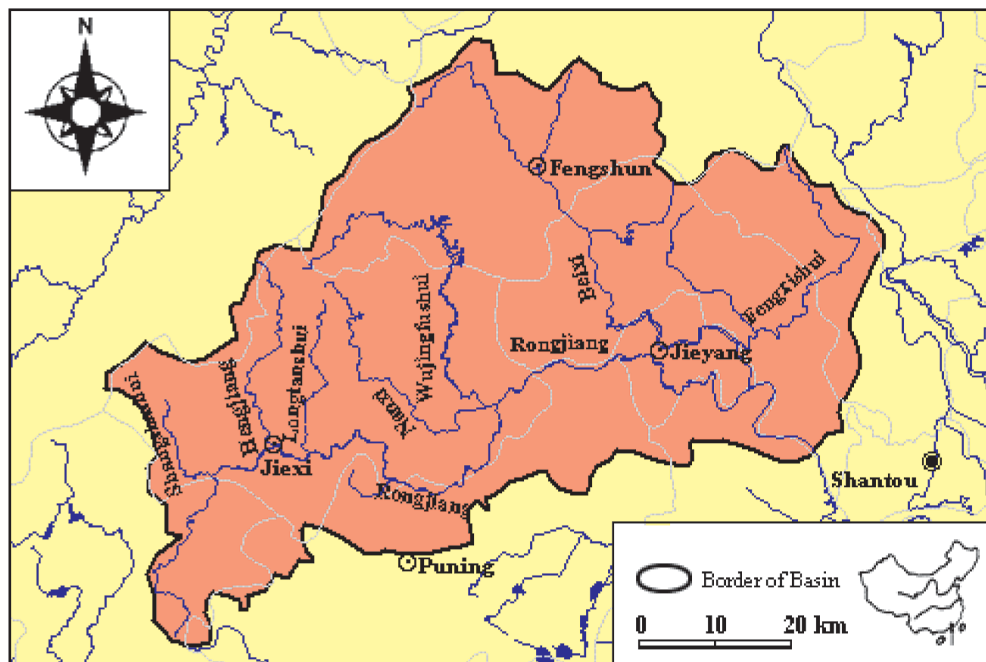


## Rong Jiang

### Map of River



### Table of Basic Data

<b>Name(s):</b> Rong Jiang		<b>Serial No. :</b> China-14
<b>Location:</b> Guangdong Province, Coastways China	N 23° 11' ~ 23° 55'	E 115° 37' ~ 116° 38'
<b>Area:</b> 4,408 km <sup>2</sup>	<b>Length of the main stream:</b> 175 km	
<b>Origin:</b> Mt. Luhe County Fenghuangshan (Phoenix)	<b>Highest point:</b> Mt. Lufeng County (741.3 m)	
<b>Outlet:</b> Nanhai (South Sea) Bay	<b>Lowest point:</b> Shantou Harbour 0 m	
<b>Main geological features:</b> Various hard, Massive intrusive rocks; Cohesive soil		
<b>Main tributaries:</b> Wujingfushui (719 km <sup>2</sup> ), Beixi (1,629 km <sup>2</sup> ), Longtanshui (101 km <sup>2</sup> ), Henjiang (219 km <sup>2</sup> ), Shangshashui (134 km <sup>2</sup> )		
<b>Main lakes:</b> None		
<b>Main reservoirs:</b> Henjiang (64.5 × 10 <sup>6</sup> m <sup>3</sup> , 1971), Longjin (165 × 10 <sup>6</sup> m <sup>3</sup> , 1960), Longtan (121 × 10 <sup>6</sup> m <sup>3</sup> , 1960)		
<b>Mean annual precipitation:</b> 2,033 mm (1954~1979) (basin average)		
<b>Mean annual runoff:</b> 112 m <sup>3</sup> /s (1954~1979) (basin average)		
<b>Population:</b> 5,084,600 in 1990	<b>Main cities:</b> Jieyang, Jiexi	
<b>Land use:</b> Forest (52%), Urban land (12%), Agriculture (30%), Others (8%)		

## 1. General Description

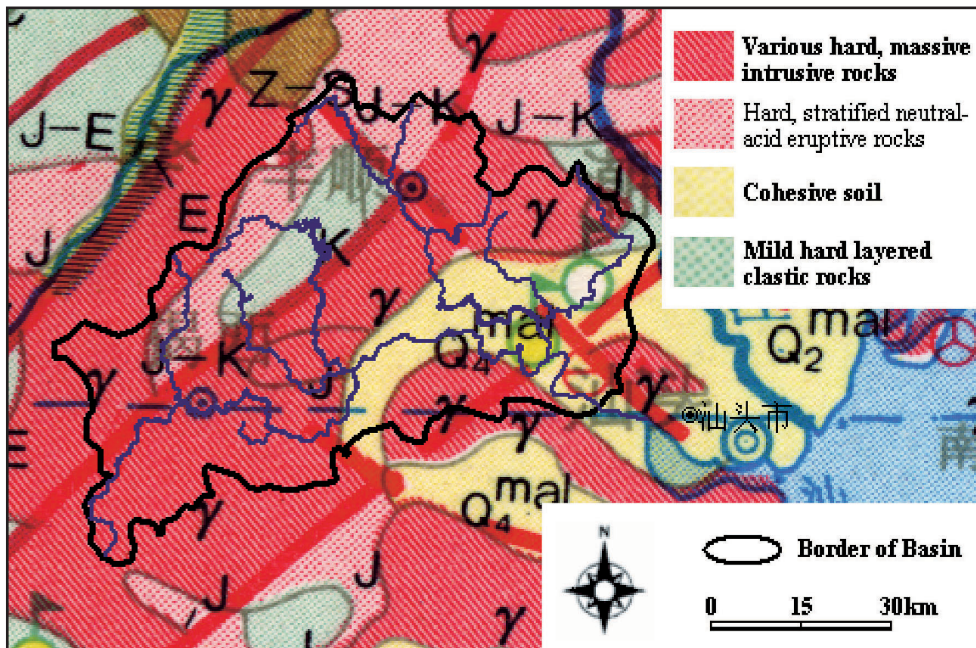
The Rong Jiang is a small river flowing directly to the South Sea. It is located in the southeast part of Guangdong Province. The catchment area is 4,408 km<sup>2</sup> with a main river length of 175 km. The river flows in a northeast direction from its origin near Phoenix Mountain in the southwest of the catchment. There are several tributaries, Shashui, Hengjiangshui, Longtanshui. Water resources control projects including the Daxi, Qiantang, Wushi and Sanzhou Dam water gates were constructed in the main stream. The river is influenced by the tide of the South Sea. Due to it being a relatively small river basin, constructed reservoirs are of medium and small scale based on the China State Reservoir Identification Standard. Total reservoir storage capacity is 569 million m<sup>3</sup>. Two county level cities, Jieyang and Jiexi, are very important from an economic point of view. Water quality in the river can be identified as grade II, III and IV from the upper river reaches to down stream.

The average annual precipitation for the basin was 2,033 mm and annual discharge was 112 m<sup>3</sup>/s for the period 1954-1979. The coverage of forests in the basin takes up 50% of the total area.

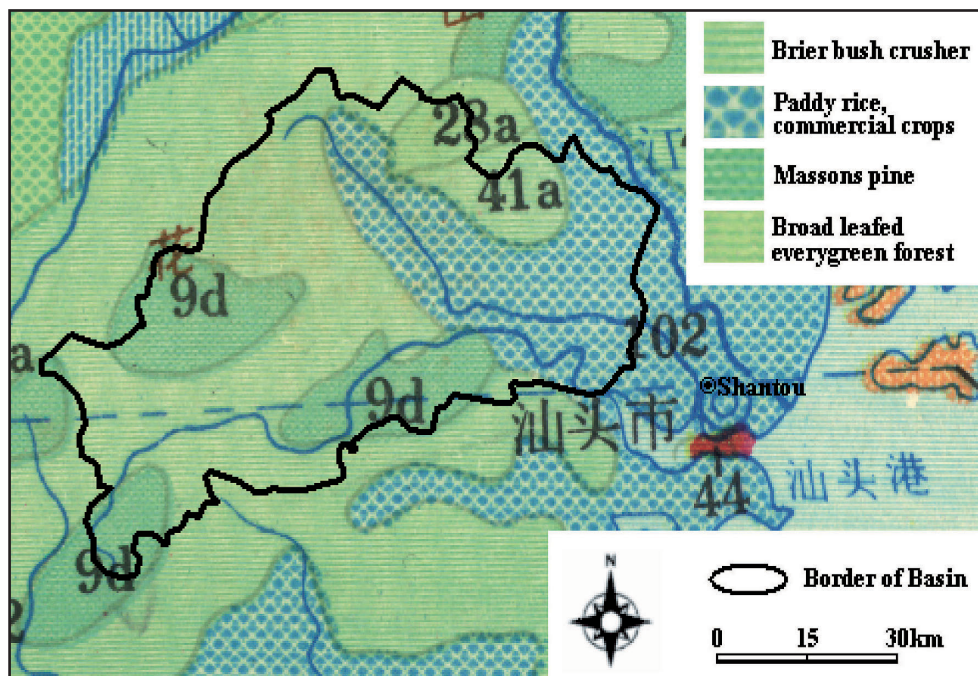
The geographical features include mountain, hill, basin and plain. There are several kinds of rocks and soils, which can be identified from the geological map.

## 2. Geographical Information

### 2.1 Geological Map



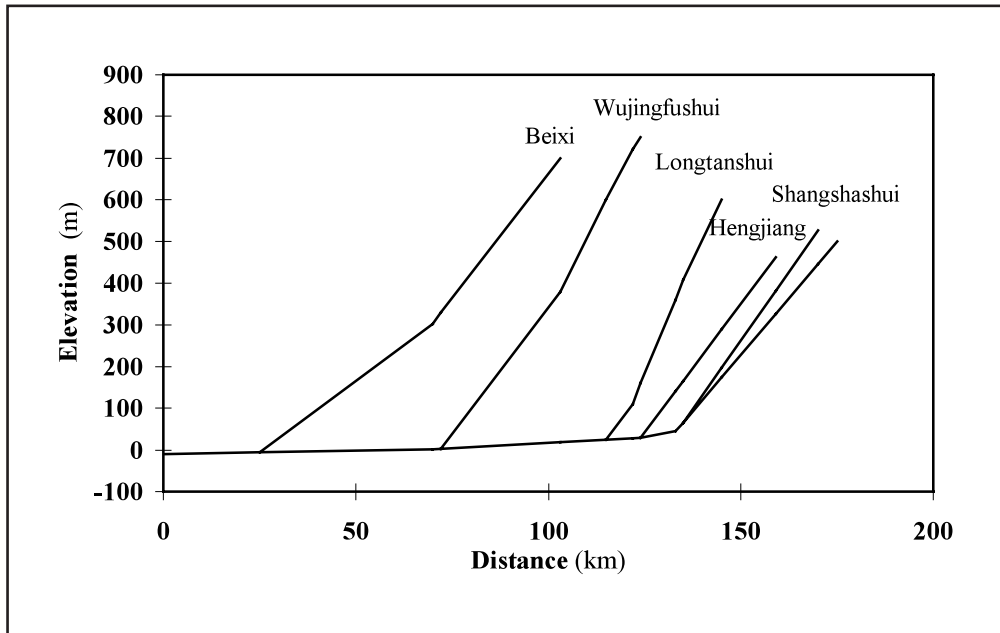
## 2.2 Land Use Map



## 2.3 Characteristics of the River and the Main Tributaries

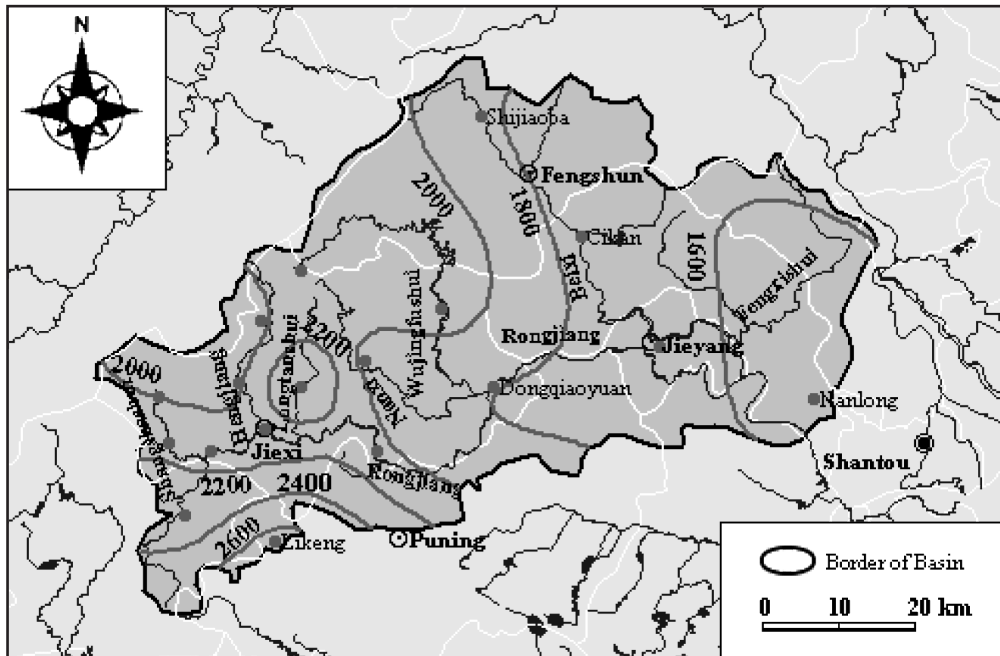
No.	Name of river	Length [km] Catchment area [km <sup>2</sup> ]	Highest peak [m] Lowest point [m]	Cities Population (1990)	Land use [%] (1985)
1	<b>Rongjiang</b> (Main River)	178 4,408	500 0	Jieyang 305,000	Forest (52%) Urban land (12%) Agriculture (30%) Others (8%)
2	<b>Shangshashui</b> (Tributary)	32.6 134	527 65		
3	<b>Hengjiang</b> (Tributary)	39 219	462 30		
4	<b>Longtanshui</b> (Tributary)	30 101	600 13		
5	<b>Wujingfushui</b> (Tributary)	76 719	750 6		
6	<b>Beixi</b> (Tributary)	92 1,629	700 3		

## 2.4 Longitudinal Profiles



## 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 <sup>1)</sup> [mm]	Mean annual evaporation <sup>1)</sup> [mm]	Observation items <sup>2)</sup>
1	Jilong	80	N 23° 19' E 115° 44'	1956 ~ present	2,255		P (TB)
2	Shangsha	150	N 23° 28' E 115° 42'	1957 ~ present	1,996		P (TB)
3	Fengshulang	73	N 23° 25' E 115° 43'	1956 ~ present	2,173		P (TB)
4	Fukou	50	N 23° 24' E 115° 46'	1956 ~ present	2,146		P (TB)
5	Liangtian	170	N 23° 34' E 115° 50'	1963 ~ present	1,951		P (TB)
6	Hengjiang	45	N 23° 30' E 115° 48'	1958 ~ present	1,970		P (TB)
7	Hepo	50	N 23° 26' E 115° 50'	1954 ~ present	2,095	3,758	P (TB), E
8	Gaojiping	720	N 23° 28' E 115° 53'	1959 ~ present	2,187		P (TB)
9	Longtan	35	N 23° 29' E 115° 53'	1937 ~ present	2,445		P (TB)
10	Likeng	370	N 23° 17' E 115° 51'	1934 ~ present	2,663		P (TB)
11	Qiankeng	10	N 23° 24' E 115° 59'	1934 ~ present	2,064		P (TB)
12	Nanshan	20	N 23° 31' E 115° 58'	1934 ~ present	1,957		P (TB)
13	Longjing	30	N 23° 35' E 116° 04'	1934 ~ present	2,104		P (TB)
14	Dongqiaoyuan	5	N 23° 29' E 116° 08'	1934 ~ present	1,808		P (TB)
15	Jieyang	3	N 23° 32' E 116° 21'	1934 ~ present	1,718		P (TB)
16	Shijiaoba	50	N 23° 50' E 116° 07'	1934 ~ present	1,837		P (TB)
17	Cikan	13	N 23° 41' E 116° 15'	1934 ~ present	1,738		P (TB)
18	Nanlong	3	N 23° 28' E 116° 33'	1934 ~ present	1,487		P (TB)

Evaporation used with  $\Phi 80$  Evaporation vessel

1) Period for the mean is from 1956 to 1988.

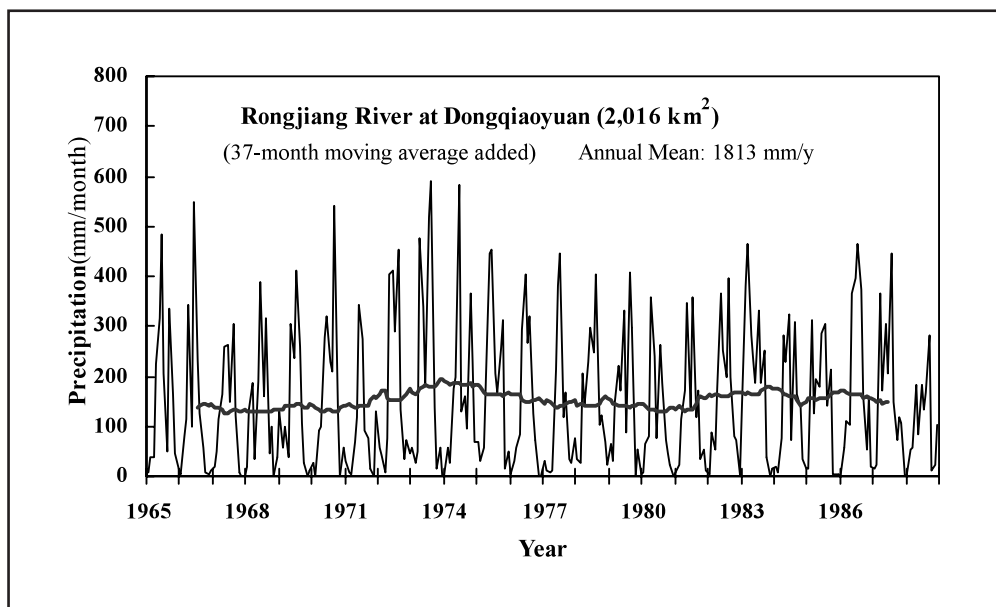
2) P: Precipitation, E: Evaporation, TB: Tipping bucket with recording chart.

### 3.3 Monthly Climate Data

At Shantou station (the nearest state-owned station)

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	13.2	13.8	16.2	20.4	24.2	26.5	28.2	28.0	26.6	23.3	19.3	15.1	21.2	1961 ~ 1990
Precipitation [mm]	30.0	56.1	82.3	155.0	209.8	302.6	206.4	214.8	144.7	61.8	39.1	28.5	1,531.2	1961 ~ 1990
Evaporation [mm]	95.0	83.7	102.6	119.0	134	143.5	188.7	180.7	160.8	160.5	127.0	108.2	1,603.6	1961 ~ 1990
Solar radiation [MJ/m <sup>2</sup> /day]	10.4	10.0	11.0	13.0	14.3	14.7	18.5	17.3	15.9	14.9	12.6	11.0	13.6	1982 ~ 1985
Duration of sunshine [hr]	147.3	99.6	107.0	113.0	138.3	164.5	247.7	230.6	200.8	211.2	179.5	175.6	2,015	1961 ~ 1990

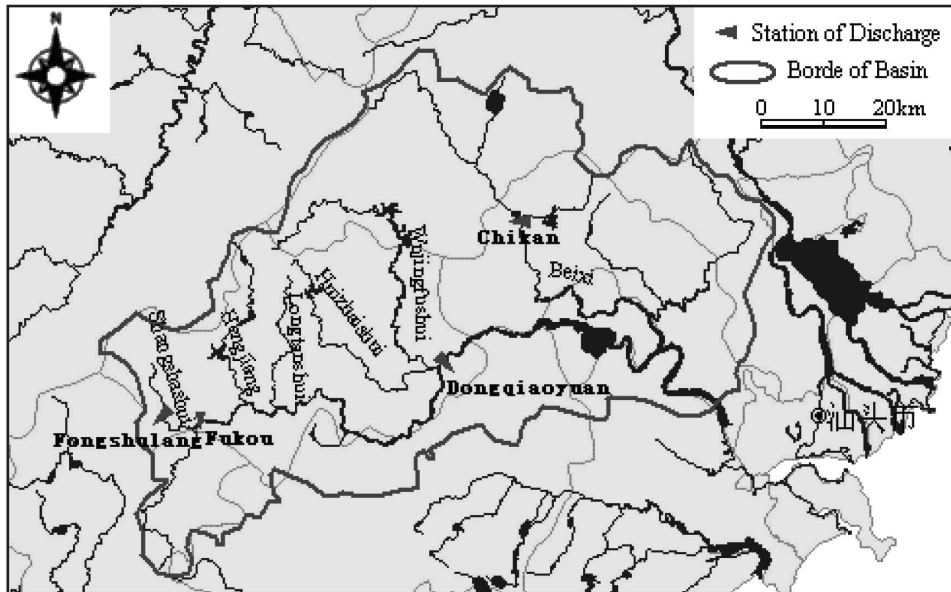
### 3.4 Long-term Variation of Monthly Precipitation





## 4. Hydrological Information

### 4.1 Map of Streamflow Observation Stations



### 4.2 List of Hydrological Observation Stations

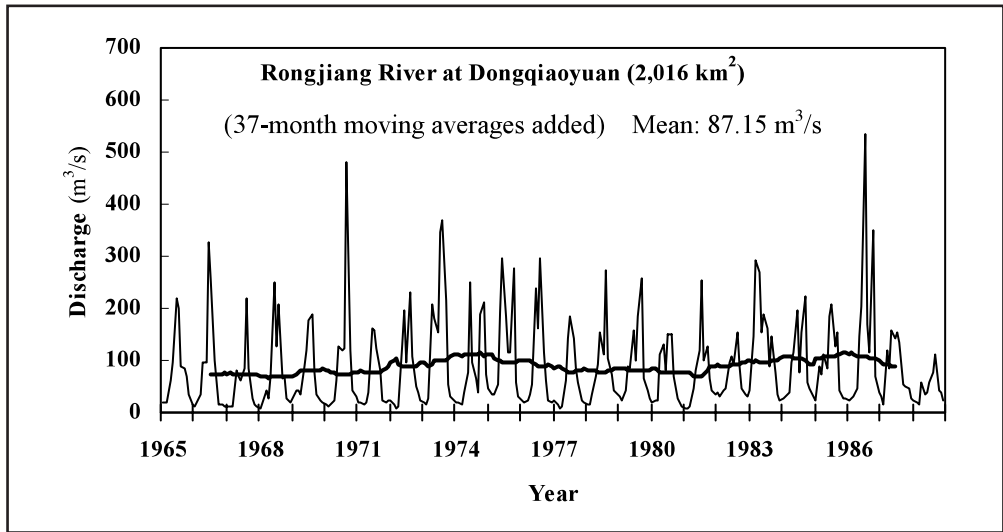
No.	Station	Location	Catchment area (A) [km <sup>2</sup> ]	Observation period	Observation items (frequency) <sup>1)</sup>
39	Fongshulang	N 23° 25' E 115° 43'	97.7	1966 ~ present	H2, Q
30	Fukou	N 23° 24' E 115° 46'	355	1959 ~ present	H2, Q
32	Dongqiaoyuan	N 23° 29' E 116° 08'	2,016	1953 ~ present	H2, Q
33	Chikan	N 23° 41' E 116° 15'	641	1968 ~ present	H2, Q

1) H2: water level by manual, Q: discharge

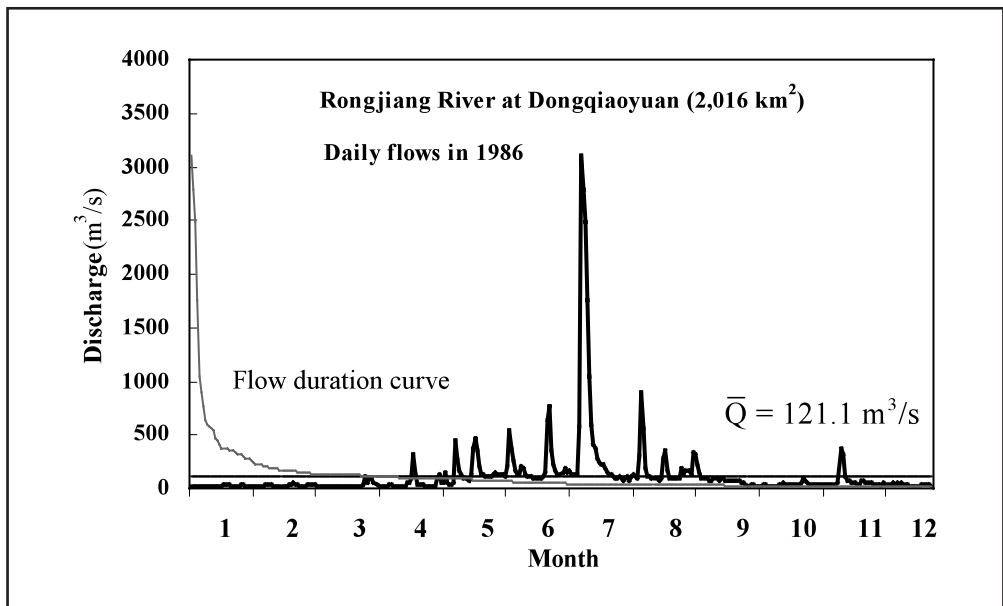
No.	$\bar{Q}$ <sup>1)</sup> [m <sup>3</sup> /s]	Qmax <sup>2)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ max <sup>3)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ min <sup>4)</sup> [m <sup>3</sup> /s]	$\bar{Q}/A$ [m <sup>3</sup> /s/100km <sup>2</sup> ]	Qmax/A [m <sup>3</sup> /s/100km <sup>2</sup> ]	Period of statistics
39	4.19	756	282	0.477	4.28	772.2	1966 ~ 1990
30	18.3	1,710	719	1.35	5.15	481.7	1959 ~ 1990
32	88.1	4,830	1,721	5.93	4.37	239.6	1953 ~ 1990
33	26.0	2,300	776	1.90	4.06	358.8	1968 ~ 1990

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

### 4.3 Long-term Variation of Monthly Discharge Series



### 4.4 Annual Pattern of Discharge Series





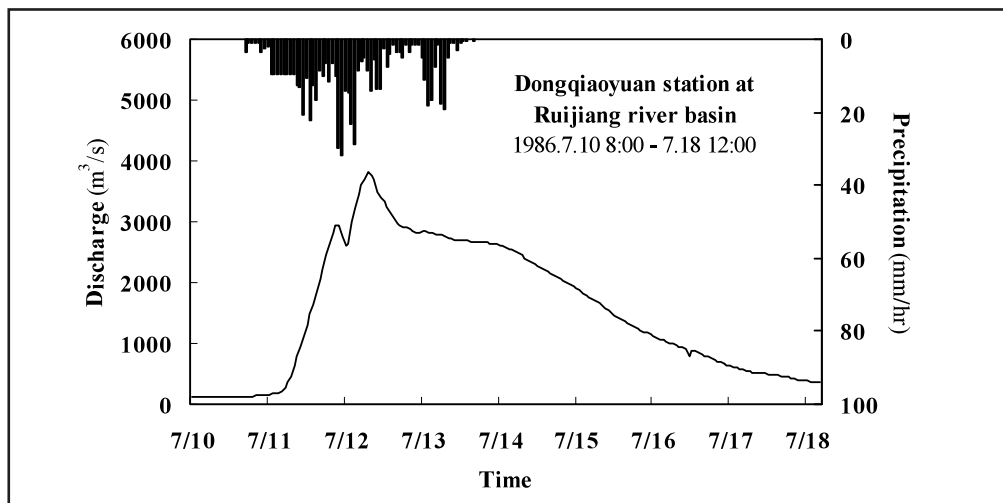
## 4.5 Annual Maximum and Minimum Discharges

At Dongqiaoyuan (2,016 km<sup>2</sup>)

Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>		Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>	
	Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]		Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]
1953	9.03	1,370	1	15.2	1971	7.28	1,020	4	0.9
1954	8.06	1,450	3	0	1972	6.16	1,150	4	0.5
1955	7.23	1,030	3	0	1973	7.25	1,690	1	6.4
1956	6.18	885	4	0.4	1974	10.19	1,990	2	9.7
1957	9.25	1,770	4	0	1975	10.06	1,660	12	12.8
1958	9.07	1,230	3	0.6	1976	8.26	1,980	12	8.0
1959	9.11	2,050	4	2.1	1977	7.26	1,050	5	1.8
1960	6.10	2,370	2	0.2	1978	8.28	888	11	6.1
1961	9.10	2,900	3	6.2	1979	9.25	2,070	11	11.3
1962	9.02	3,010	3	7.2	1980	7.28	963	12	4.4
1963	7.02	1,020	5	0.6	1981	7.26	1,270	3	6.1
1964	10.13	2,750	5	5.0	1982	5.29	973	10	13.0
1965	6.18	1,150	3	6.8	1983	4.09	1,740	12	8.9
1966	6.22	1,970	12	5.3	1984	9.02	1,290	3	5.3
1967	8.16	1,430	3	3.1	1985	6.25	1,340	12	15.8
1968	8.22	1,900	1	6.7	1986	7.12	3,830	4	12.6
1969	8.12	1,710	1	4.6	1987	7.30	1,370	12	8.0
1970	9.14	4,830	2	5.8	1988	9.22	867	3	12.1

1), 2) Instantaneous observation by recording chart

## 4.6 Hyetographs and Hydrographs of Major Floods



## 5. Water Resources

### 5.1 General Description

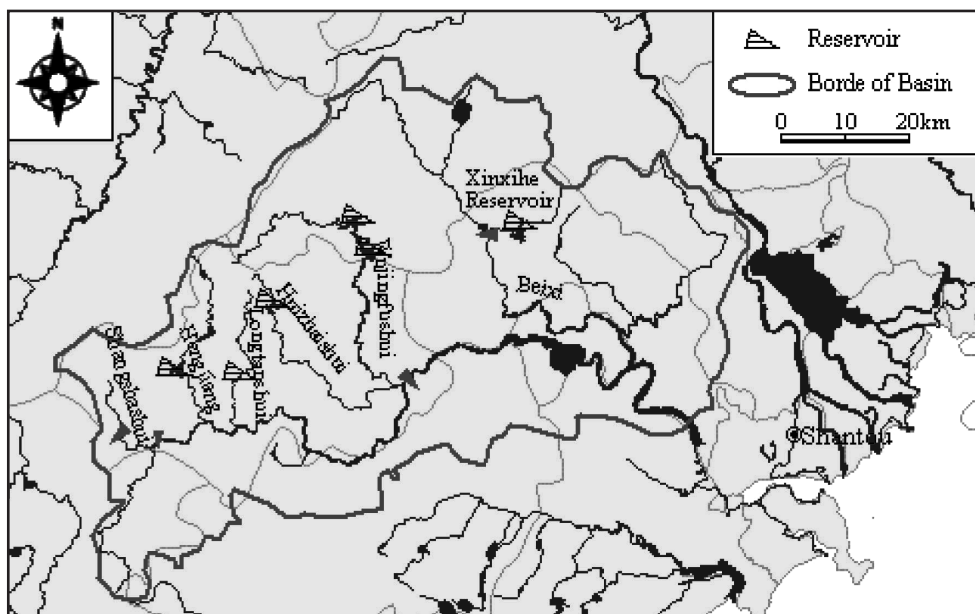
The Rong Jiang is a river that flows direct to the South Sea in the southeast coastal zone of China. The river is totally located in Guangdong Province.

The precipitation is concentrated in April-September when 80%-85% of the annual precipitation is recorded. The annual variation of precipitation is large., For example, the maximum precipitation at Dongqiaoyuan was 2,465 mm in 1961 but the minimum was only 1,160 mm, the ratio being 2.12 times. The annual runoff has similar characteristics. Generally high precipitation occurs in the mountain areas with annual precipitation of 2,400-2,600 mm. Water availability in Rong Jiang is abundant compared with other areas in the country. However, due to the high density of population, average water availability per capita is extremely limited. Based on water resources assessment, the average water availability is only 1,218 m<sup>3</sup>. This is only 48% of the provincial average or 57% of the national average.

The city of Jieyang is located in the downstream area of the Rong Jiang. Even though some water flowing from upper stream besides local water availability, the water cannot be used due to pollution.

There are four medium and small size reservoirs in the river basin, Hengjiang, Wujingfushui, Longtanshui and Beixi, that were mainly completed in the 1950s-1970s. The main purpose of these reservoirs is hydropower generation and flood control.

### 5.2 Map of Water Resource Systems



### 5.3 List of Major Water Resources Facilities

#### Major Reservoirs

Name of river	Name of dam	Catchment area [km <sup>2</sup> ]	Gross capacity [10 <sup>6</sup> m <sup>3</sup> ]	Effective capacity [10 <sup>6</sup> m <sup>3</sup> ]	Purposes <sup>1)</sup>	Year of completion
Hengjiang	Hengjiang	155	82.3	64.9	F, P	1960
Wujingfushui	Longjin	285	165	119.2	F, P	1960
Longtanshui	Longtan	156	121	120	F, P	1971
Beixi	Xinxihe	76.8	59.58	37.39	F, P	1958

1) F: Flood control, P: Hydro-power, N: Navigation

### 5.4 Major Flood and Drought Experiences

#### Major Floods at Dongqiaoyuan (Catchment area 2,016 km<sup>2</sup>)

Date	Peak discharge [m <sup>3</sup> /s]	Rainfall [mm] Duration	Meteorological cause	Death and Missing	Major damages (Districts affected)
1961.9	2,900		Typhoon	---	
1962.8	3,010		Typhoon	15	
1970.9	4,830		Typhoon	779	

#### Major Droughts

Period	Affected area	major damages and counteractions
1962,10 - 1963,5	Jieyang, Jiexi	River dry, No products in irrigation land

## 6. Socio-cultural Characteristics

The Rong Jiang area is in the special economic zone, Shantou, which is one of three large economic zones. The GDP has increased dramatically in the past two decades. Currently it is a base for light industries. It is also a base for fruits, such as longyan, olive, tea etc. Shantou is a harbour and coastal city in the downstream area of Rong Jiang. There are many scenic points to visit such as Laoma Palace and Mayu Island.

## 7. References, Databooks and Bibliography

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