Hongshuihe (Hongshui He)

Map of River

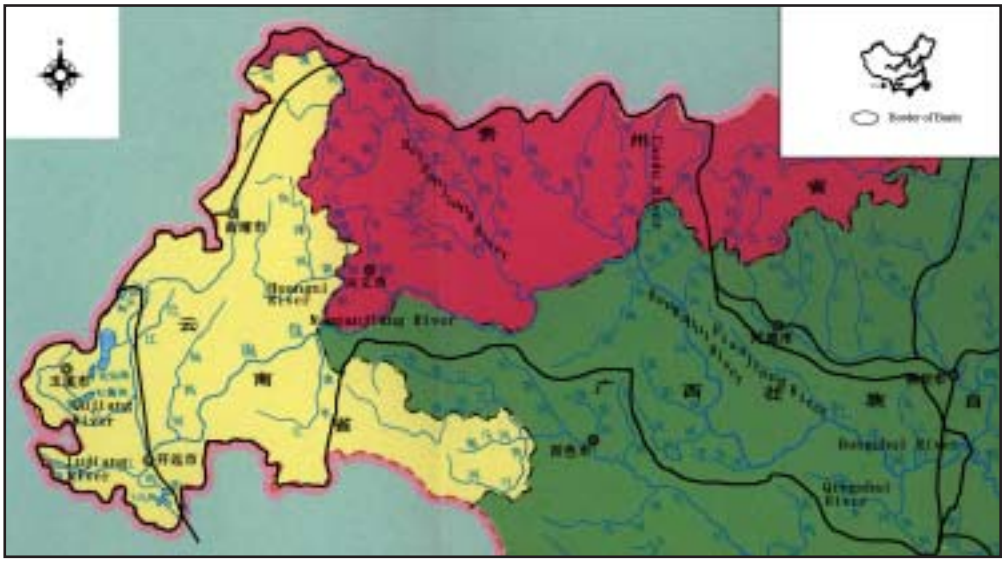


Table of Basic Data

Name(s): Hongshui River		**Serial No. :** China-11
Location: Sorth-western China	N 23° 04' ~ 26° 49'	E 102° 14' ~ 109° 32'
Area: 138,340 km^2	**Length of the main stream:** 1,573 km	
Origin: Mt. Maxiongshandonglu 4,288 (m)	**Highest point:** Mt. Wumengshan 2,866 (m)	
Outlet: Qianjiang	**Lowest point:** Sanjiangkou 16 (m)	
Main geological feature: Carbonate rock, Hard massive metamorphic rock, Clastic rock		
Main tributaries: Beipanjiang (26,590 km^2), Mengjiang (8,607 km^2), Huangnihe (8,158 km^2), Caoduhe (5,843 km^2), Qujiang (4,105 km^2), Lujiang (4,342 km^2), Qingshuihe (4,067 km^2), Diaojiang (3,604 km^2)		
Main lakes: Fuxianhu, Xinyunhu		
Main reservoirs: Dumu (100×10^6m^3, 1963), Dalongdong (151×10^6m^3, 1960), Dahua (960×10^6m^3, 1960)		
Mean annual precipitation: 1,182 mm (1954 ~ 1979) (basin average)		
Mean annual runoff: 2,151 m^3/s		
Population: 20,570,000 (1990)	**Main cities:** Duwu Wenxian, Diechang Nanping	
Land use: Forest (28.5%), Rice paddy (6.6%), Other agriculture (3.8%), Waste (21.6%), Others (39.5%) (1991)		

1. General Description

The Hongshui River is the upper stream of the Xijiang, a main tributary of the Pearl River. It is located in the south of Guizhou, southeast of Yunnan province and west of the Guangxi Autonomous Region. The upper stream of the Hongshuihe is called the Nanpanjiang and originates from Maxiong Mountain. The general direction of the Hongshuihe is from southwest to northeast, then from north to southeast. The river joins the Qingjiang at Sanjiangkou after flowing through Wangmo, Luodian, Tian'e, Donalan, and Laibin counties. The catchment area is 138,340 km^2 and the main channel length is 1,573 km. Forests cover 40% of the total area of the basin. The upstream part of the basin belongs to Yunnan-Guizhou Plateau.

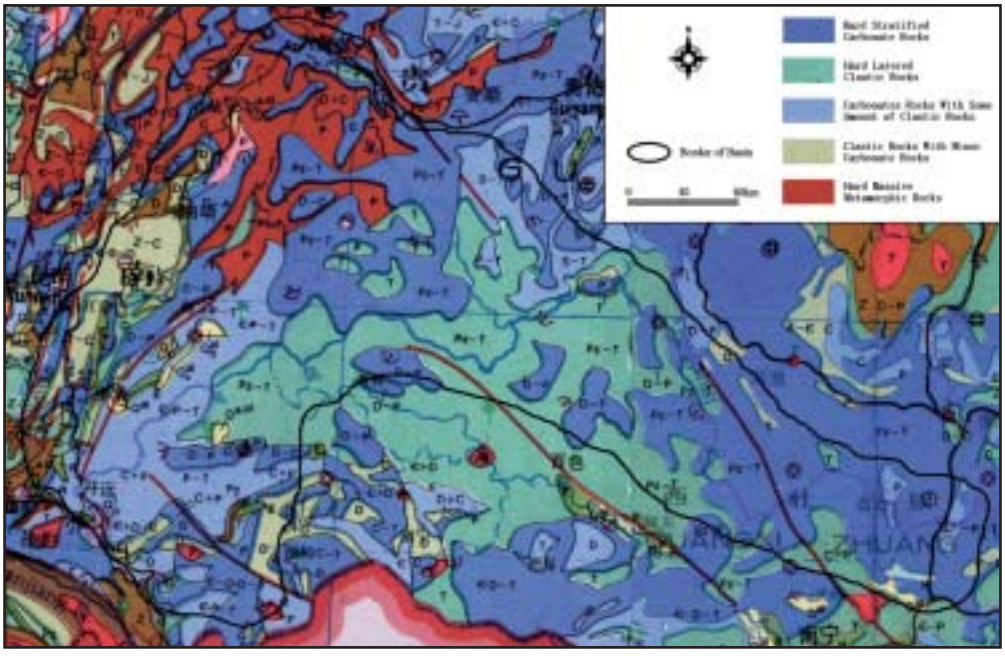
The annual precipitation varies along the main stream from about 1,100-1,300 mm in Yunnan and Guizhou, to 1,500 - 1,800 mm in Guangxi. The maximum recorded annual precipitation was 2,300 mm in the Daming mountains in the downstream part of the basin. The precipitation of the basin is concentrated in the period May-October, when 80% of the annual rainfall occurs. The annual evaporation is relatively stable being between 1,100-1,200 mm. The annual discharge at the Shilongkou station is 2,151 m^3/s.

The Hongshuihe is one of China's main sources of hydro-electric power and there are already 3 large cascading reservoirs in the catchment for this purpose. Flooding, which is mainly experienced in the downstream part of the basin, is caused by summer storms.

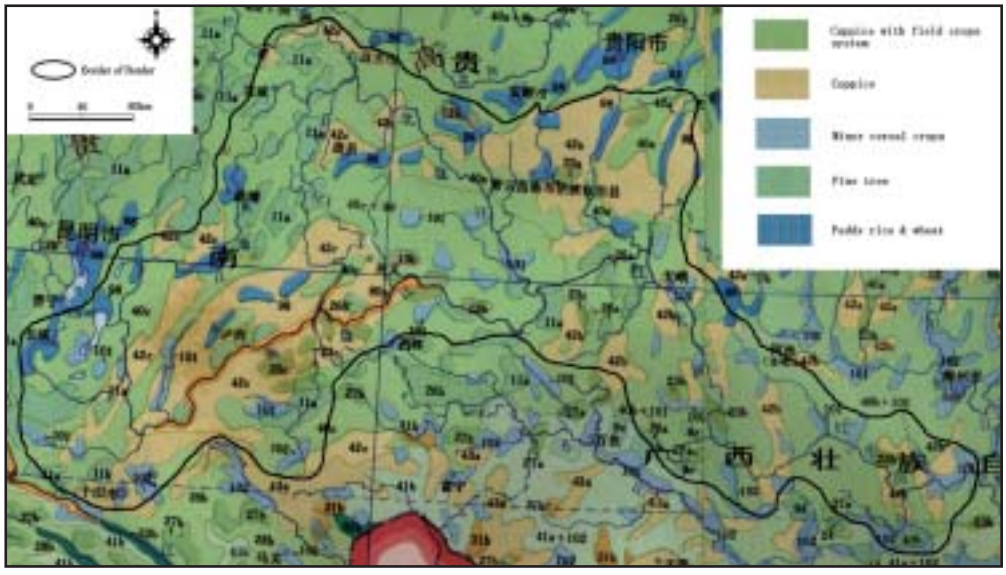
Yunnan, Guizhou and Guangxi are agriculture provinces in China. The population of the catchment was 20,570,000 in 1990. The climate is warm and wet. The landscape includes mountains: 76%, hills: 20% and plains 4%. The main crops are paddy rice, corn, and sugarcane.

2. Geographical Information

2.1 Geological Map



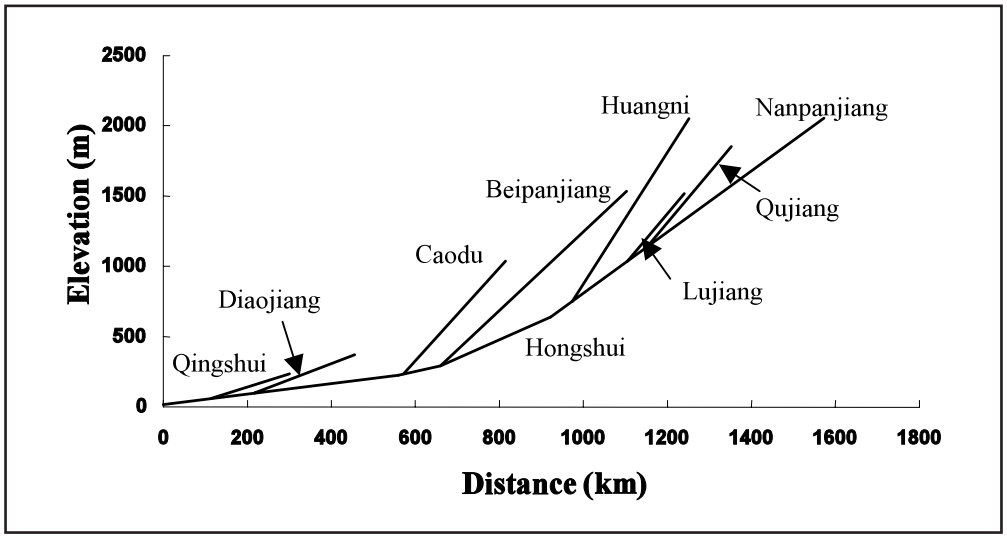
2.2 Land Use Map



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]	Cities Population (1990)	Land use [%] (1985)
1	**Nanpanjiang** (Main River)	9,14 56,880	2,054.6 290.6	Qujing 830,000	Forest (28.5%), Rice paddy (6.6%), Other agriculture (3.8%), Uncultivated land (21.6%), Others (39.5%)
2	**Qujiang** (Tributary)	198 4,105	1,852.2 1,145.4		
3	**Lujiang** (Tributary)	136 4,342	1,516.4 1,039.0		
4	**Huangnihe** (Tributary)	278 8,158	2,049.5 751.3		
5	**Beibanjiang** (Tributary)	444 26,590	1,533.8 290.6		
6	**Hongshuihe** (Main River)	659 54,870	290.6 17.8		
7	**Mengjiang** (Tributary)	241 8,607	1,036.8 233.8		
8	**Mengjiang** (Tributary)	241 8,607	1,036.8 233.8		
9	**Caoduhe** (Tributary)	235 5,843	991.6 224.6		
10	**Diaojiang** (Tributary)	237 3,604	371.0 98.4		
11	**Qingshuihe** (Tributary)	189 4,067	235.4 59.6		

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[1] [mm]	Mean annual evaporation[1] [mm]	Observation items[2]
1	**Zhanyi**	1,860	N 25° 36' E 103° 50'	1956 ~ present	954.4	1,469.2	P (TB), E
2	**Xiqiao**	1,836	N 25° 01' E 103° 38'	1957 ~ present	954.7	1,569.8	P (TB), E
3	**Gaoguma**	1,534	N 24° 47' E 103° 08'	1956 ~ present	922.9	1,237.4	P (TB), E
4	**Jiangbianjie**	966	N 24° 01' E 103° 37'	1956 ~ present	899.4	1,300.4	P (TB), E
5	**Dadukou**	929	N 26° 18' E 104° 43'	1963 ~ present	1,115.4	1,004.0	P (TB), E
6	**Zhedong**	378	N 25° 22' E 105° 47'	1958 ~ present	1,060.3	1,390.0	P (TB), E
7	**Zhexiang**	327	N 24° 58' E 106° 16'	1954 ~ present	1,061.9	1,304.6	P (TB), E
8	**Tiane**	245	N 25° 06' E 107° 09'	1959 ~ present	1,344.1	1,011.9	P (TB), E
9	**Donglan**	226	N 24° 31' E 107° 26'	1937 ~ present	1,431.0	1,113.6	P (TB), E
10	**Duan**	151	N 23° 50' E 108° 11'	1934 ~ present	1,731.1	1,217.2	P (TB), E
11	**Qianjiang**	90	N 23° 37' E 108° 58'	1934 ~ present	1,532.1	1,270.7	P (TB), E

Evaporation used with Φ20 Evaporation vessel
1) Period for the mean is from 1956 to 1979 2) P: Precipitation, E: Evaporation, TB: Tipping bucket with recording chart

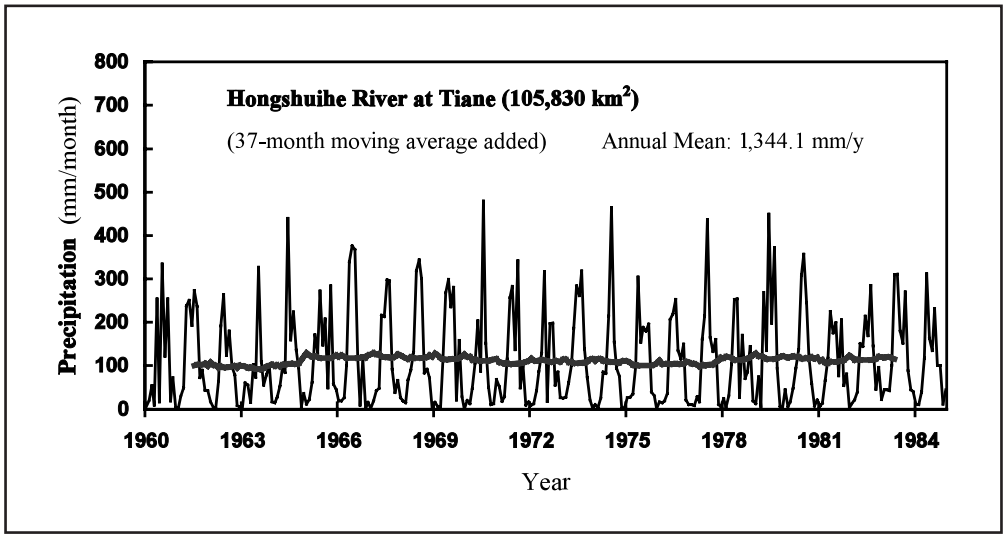
3.3 Monthly Climate Data

Station: Duan

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	12.2	13.3	17.1	21.5	25.2	27.2	28.2	27.9	26.9	23.3	18.6	14.4	21.3	1952~1985
Precipitation [mm]	36.4	43.7	69.5	128.5	254.2	367.5	257.6	295.0	109.0	77.5	48.8	43.6	1,731	1952~1985
Evaporation [mm]	64.2	57.7	66.8	87.2	119.1	122.3	139.3	133.4	143.6	125.2	89.6	68.8	1,217	1952~1985
Solar radiation [$MJ/m^2/day$]*	5.52	7.14	9.96	12.5	12.3	12.4	15.5	14.9	12.1	8.82	6.96	5.56	10.3	1982~1985
Duration of sunshine [hr]	69.1	53.6	52.7	69.8	109.5	123.0	167.7	180.1	191.3	151.4	126.7	100.6	1,396	1971~1980

* Observed at Guiyang.

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

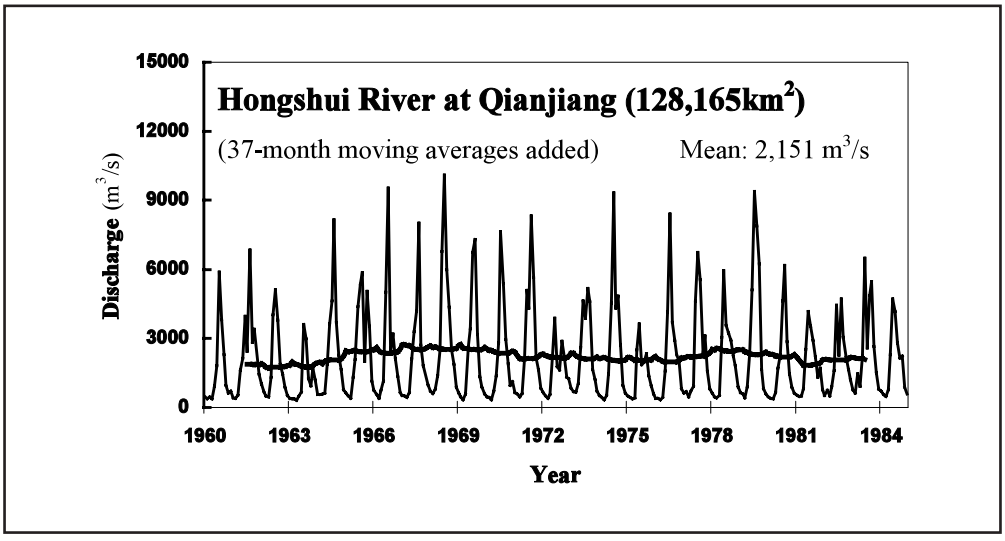
No.	Station	Location	Catchment area (A) [km^2]	Observation period	Observation items (frequency)
21	**Gaoguma**	N 24° 47' E 103° 08'	6,301	1953 ~ present	H2, Q
23	**Xiaolongtan**	N 23° 49' E 103° 11'	15,405	1960 ~ present	H2, Q
24	**Jiangbianjie**	N 24° 01' E 103° 37'	25,116	1954 ~ present	H2, Q
25	**Bajie**	N 24° 52' E 105° 02'	44,242	1971 ~ present	H2, Q
28	**Zhedong**	N 25° 22' E 105° 47'	19,300	1957 ~ present	H2, Q
27	**Zhexiang**	N 24° 58' E 106° 12'	82,480	1953 ~ present	H2, Q
	Tiane	N 25° 00' E 107° 09'	105,830	1962 ~ present	H2, Q
	Duan	N 23° 50' E 108° 11'	119,245	1936 ~ present	H2, Q
29	**Qianjiang**	N 23° 37' E 108° 58"	128,165	1936 ~ present	H2, Q

H2: water level by manual Q: discharge

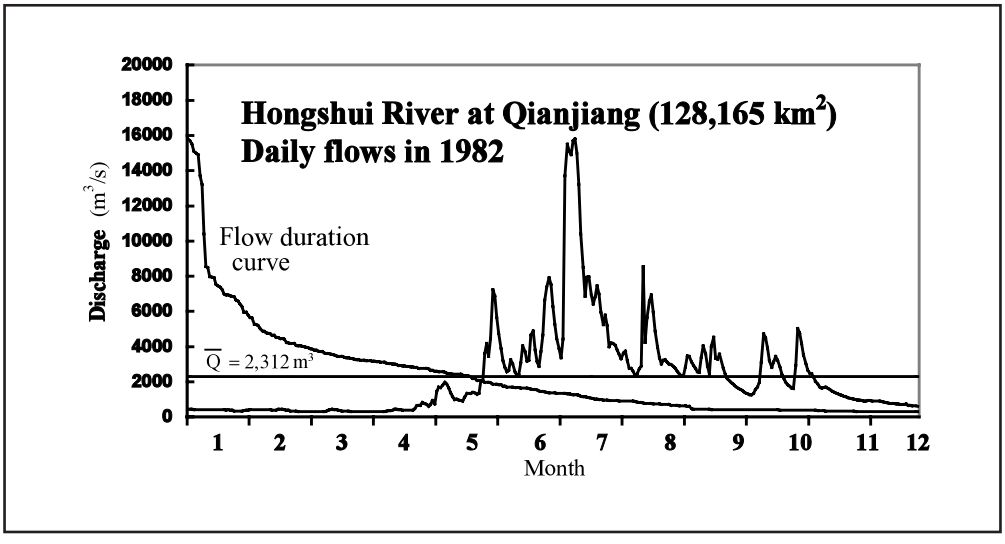
No.	$\overline{Q}$[1)] [m^3/s]	Qmax[2)] [m^3/s]	$\overline{Q}$max[3)] [m^3/s]	$\overline{Q}$min[4)] [m^3/s]	$\overline{Q}$/A [$m^3/s/100km^2$]	Qmax/A [$m^3/s/100km^2$]	Period of statistics
21	62.6	1,270	646	1.18	0.99	20.16	1953 ~ 1984
23	131.7	2,220	1,064	13.6	0.86	14.41	1961 ~ 1984
24	200	3,080	1,335	35.2	0.80	12.26	1954 ~ 1984
25	563	6,720	3,770	99.8	1.27	15.19	1971 ~ 1984
28	372	5,670	3,680	55.8	1.93	29.38	1958 ~ 1984
27	1180	11,300	7,166	194	1.43	13.70	1954 ~ 1984
	1630	15,800	10,230	261	1.54	14.93	1960 ~ 1984
	2026	18,700	11,860	339	1.70	15.68	1958 ~ 1984
29	2151	17,600	12,160	349	1.69	13.73	1952 ~ 1984

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



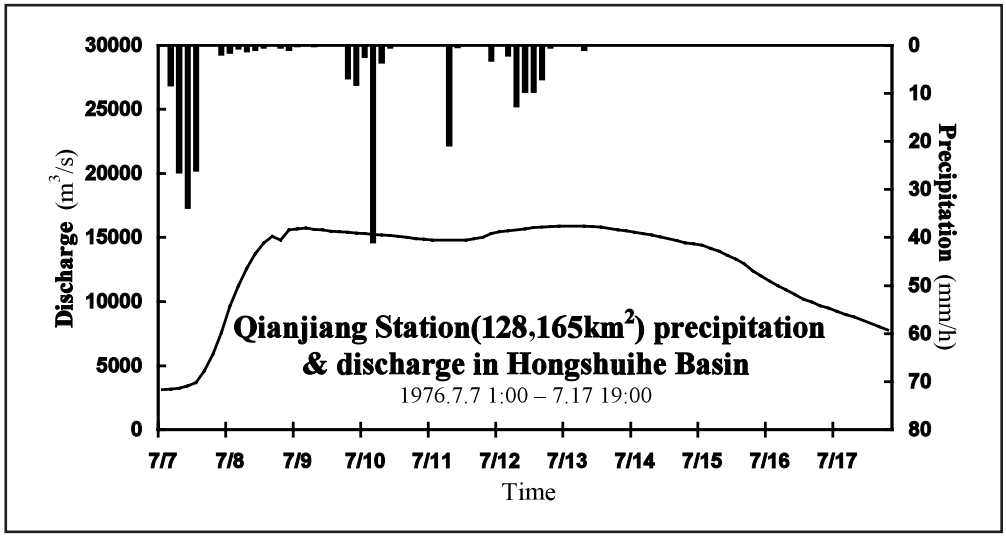
4.6 Annual Maximum and Minimum Discharges

Station: Qianjiang (128,165 km^2)

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]
1952	8.27	11,700	2	470	**1969**	7.03	13,300	4	280
1953	6.13	5,660	1	465	**1970**	7.16	16,500	3	275
1954	6.30	16,500	4	319	**1971**	8.21	13,300	3	396
1955	6.21	10,800	4	295	**1972**	9.26	7,460	3	353
1956	5.31	11,300	4	380	**1973**	6.16	9,490	3	465
1957	7.04	10,700	3	339	**1974**	7.02	14,700	3	312
1958	9.21	9,590	5	222	**1975**	6.07	6,770	4	293
1959	7.06	11,200	2	336	**1976**	7.12	15,900	4	291
1960	7.24	14,000	5	308	**1977**	8.06	11,200	3	300
1961	8.12	10,300	2	330	**1978**	6.29	10,000	4	324
1962	7.03	14,300	4	397	**1979**	7.02	17,200	3	339
1963	8.09	7,260	5	240	**1980**	8.14	12,100	3	316
1964	8.13	16,000	4	416	**1981**	6.07	9,000	3	351
1965	8.16	11,200	3	347	**1982**	6.19	12,500	3	354
1966	7.06	15,500	3	351	**1983**	6.24	15,400	2	434
1967	8.09	13,400	4	362	**1984**	6.03	9,300	3	346
1968	7.16	17,600	2	523					

1), 2) Instantaneous observation by recording chart

4.7 Hyetographs and Hydrographs of Major Floods



5. Water Resources

5.1 General Description

The Hongshui River is the upper stream of the Xijiang, a main tributary of the Pearl River. The Nanpanjiang River is the upper stem of the main river and originates from the Yunnan-Guizhou Tibet Plateau.

The precipitation of the basin is concentrated in the period May-October, when 80% of the annual rainfall occurs. Water is abundant in the Hongshuihe basin. The annual average discharges at the Tian'e station in upstream part of the basin and Qianjiang station in the downstream part are 1,590 m^3/s and 2,140 m^3/s repectvely. Flooding, which is mainly experienced in the downstream part of the basin, is caused by summer storms. It is common to have 2 or 3 floods each year. The maximum recorded flood discharge at the Qianjiang station was 18,300 m^3/s in July 1968. The Hongshuihe carries the largest sediment load of the rivers in Guangxi. Annual average sediment transportation is 45.6 million tons.

There is at present a cascade of 3 large man-made reservoirs on the main stream. The Tianshengqiao, Yantan, and Dahua reservoirs were completed in 1993, 1981 and 1983 with capacities of 88 x 10^6 m^3, 2,430 x 10^6 m^3, and 960 x 10^6 m^3 respectively. The main purpose of these reservoirs is hydroelectric power generation associated with flood control and navigation. The Longtan reservoir, on which construction began July 2001, will have a capacity of 55,490 x 10^6 m^3 and will become the largest reservoir in the Hongshuihe cascade when completed in 2009. There are several large and middle scale reservoirs, such as the Lubuge and Dalongdong, on tributaries rivers.

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^2]	Gross Capacity [$10^6 m^3$]	Effective Capacity [$10^6 m^3$]	Purposes[1)]	Year of completion
Nanpanjiang River	**Dumu**	196	100.4	98.5	A	1963
Huangni River	**Lubuge**	7,300	120	110	P	1992
Nanpanjiang River	**Tianshengqiao**	50,194	88	26	P	1993
Hongshui River	**Yantan**	106,580	2,430	990	P, N	1981
Hongshui River	**Dahua**	112,200	960	419	P, F	1983
Qingshui River	**Dalongdong**	245	151	150.6	A, P	1960

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

5.4 Major Floods and Droughts

Major Flood at Qianjiang (Catchment area 128,165 km^2)

Date	Peak discharge [m^3/s]	Rainfall [mm] Duration	Meteorological cause	Dead and Missing	Major damages (Districts affected)
1976.12	15,900	690.6 7.7 ~ 7.12	Frontal rain	---	Duan, Laibing City

6. Socio-cultural Characteristics

The Hongshuihe originates from the famous 10-thousand mountains area and flows via Yunnan Guizhou and Guangxi provinces. Mountains and hills take up 96% of the total area. Miao, Zhuang, Hani, Yao minorities live in these provinces. Each minority dresses differently, with distinct head decorations, and each have different wedding ceremonies etc.

The natural scenery is very beautiful, e.g., Tianshengqiao means a natural bridge between two mountains, while words like Maotiaohe, mean a river that a cat can jump though. Rapids, dangerous beaches, and submerged rocks are quite common.

The river basin has karst geological characteristics. There are some vanishing rivers, e.g., the Congli, that disappears underground before returning to the surface some 35 km later. The subterranean rivers make a very loud noise like a thunder.

7. References, Databooks and Bibliography

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