

Citarum

Map of River

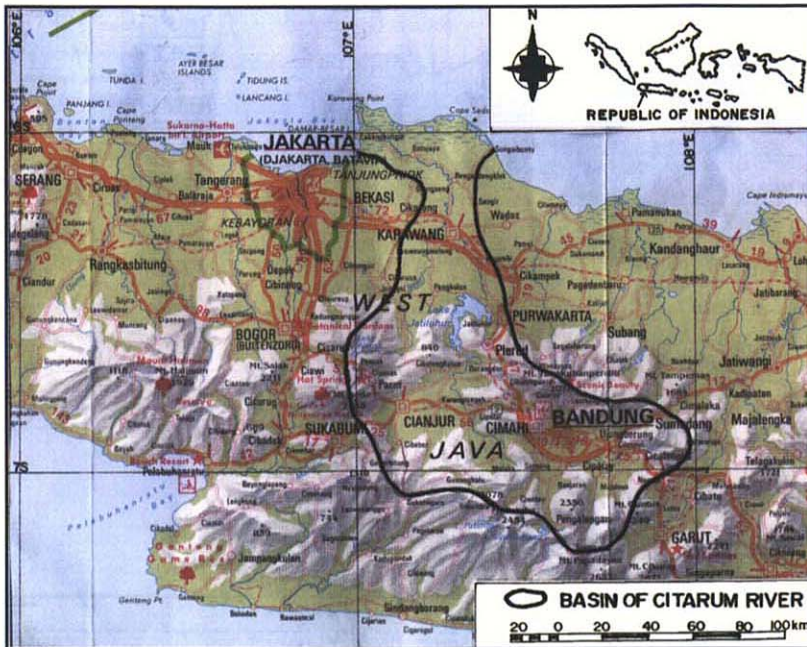
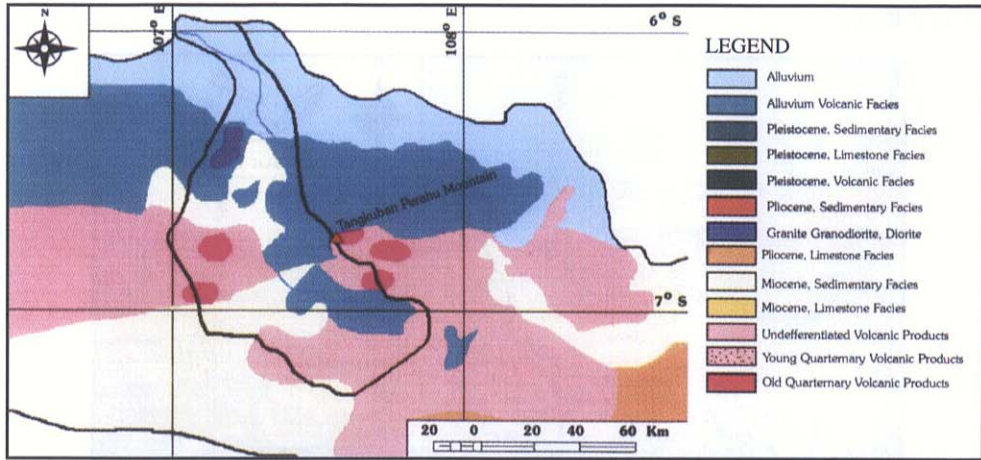


Table of Basic Data

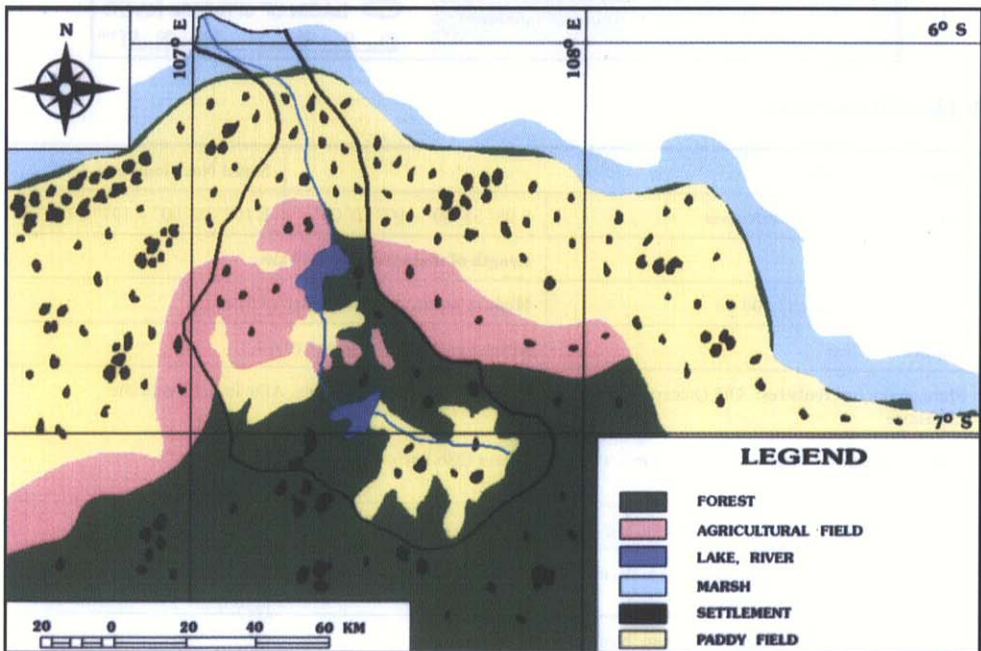
Name: Citarum River		Serial No.: Indonesia-1
Location: Java Island, Indonesia	S 05° 55' 00" ~ 07° 10' 00"	E 107° 02' 00" ~ 107° 39' 00"
Area: 6 080 km ²	Length of main stream: 269 km	
Origin: Mt. Wayang (1 700 m)	Highest point: Mt. Pangrango (3 019 m)	
Outlet: Java Sea	Lowest point: River mouth (0 m)	
Main geological features: Old Quaternary Volcanic, Miocene Sedimentary, Granite, Alluvium, Pleistocene Limestone		
Main tributaries: Citarik River (265 km ²), Cisangkuy River (286 km ²), Cisokan River (964 km ²), Cipamingkis River (1 887 km ²)		
Main lakes: Situ Lembang, Situ Patenggang		
Main reservoirs: Saguling Dam (982 x 10 ⁶ m ³ , 1986), Cirata Dam (2 165 x 10 ⁶ m ³ , 1988), Jatiluhur Dam (3 000 x 10 ⁶ m ³ , 1963)		
Mean annual precipitation: 2 300 mm (basin average)		
Mean annual runoff: 97.8 m ³ /s at Nanjung (1 675 km ²) (1992)		
Population: 8 200 000 (1992)	Main cities: Bandung, Cianjur, Purwakarta, Karawang, Bekasi.	
Land use: Forest (20%), Paddy field (30%), Urban (32%), Other agriculture (18%) (1983)		

2. Geographical Information

2.1 Geographical Map



2.2 Land Use Map



1. General Description

The Citarum River, 269 km long and draining an area of 6 080 km², is one of the largest rivers in Java Island. It originates from Mt. Wayang (1 700 m) and flows through the middle of the western part of the island before flowing out into the Java Sea. The basin has an average annual rainfall of 2 300 mm, and the annual discharge at Nanjung (1 675 km²) in 1992 has been 97.8 m³/s (0.058 m³/s/km²). Three dams have been built across the river; the Jatiluhur in 1963 to store 3 000 x 10⁶ m³, the Saguling in 1986 to store 982 x 10⁶ m³, and the Cirata in 1988 to store 2 165 x 10⁶ m³. The basin population in 1992 has been 8.2 million.

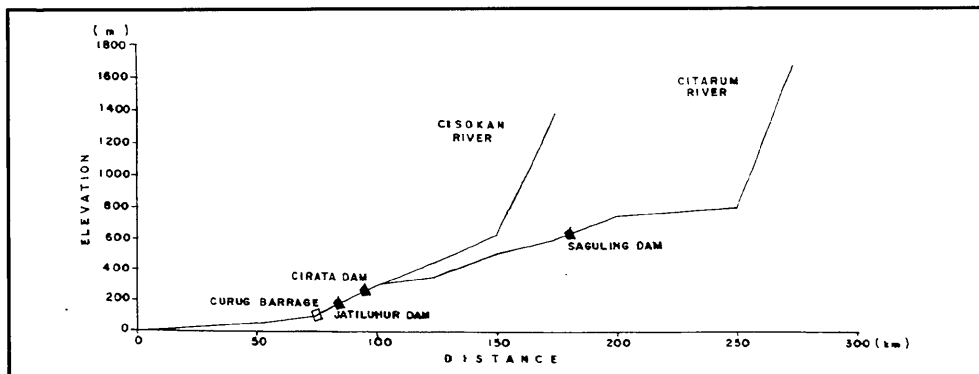
The river segment above Bandung is considered the upper reach which is in the mountain areas and lying between Mt. Tangkuban on the northern side and Mt. Patuha on the southern side. Between Bandung and Jatiluhur is the middle reach and below Jatiluhur is considered the lower reach. The geological formation consists mainly of old quaternary volcanic product with some Miocene sedimentary facies, granite, granodiorite, diorite, alluvium, Pleistocene volcanic facies and Miocene limestone facies. The current water related problems are droughts in the dry season and flooding in the wet season. For a flood with a 5 year return period, approximately 22.5 km² of area in the southern part of Bandung is likely to be inundated.

2.3 Characteristics of River and Main Tributaries

No.	Name of river	Length [km] Catchment area [km ²]	Highest peak [m] Lowest point [m]	Cities Population (1992)	Land use [%]				
					A	F	L	P	U
1	Citarum (Main River)	269 6 080	Mt. Wayang, 1 700 -----	Bandung 2 513 000	18	20	2.5	30	29.5
2	Citarik (Tributary)	31.8 265	Mt. Calangcang, 1 887 -----	Bandung 2 513 000	20	20	2.5	30	25
3	Cisangkuy (Tributary)	32.3 286	Mt. Patuha, 2 385 -----	Bandung	22	25	3	30	20
4	Cisokan (Tributary)	78.6 984	Mt. Kendeng, 694 -----	Cianjur 320 000	30	20	4	25	21
5	Cipamingkis (Tributary)	53.2 1 887	Mt. Pangrango, 3 019 -----	Bekasi Karawang 1 600 000	27	15	3	20	35

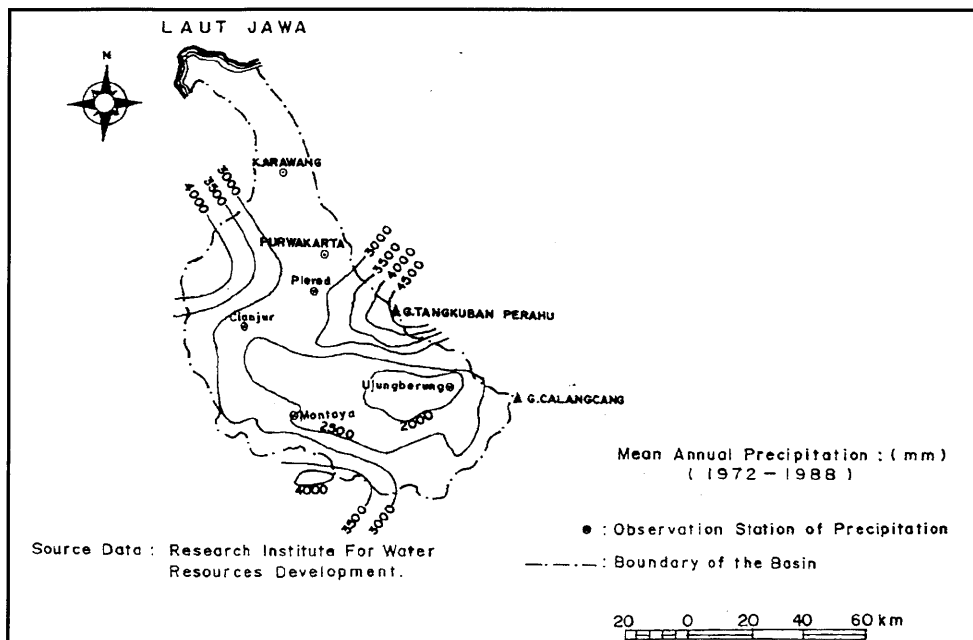
A: Other agricultural field F: Forest L: Lake, River, Marsh P: Paddy field U: Urban

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 [mm]	Mean annual evaporation [mm]	Observation items ¹⁾
321004	Ciparay	674	S 07° 01' E 107° 42'	1982~1993	2 116	1 645	DS, E, P, SR
321015	Gunung Campaka	1 050	S 07° 02' E 107° 08'	1981~1993	2 946	-	DS, P, SR
321017	Garokgek	650	S 06° 39' E 107° 34'	1980~1986	4 180	2 042	DS, E, P, SR

1) DS: Duration of sunshine E: Evaporation P: Precipitation SR: Solar radiation

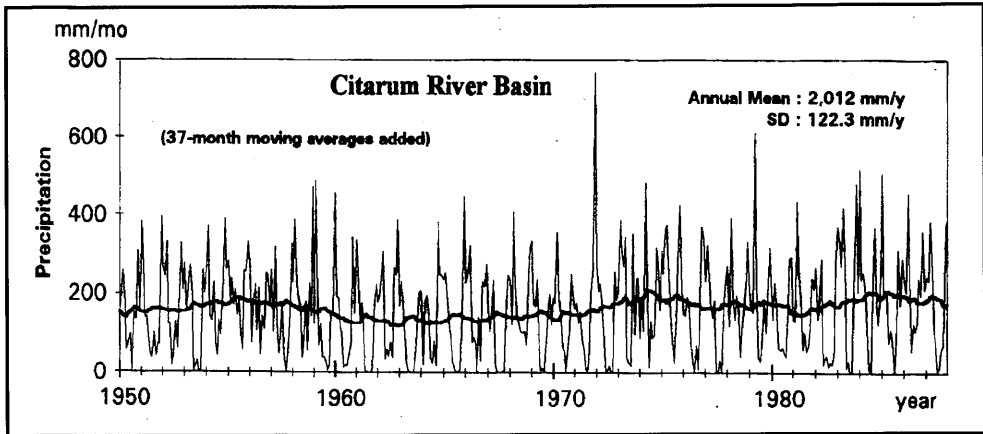
3.3 Monthly Climate Data

Station: Ciparay

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	24.3	24.3	24.6	25.0	24.7	24.1	23.3	23.5	24.0	24.4	24.5	24.3	24.25	1982~1993
Precipitation [mm]	273	210	242	262	165	85	52	66	86	165	254	258	2 118	1982~1993
Evaporation* [mm]	171	179	183	144	152	150	152	167	180	217	183	164	2 042	1982~1993
Duration of sunshine [hr]	138	131	156	173	205	223	238	242	216	193	158	145	2 218	1982~1993
Solar radiation [MJ/m ² /d]	325	343	340	344	316	323	342	366	399	360	352	327	345	1982~1993

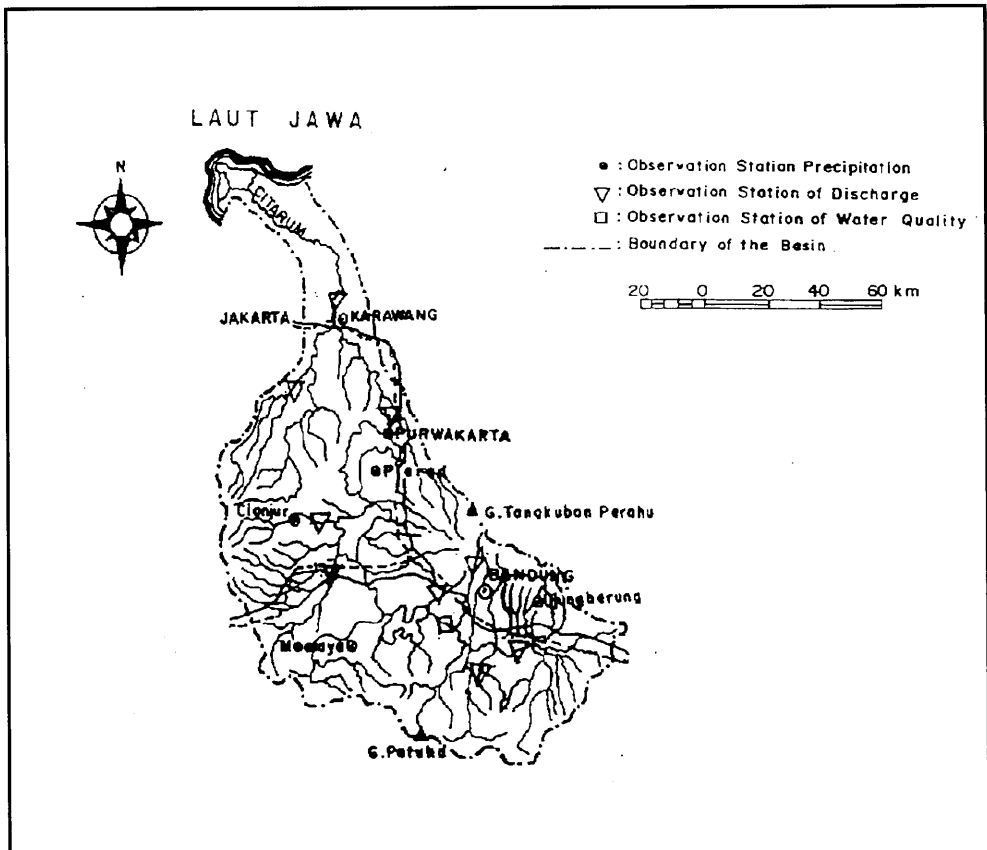
* Average using Class A Pan (at Garokgek)

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

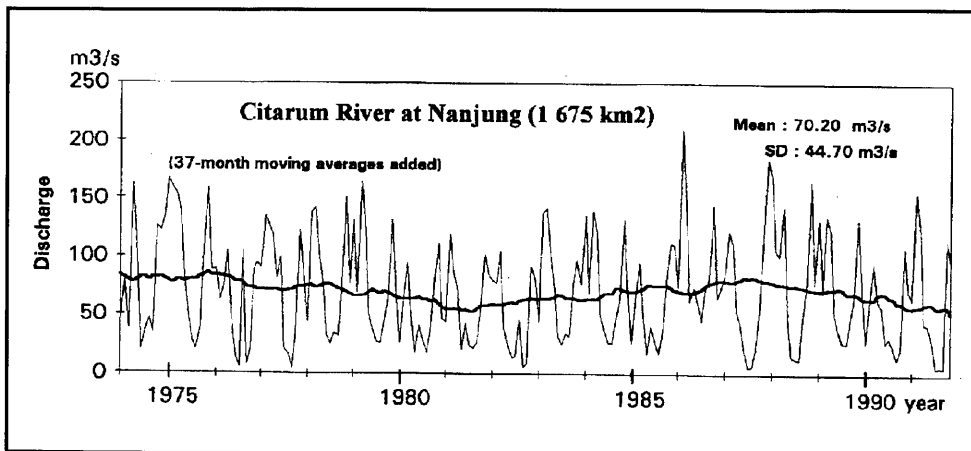
No.	Station	Location	Catchment area (A) [km ²]	Observation period	Observation items ¹⁾ (frequency)
02-016-04-05	Maribaya	S 06° 51' 00" E 107° 36' 00"	76.0	1957~1991	Q(7d)
02-016-04-08	Gandok	S 06° 53' 00" E 107° 36' 00"	90.4	1957~1991	Q(7d), Q(m)
02-016-04	Dayeuh Kolot	S 06° 05' 00" E 107° 03' 00"	1 035	1980~1985	Q(7d)
02-016-04-02	Nanjung	S 06° 57' 00" E 107° 32' 00"	1 675	1918~1931 1974~1991	Q(7d)
02-016-04-01	Tanjungpura	S 06° 20' 00" E 107° 19' 00"	5 970	1969~1977	Q(7d)

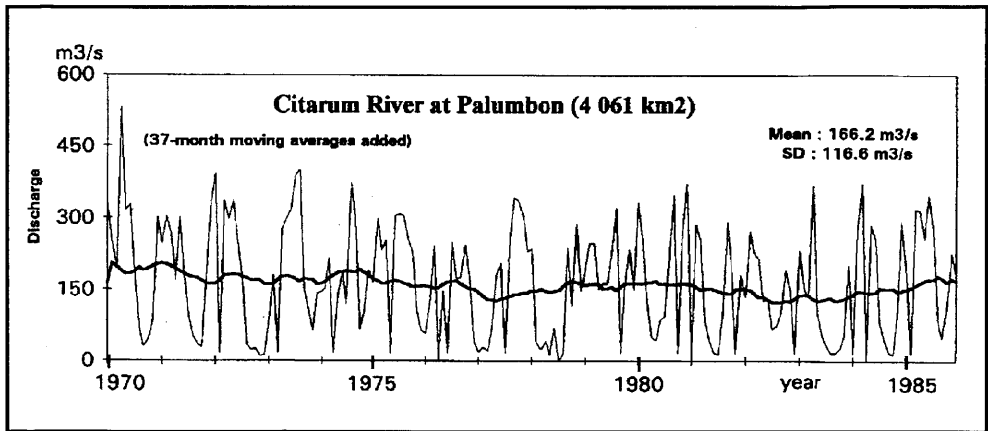
No.	\bar{Q} ²⁾ [m ³ /s]	Q max ³⁾ [m ³ /s]	\bar{Q} max ⁴⁾ [m ³ /s]	\bar{Q} min ⁵⁾ [m ³ /s]	\bar{Q} / A [m ³ /s/100km ²]	Q max / A [m ³ /s/100km ²]	Period of statistics
02-016-04-05	3.18	55.8	20.7	1.37	4.18	73.4	1957~1991
02-016-04-08	3.16	95.8	49.2	0.72	3.50	106	1957~1991
02-016-04	39.37	182	154.5	5.96	3.80	17.6	1980~1985
02-016-04-02	68.7	455	279.4	5.41	4.10	27.1	1918~1931 1974~1991
02-016-04-01	171	1 250	851	15.74	2.86	20.9	1969~1977

1): 7d: 7-day
m: Monthly

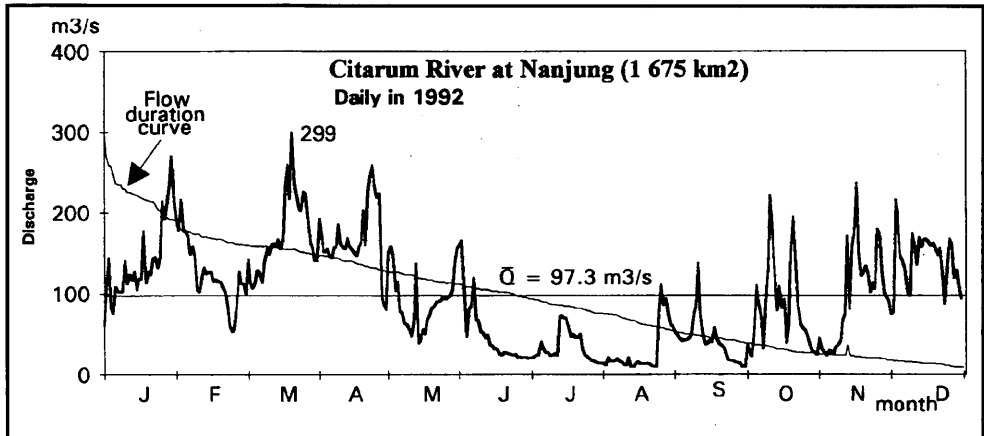
2) Mean annual discharge
3) Maximum discharge
4) Mean maximum discharge
5) Mean minimum discharge

4.3 Long-term Variation of Monthly Discharge

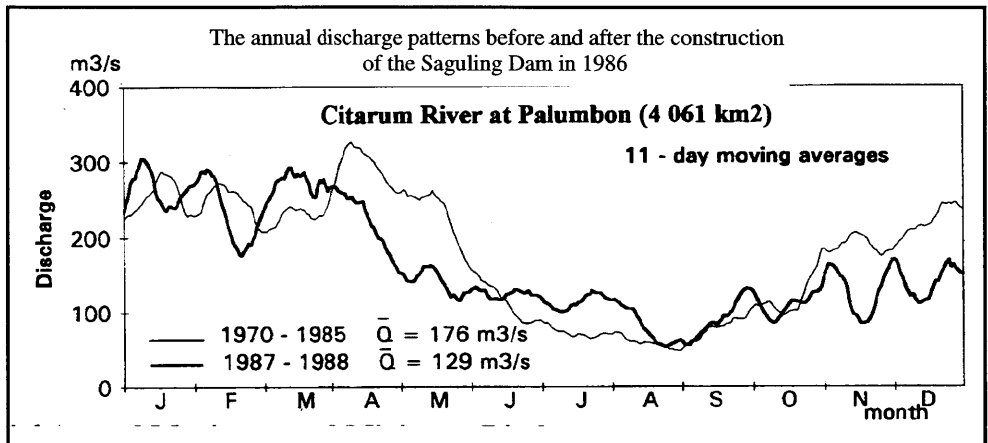




4.4 Annual Pattern of Discharge



4.5 Unique Hydrological Features



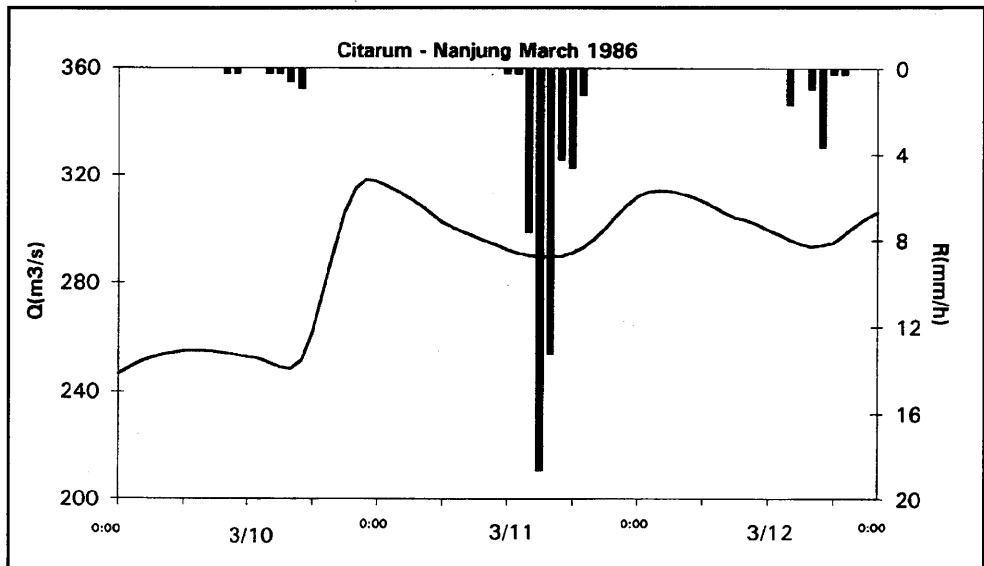
4.6 Annual Maximum and Minimum Discharges

At Citarum Nanjung [1 675 km²]

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]
1918	12.14	244	10	3.65	1977	10.05	290	10	3.2
1919	12.04	252	8	1.8	1978	12.11	302	-	13.3
1920	10.25	224	8	10.5	1979	12.07	301	9	5.2
1921	4.05	261	10	2.6	1980	12.05	284	8	4.8
1922	4.16	275	9	3.51	1981	3.16	276	9	8.0
1923	7.12	252	10	2.71	1982	12.26	265	10	3.8
1924	1.23	252	9	2.57	1984	2.11	269	8	1.8
1925	12.29	204	11	2.10	1986	3.16	332	9	11.2
1974	5.12	323	6	12.5	1987	4.15	264	11	3.7
1975	4.17	364	6	12.5	1988	-	288	-	3.5
1976	12.17	247	8	2.6	1991	3.24	379	10	3.5

1), 2) Instantaneous observation by recording chart

4.7 Hyetographs and Hydrographs of Major Floods



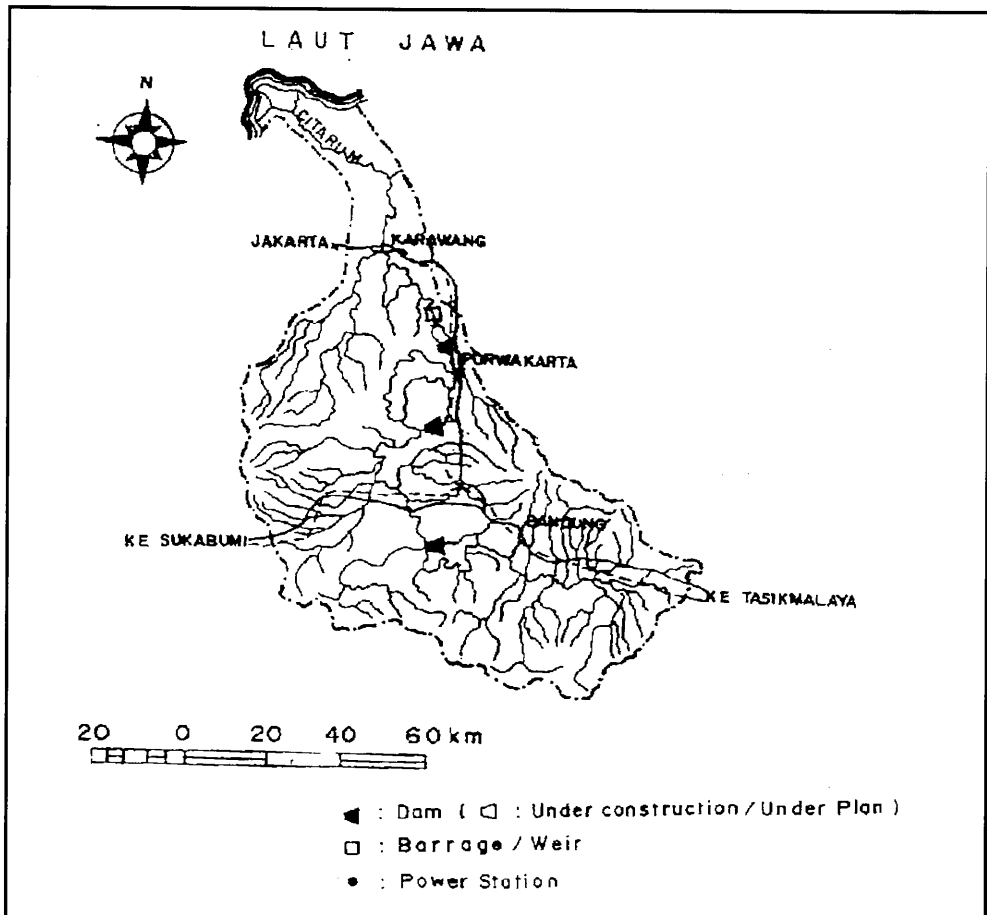
Data Source: Research Institute for Water Resources Development.

5. Water Resources

5.1 General Description

The Citarum River with its three dams, the Saguling located in the upstream reaches, the Cirata and Jatiluhur located in the middle reaches is the main source of hydropower in the island. The multipurpose Jatiluhur dam is also a place of tourist attraction, and provides for fisheries, sports facilities, irrigation, domestic and industrial water supplies as well in addition to providing hydropower. The water from the Jatiluhur reservoir flows to the northern coast of west Java providing irrigation to the Subang, Cikampek, Karawang and Bekasi areas which are some of the main rice producing areas of west Java. The other two dams, Saguling and Cirata are utilized for hydropower generation and freshwater fish farming. The inhabitants of the basin who are mostly farmers by profession use a great deal of water from the Citarum River as well as from its tributaries. There are some 90 small and large weirs built across the river and the tributaries for cultivating over 54 000 ha of paddy fields. The wet and dry seasons in the Citarum River Basin are from November to May and from June to October respectively. There have been frequent water shortages, particularly in the upstream regions due to the increasing demand caused by the rapid population growth and industrial needs. To resolve such problems and to manage the distribution of the water resources, Badan Otorita will be established. It is also planned to construct small dams at the upstream reaches of the Citarum River.

5.2 Map of Water Resources 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]	Purpose ¹⁾	Year of completion
Citarum	Saguling	2 283	982	609	P	1986
	Cirata	4 119	2 165	709	P	1988
	Jatiluhur	4 500	3 000	1 825	A, F, I, N, P, W	1963

Major Interbasin Transfer

Name of transfer line	Names of rivers connected		Length [km]	Maximum capacity [m ³ /s]	Purpose ¹⁾	Year of completion
	From	To				
Tarum Barat (Main canal)	Citarum	Ciliwung	70	30	A, I, W	1963
Tarum Timur (Main canal)	Citarum	Cilalanang	40	20	A, I, W	1963

Major Diversions and Canals

Name of river	Location	Maximum capacity [m ³ /s]	Purpose ¹⁾
Cibeet	Wanakarta	41.18	A
Citarum	Curug	73.43	A
Cikundul	Cikalong kulon	23.65	A
Cisalak	Cikalong kulon	26.49	A
Cinangka	Cikalong kulon	23.65	A
Cibalagung	Mande	24.61	A
Cisokan	Bojongpicung	53.21	A
Cimahi	Leuwigajah	21.40	A
Ciwidey	Cilame	21.66	A
Ciwidey	Sadu	27.23	A
Cisangkuy	Nagrak	23.40	A
Citarum	Wangisaga	37.97	A

1) A: Agricultural use F: Flood control I: Industrial use N: Maintenance of normal flows P: Hydropower
W: Municipal water supply

5.4 Major Floods and Droughts

Major Floods at Nanjung [1 675 km²]

Date	Peak discharge [m ³ /s]	Rainfall [mm] Duration	Meteorological cause	Dead and missing	Major damages (Districts affected)
1931. 1.03	757	45 17.00~24.00	Thunderstorm	-	South of Bandung Area
1986.11.03	580	34 16.00~23.00	Thunderstorm	2	South of Bandung Area

Major Drought

Period	Affected areas	Major damages and counteractions
1978. 8	Bekasi, Purwakarta and Karawang District	Water supply for irrigation and hydropower decreased eventually

5.5 Groundwater and Water Quality

River Water Quality at Nanjung¹⁾ in 1991

Date	Jan 13	Feb 26	May 14	Jun 21	Aug 3	Sep 15	Oct 28	Dec 9
pH	7.6	7.6	7.7	7.9	8.4	8.7	7.3	7.2
DO [mg/l]	2.5	2.1	0.8	0.7	0.7	0.2	1.4	1.4
COD [mg/l]	23	28	56	42	52	75	95	35
SS [mg/l]	336	51	324	99	39	28	118	144
F.Coli x 10 ⁵ 2)	0.69	18	220	2.0	3.9	320	230	2.1
Discharge [m ³ /sec] 3)	83	17.5	50.9	21.4	6.45	4.9	6.3	151

1) Located at Nanjung bridge, Bandung district, West Java

2) Membrane filter method, colonies/100 ml

3) Discharge on the water quality observation date

5.6 Other Notable Water Resources Features

Water Uses at Major Reservoirs

Name of dam	Hydropower capacity [MW]	Agricultural use [km ²]	Industrial use [10 ⁶ m ³]	Fisheries use [10 ⁶ m ³]	Municipal water supply [10 ⁶ m ³]
Saguling	700	-	-	-	-
Cirata	500	-	-	-	-
Jatiluhur	150	3 045	45.75	47.3	400.5

6. Socio-cultural Characteristics

The upper part of the Citarum catchment is located in the Priangan region where the city of Bandung, the capital of west Java Province, is also situated. The city of Bandung is very famous among the non aligned countries, having the name of "Semangat Bandung" (The Spirit of Bandung), because the first conference of Asian and African countries was held in this city in 1955. The region of Priangan is also called Pasundan because most people in this region are Sundanese. The traditional music and dance such as "Angklung" (bamboo music) from Pasundan is also very famous. Angklung can be played with a specific sound and it can follow the modern music from the most of the countries in the world. This region also has a traditional dance called "Tari Jaipongan". It is a specific type of dance from Pasundan which when performed by professional dancers may appear to be sensual and spiritual.

7. References, Databooks and Bibliography

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