agricultural field (vegetable, grass) F: Forest L: Lake, River, Marsh O: Orchard P: Paddy field
U: Urban R: Rubber OP: Oil Palm.

3. Climatological Information

3.1 Annual Isohyetal Map and Observation Stations



3.2 List of Meteorological Observation Stations

No.*)	Station	Elevation [m]	Location	Observation period	Mean annual precipitation[1] [mm]	Observation items[2]
6021060	**Peng. Kubor Pumphouse**	-	N 06° 01' 05" E 102° 10' 40"	1951 - present	3,086 (1952 - 1997)	(P) SM
5518035	**Luboh Bungor**	-	N 5° 42' 05" E 101° 50' 20"	1956 - present	3,220 (1957 - 1996)	(P) SM
5322044	**Kg. Laloh**	541	N 05° 18' 30" E 102° 16' 30"	1971 - present	2,222 (1971 - 1996)	(P) PAT
5320039	**Ldg Kuala Garis**	1,422	N 05° 22' 40" E 102° 00' 55"	1967 - present	2,022 (1971 - 1996)	(P) SM
4923001	**Kg Aring**	1,200	N 04° 50' 15" E 102° 21' 10"	1975 - present	2,404 (1975 - 1998)	(P) PAT
4819027	**Gua Musang**	1,539	N 04° 53' 05" E 101° 58' 10"	1970 - present	2,258 (1972 - 1998)	(P) PAET
4726001	**Gunung Gagau**	1,376	N 04° 45' 25" E 102° 39' 20"	1982 - present	4,339 (1985 - 1996)	(P) SAT
4717001	**Blau**	898	N 04° 46' 00" E 101° 45' 25"	1975 - present	2,116.6 (1980 - 1995)	(P) SA

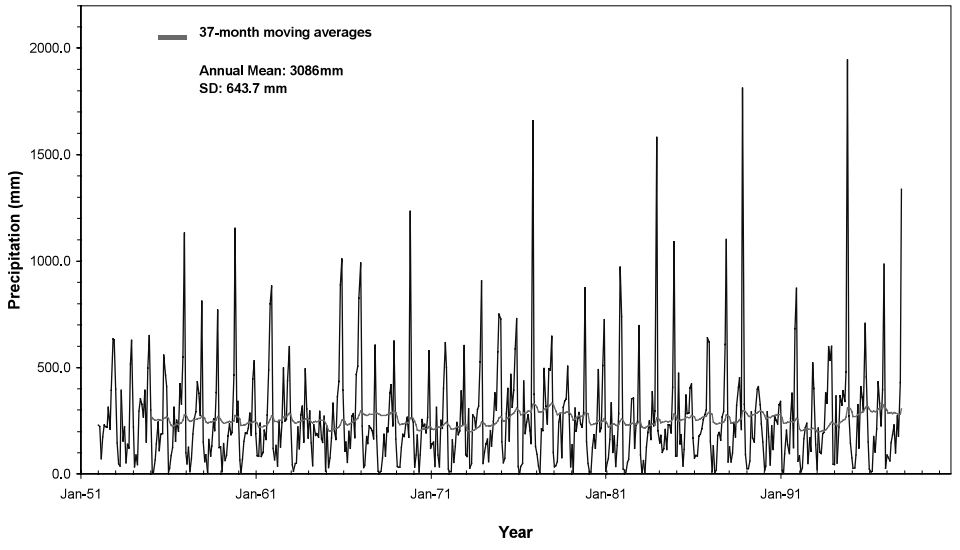
*: Serial number used by Department of Irrigation and Drainage, Malaysia.
1) Period for the mean is from the beginning of the observation period to 1996.
2) (P): Precipitation, SM: Secondary Manual, PAT: Primary Auto telemetric, PAET: Primary auto, evaporation and telemetric , SA: Secondary Auto, SAT: Secondary auto telemetric

3.3 Monthly Climate Data

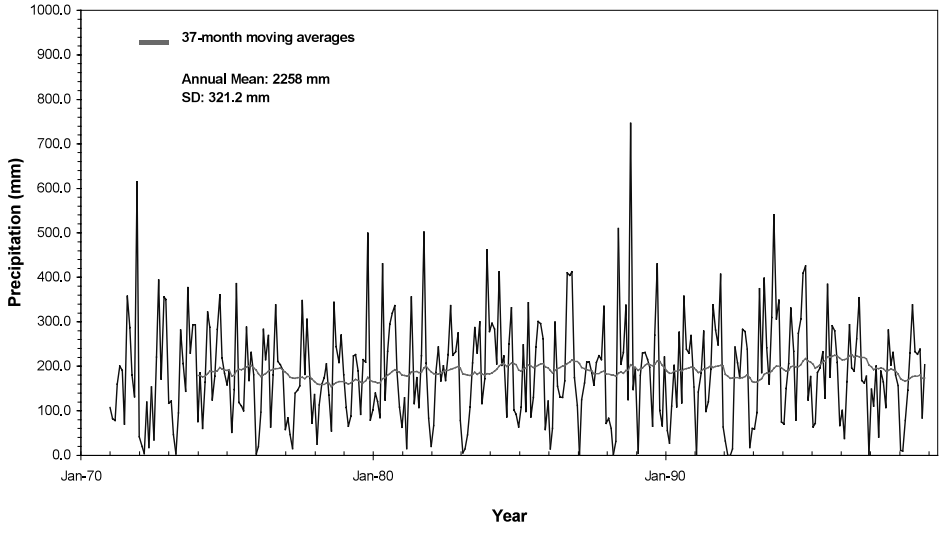
Observation item	Observation station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	**Kota Bharu**	25.7	26.2	27.9	28.1	27.7	27.2	27	26.8	26.7	26	25.8	26.8	26.8	1968 - 1997
Precipitation [mm]	**Peng. Kubor Pumphouse**	169	74	87	83	178	187	212	257	280	302	640	618	3,086	1952 - 1997
Evaporation [mm]		96.5	98.5	123.7	129	119.5	113.4	114.3	112.8	112.2	104.6	85.2	86.5	1,296.2	1975 - 1196
Duration of sunshine [hr]		7.1	8.1	8.4	8.8	7.9	7.0	7.0	6.8	6.5	5.9	4.6	4.8	6.9	1968 - 1997

3.4 Long-term Variation of Monthly Precipitation

(a) Pengkalan Kubor Pump House, Kelantan (6021060)

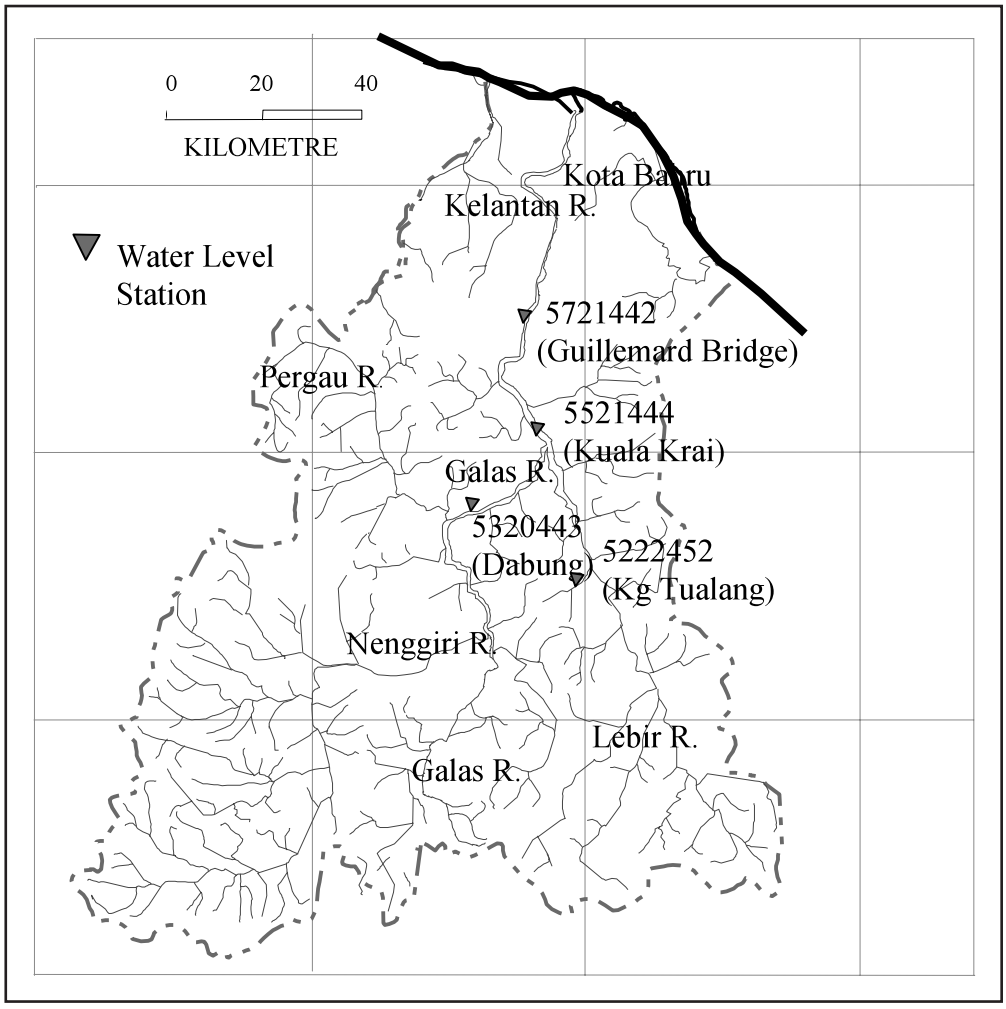


(b) Gua Musang, Kalantan (4819027)



4. Hydrological Information

4.1 Map of Streamflow Observation Stations



4.2 List of Hydrological Observation Stations

No.*	Station	Location	Catchment area (A) [km^2]	Observation period	Observation items[1] (frequency)
5222452	**Kg Tualang**	N 05° 16' 30" E 102° 18' 00"	2,430	1973 - present	WL/Q (A), SS (Wk), WQ (Wk)
5320443	**Dabong**	N 05° 22' 55" E 102° 00' 55"	7,770	1972 - present	WL/Q (A), SS (Wk), WQ (Wk)
5521446	**K.Krai**	N 05° 32' 05" E 102° 10' 50"	10,950	1979 - present	WL (A)
5721442	**Guillemard Bridge**	N 05° 45' 45" E 102° 09' 00"	11,900	1959 - present	WL/Q (A), SS (Wk), WQ (Wk)

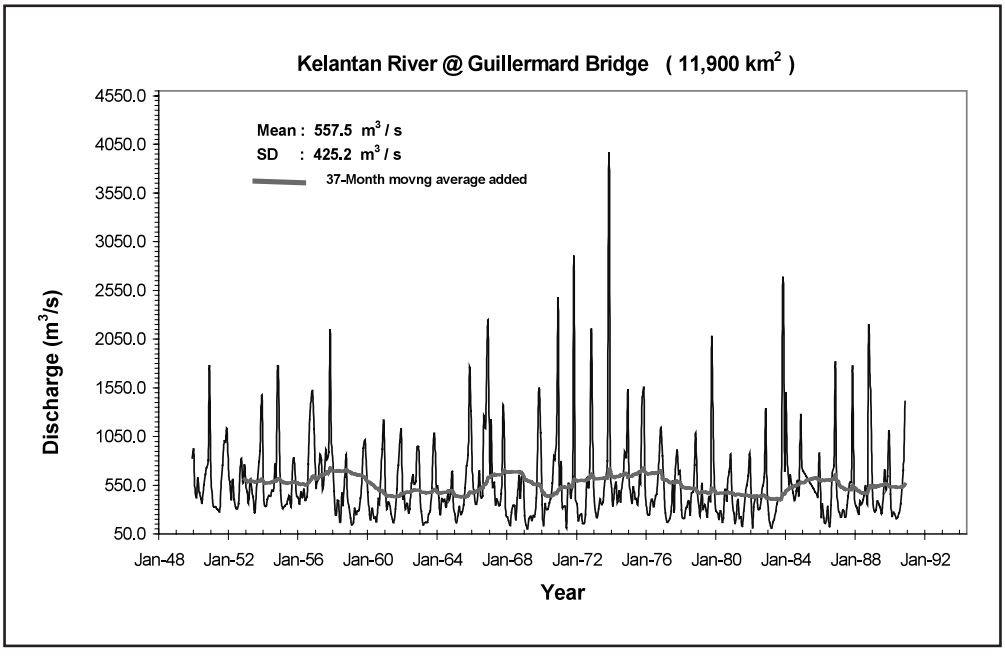
No.*	$\overline{Q}$[2] [m^3/s]	Qmax[3] [m^3/s]	$\overline{Q}$max[4] [m^3/s]	$\overline{Q}$min[5] [m^3/s]	$\overline{Q}$/A [m^3/s/100km^2]	Qmax/A [m^3/s/100km^2]	Period of[2] statistics
5222452	109.8	4,020	1,636	32.4	4.52	165.4	1950 - 1990
5721442	557.5	12,900	5,387	153	4.68	108.4	1950 - 1990

* Serial number used by Dept. of Irrigation and Drainage Malaysia.

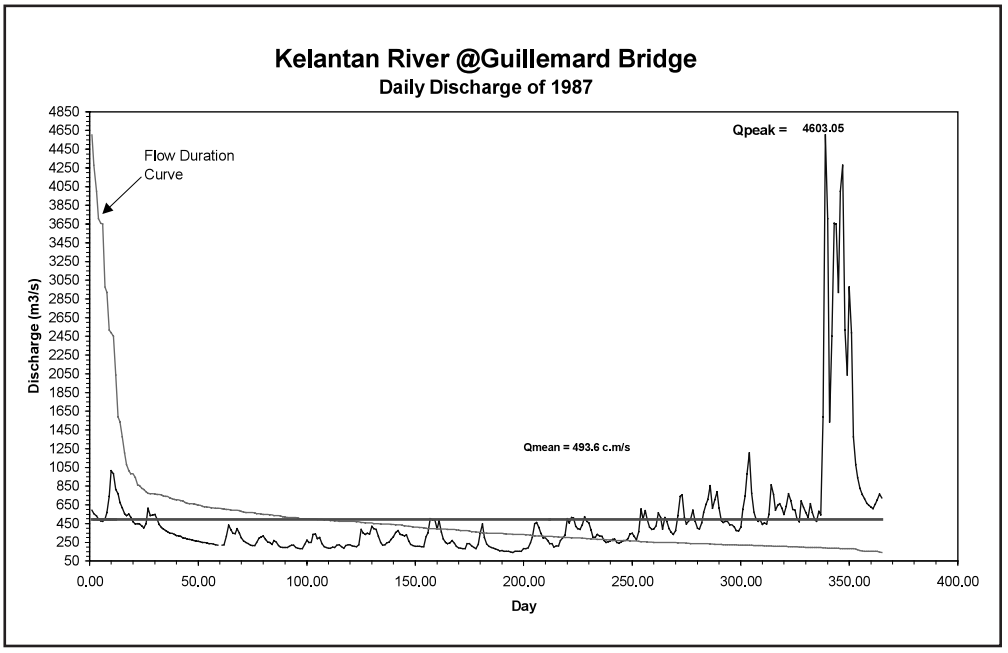
1) WL: Water Level; Q: Discharge; SS: Suspended sediment; WQ: Water quality; (A): Automatic; (Wk): 2- weekly.

2)Mean annual discharge
3)Maximum discharge
4)Mean maximum discharge
5)Mean minimum discharge

4.3 Long-term Variation of Monthly Discharge



4.4 Annual Pattern of Discharge

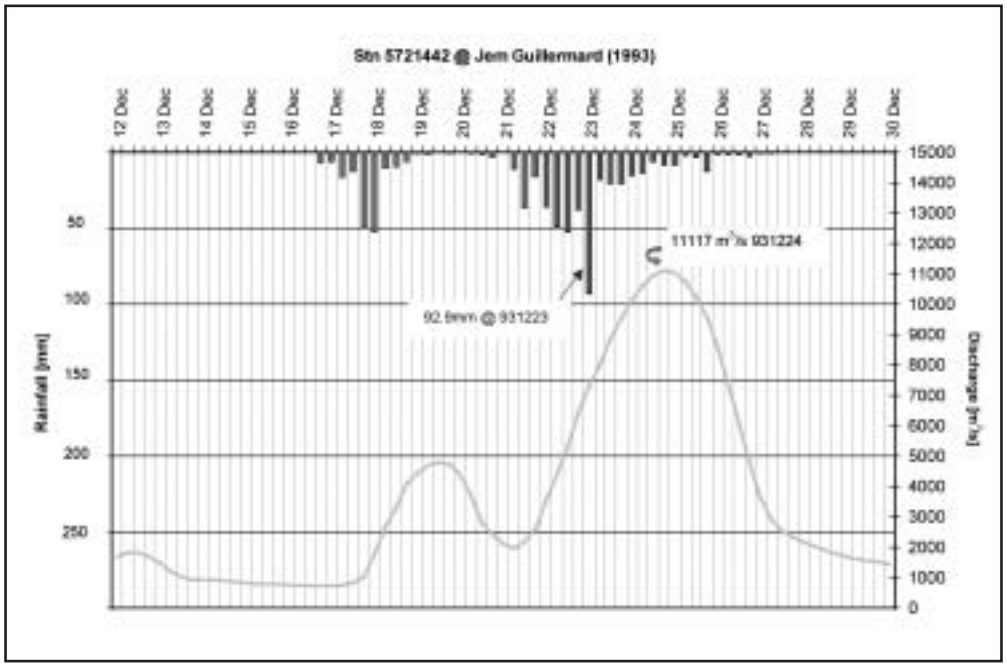


4.6 Annual Maximum and Minimum Discharges

Year	Maximum[1)]		Minimum[2)]		Year	Maximum[1)]		Minimum[2)]	
	Date	[m^3/s]	Month	[m^3/s]		Date	[m^3/s]	Month	[m^3/s]
1960	10/12	3,322	7	53.4	**1979**	29/11	10,252	8	170.1
1961	05/01	2,777	8	102.9	**1980**	20/12	1,709	4	138.3
1962	18/12	2,737	6	183.7	**1981**	03/12	2,029	8	102.5
1963	9/12	3,088	5	70.4	**1982**	16/12	7,186	3	90.9
1964	29/12	1,222	4	175.9	**1983**	07/12	12,007	4	80.4
1965	29/11	6,170	3	102.9	**1984**	25/12	7,744	8	236.1
1966	24/12	3,154	9	233.2	**1985**	16/03	2,665	8	167.8
1967	03/01	8,280	8	233.2	**1986**	02/12	6,957	8	88.0
1968	08/12	1,254	4	113.4	**1987**	12/12	4,785	7	135.7
1969	29/11	6,650	4	62.5	**1988**	22/11	12,900	4	214.7
1970	29/12	8,800	6	147.3	**1989**	03/01	1,275	8	190.6
1971	05/01	8,191	10	229.7	**1990**	14/12	6,064	7	105.6
1972	18/12	10,260	8	164.6	**1991**	13/12	3,846	7	122.7
1973	09/12	11,180	4	178.8	**1992**	13/11	5,409	5	111.8
1974	29/12	4,019	3	245.3	**1993**	24/12	11,117	5	179.6
1975	29/11	5,676	8	261.4	**1994**	24/11	5,282	4	214.7
1976	24/12	2,605	4	163.8	**1995**	29/12	3,075	8	190.6
1977	03/01	2,717	5	142.1	**1996**	12/12	2,412	7	105.6
1978	08/12	3,277	4	166.2	**1997**	05/12	2,619	7	122.7

1), 2) Instantaneous observation by recording charts

4.7 Hyetographs and Hydrographs of Major Floods



5. Water Resources

5.1 General Description

Water of the Kelantan River is at present used for four major irrigation schemes, i.e the Kemubu, Salor, Lemal and Pasir Mas, all of which lie in the lower reaches of the Kelantan River. The present irrigable area for these schemes is about 31,000 ha and takes about 72 m^3/s at maximum water use if entire double cropping is to be achieved.

The Kelantan River and other surface flows were sought as water sources to solve the quantitative and qualitative restriction on groundwater use and to cope with the rapidly increasing domestic and industrial water demand of the area. The present maximum demand is about 134 Ml/d in the lower reaches of the Kelantan River covering the districts of Kota Bharu, Tumpat, Pasir Mas, Machang, Bachok, Pasir Putih and Kuala Krai.

5.4 Major Floods and Droughts

There are no major historical droughts experienced in the Kelantan River basin.

Major Floods

Date	Water level [m]	Meteorological cause	Dead and missing	Major damages [Districts affected]
27.11.90	16.82 m at Guillemard Bridge 5.41 m at Kota Bharu	Heavy rainfall	4 died	4,581 people were evacuated. Road closed for 1-3 days
1991	10.12 m at Rantau Panjang at Golok River.	Heavy rainfall	2 died	Agricultural land inundated with total damages of RM200 thousand. Road and structural damages RM135 thousand.
13.11.92	25.45 m at Tangga Krai	Heavy rainfall		743 people were evacuated, roads, bridge side drains and culverts were flooded and damaged. Damages cost RM560 thousand.
23.12.93	5.49 m at Kota Bharu	Heavy rainfall	14 died	Villages and roads were flooded and damaged. 13,587 people were evacuated Damage cost RM1.5 million.
24.11.94	24.37 m at Kuala Krai 5.15 m at Kota Bharu	Heavy rainfall	14died	1,184 people were evacuated. Roads were flooded to a dept of 2 m for 3-5 days.

6. Socio-cultural Characteristics

The State of Kelantan belongs to the Eastern Region of Peninsular Malaysia and is one of eleven States in Peninsular Malaysia. The State of Kelantan is normally divided into North and South, and is composed of ten Districts. Kota Bharu is the capital of Kelantan as well as the development centre of North Kelantan. The population of the State is 1,181,680 as recorded in 1993. About 68.5 per cent of the population live in the Kelantan River Basin. The others are found in the Golok and Kemubu River basins and in the northern coastal plain of the State. The population of Kota Bharu and Kuala Krai districts are 366,800 and 90,800 respectively. The major economic activities in Kelantan State are agricultural based, mainly the cultivation of paddy rice, rubber, oil palm and tobacco. Fishing and livestock farming are also an important occupation found in this area.