

Cimanuk

Map of River

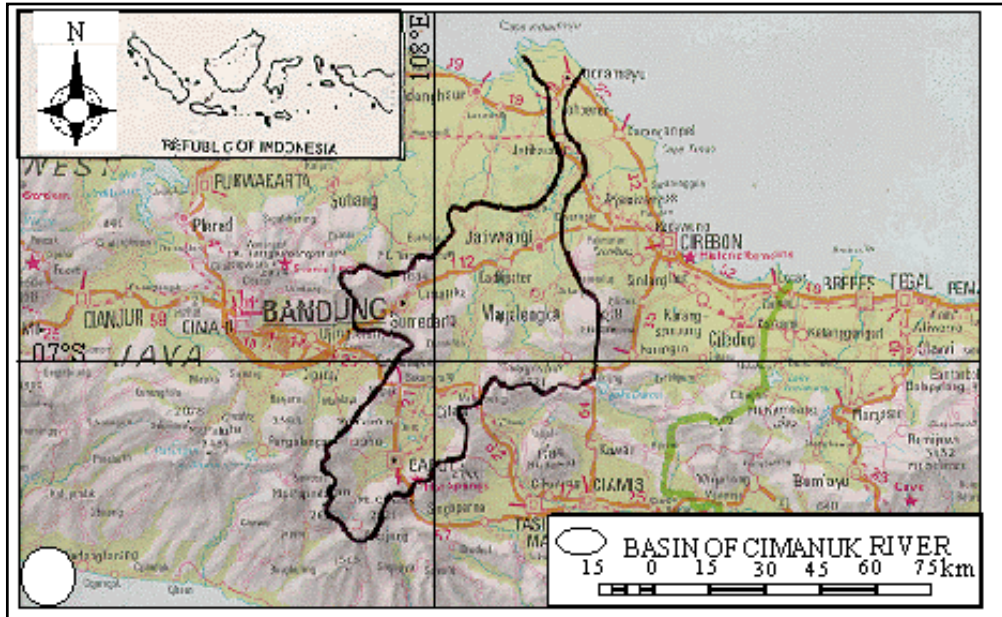


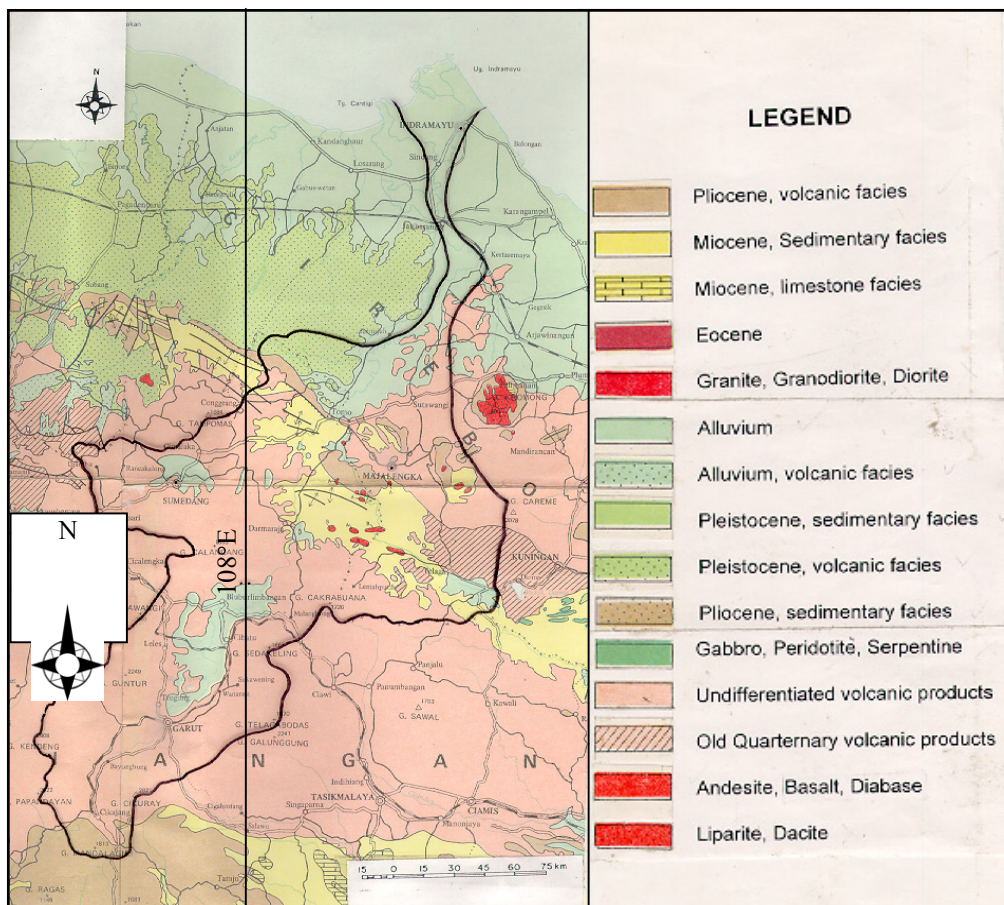
Table of Basic Data

Name(s): Cimanuk		Serial No. : Indonesia-7
Location: West Java, Indonesia	S 06° 15' 00"~ 07° 25' 00"	E 107° 40' 00" ~ 108° 35' 00"
Area: 3 600 km ²	Length of the main stream: 230 km	
Origin: Mandalagiri (1 813 m)	Highest Point: Mt. Ciremay (3 078 m)	
Outlet: Java sea	Lowest Point: River mouth (0 m)	
Main geological features: Oligocene, Miocene, Pliocene, Plistocene, Quarternary		
Main tributaries: Cipeles (440 km ²), Cilutung (640 km ²)		
Main reservoirs: Jatigede reservoir (under plan)		
Main lakes: None		
Mean annual precipitation: 2 195 mm (1879~1941) (basin average)		
Mean annual runoff: 134.7 m ³ /s at Rentang (3 003 km ²) (1970 ~1997)		
Population: 3 075 226 (1995)	Main cities: Garut, Sumedang, Majalengka, Indramayu, Cirebon	
Land use: Forest (22.76 %), Paddy field (35.99 %), Agriculture (29.76 %), Urban (6.55 %), Water surface (0.01 %), Others (4.93%) (1991)		

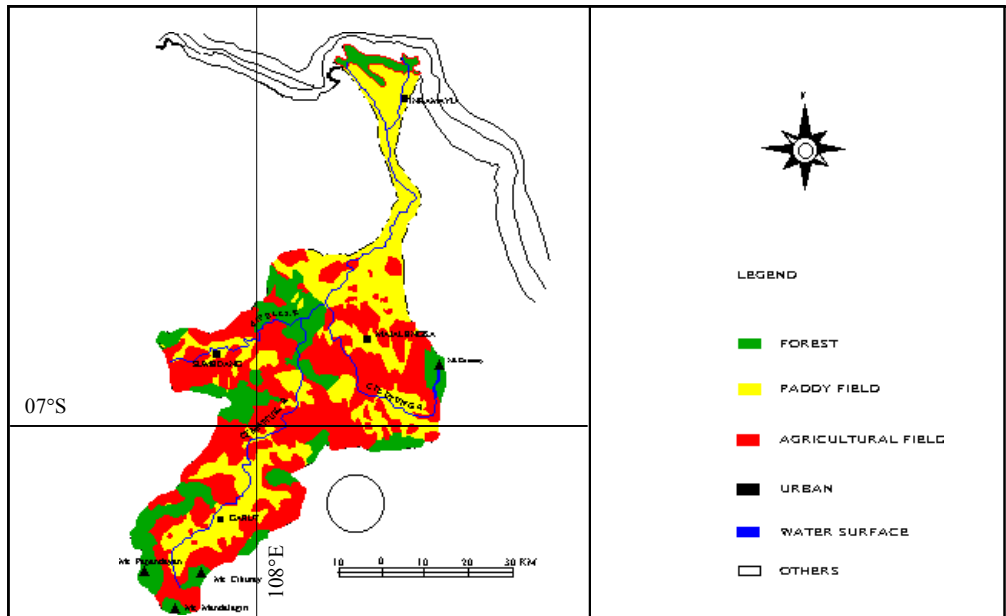
1. General Description

Cimanuk is one of the largest rivers in West Java province, Java Island and its main river is 230 km long with a catchment area of 3 600 km². It originates on the slopes of Mt. Papandayan (2 622 m) and Mandalagiri (1 813 m), only 25 km from the southern coast of Java, flows to the north-northeast through the middle part of the island before flowing out into the Java Sea. The sub-basin above Balubur Limbangan is an elevated plateau at about 700 m, surrounded by twelve volcanoes, some of which are still active, and the peaks ranging from 2 000 m to 3 000 m. The middle basin is a lower level plateau covering the middle reaches of the Cimanuk together with the catchments of two main tributaries, the Cilutung and Cipeles. The lower basin consists of coastal plains below the elevation of 50 m. The main water related problems of the lower basin is flooding. Floods originate from the upper basin resulting from intense rainfalls occurring on steep, deforested catchment with high antecedent soil moisture and with significant base-flow in the streams. The average annual rainfall in the basin is 2 195 mm and the annual discharge was 63.6 m³/s (4.3 m³/s/100 km²) at Eretan (1 460 km²) in 1985. The population of the basin was 3.075 million in 1995.

2. Geographical Information



2.2. Land Use Map

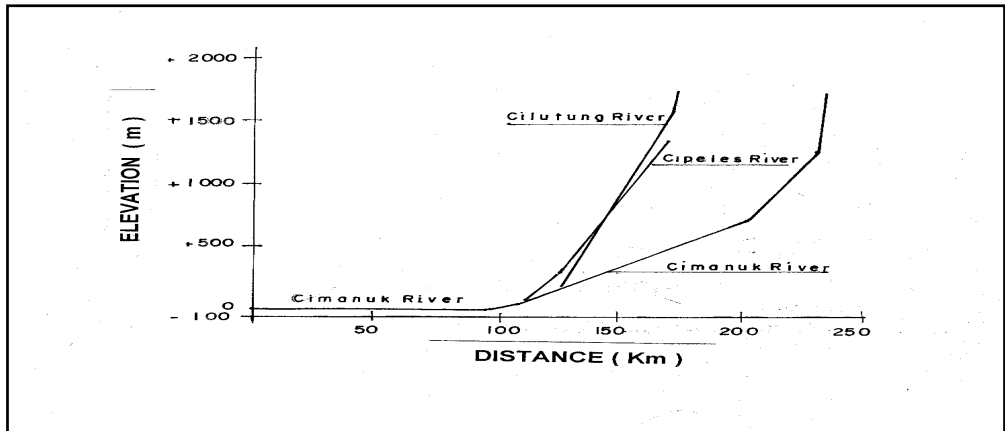


2.3. Characteristics of the River and the Main Tributaries

No.	Name of river	Length [km] Catchment area [km ²]	Highest peak [m] Lowest point [m]	Cities Population (1995)	Land use [%] (1977)
1	Cimanuk (Main River)	230 3 600	Mt. Ciremai, 3 078 River mouth, 0	Cirebon 256 134 Indramayu 89 182 Garut 104 319	A (29.76) F (22.76) L (0.01)
2	Cipeles River (Tributary)	60 440	Mt. Tunggul, 2 209 -	Sumedang 137 830	O (4.93)
3	Cilutung River (Tributary)	75 640	Mt. Ciremai, 3 078 -	Majalengka 87 988	P (35.99) U (6.55)

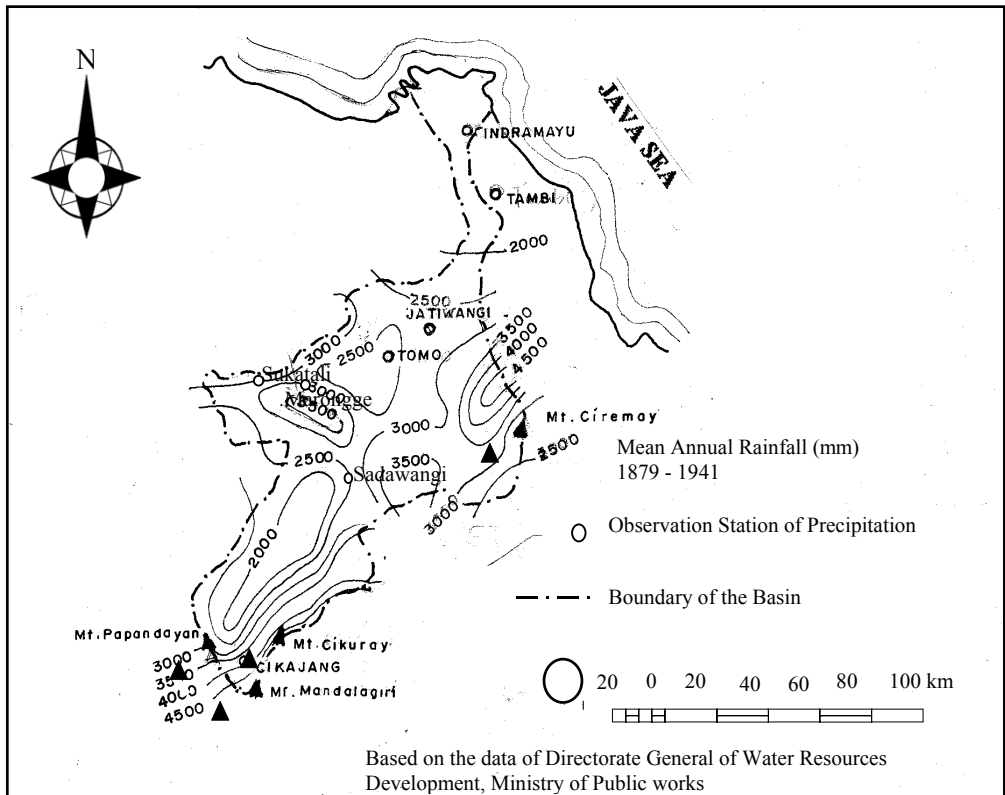
A: Agricultural
 F: Forest
 L: Lake, river, marsh
 O: Others
 P: Paddy Field
 U: Urban

2.4. Longitudinal Profiles



3. Climatological Information

3.1. Annual Isohyetal Map and Observation Stations



3.2. List of Meteorological Observation Stations

Station	Elevation (m)	Location	Observation period	Mean annual precipitation [mm]	Mean annual evaporation [mm]	Observation items
Cikajang	1 240	S 07° 29' 00" E 107° 48' 00"		2 659		P, DS
Tomo	35	S 06° 46' 00" E 108° 09' 00"		2 491		P, DS, RH, T
Jatiwangi	45	S 06° 43' 00" E 108° 14' 00"		2 680		P, WV
Tambi	10	S 06° 29' 00" E 108° 20' 00"		2 252	1 654	E, P, RH, DS, T, WV
Indramayu	10	S 06° 18' 00" E 108° 20' 00"		1 835		P
Sadawangi	702	S 06° 59' 00" E 108° 11' 00"	1978~1991	2 681	1 755	E, P, RH, DS, T, WV
Marongge	45	S 06° 46' 00" E 108° 08' 00"	1978~1991	2 352	1 730	E, P, RH, DS, T, WV
Sukatali			1978~1991	2 420	1 797	E, P, RH, DS, T, WV

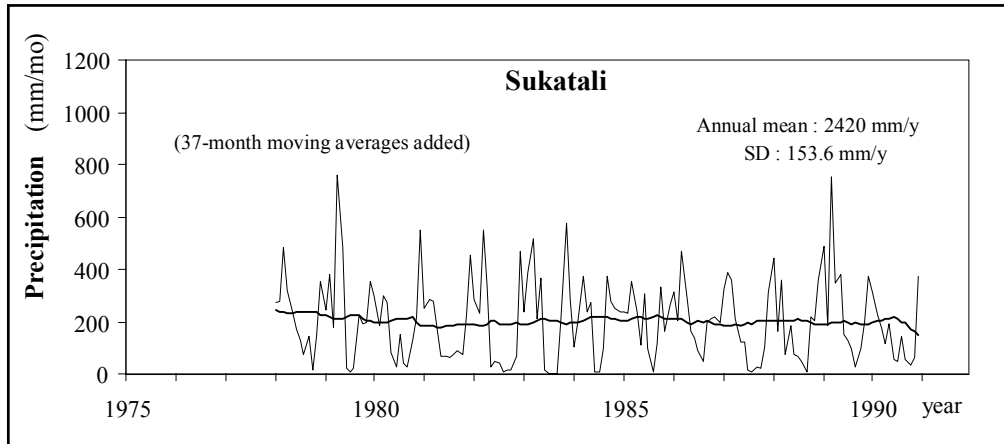
DS: Duration of sunshine ; E: Evaporation; P: Precipitation; RH: Relative humidity; T: Temperature; WV: Wind velocity

3.3. Monthly Climate Data

Station: Tomo

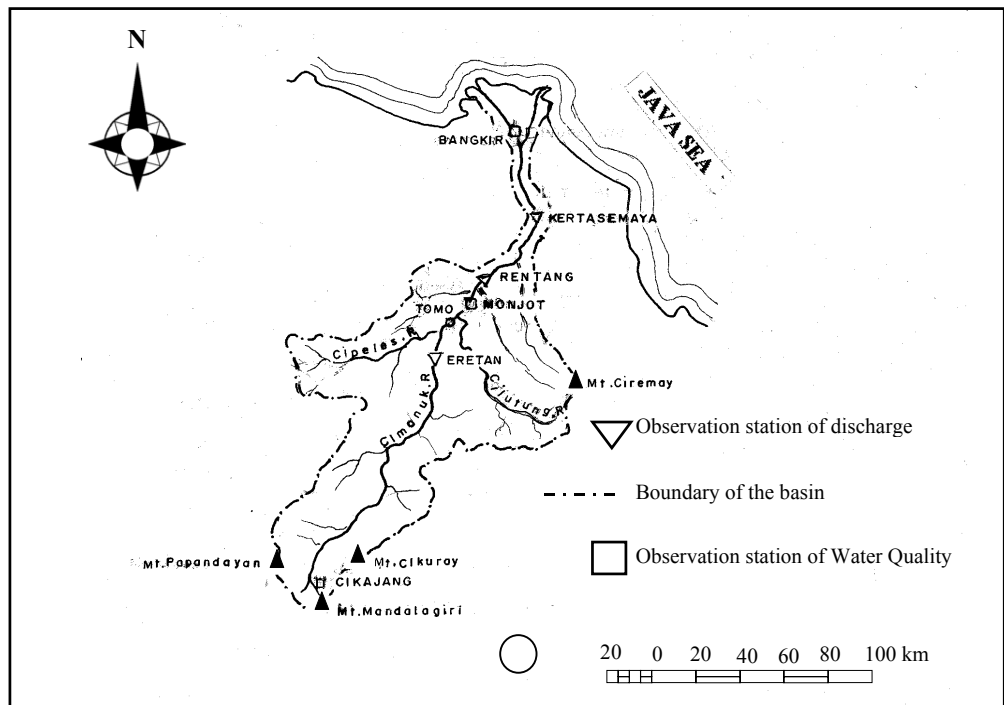
Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	25.9	26.2	26.5	27.1	27.1	27.0	26.8	27.5	28.3	28.5	27.4	26.9	27.1	1938~1943
Precipitation [mm]	397	335	383	387	194	47	78	27	20	71	253	399	2 491	1879~1941
Relative humidity[%]	88	88	87	85	81	82	81	72	68	69	79	82	80	1938~1943
Duration of sunshine [hr]	149	175	234	223	234	257	272	294	312	305	234	216	2 905	1938~1943

3.4. Long-term Variation of Monthly Precipitation Series



4. Hydrological Information

4.1. Map of Streamflow Observation Stations



4.2. List of Hydrological Observation Stations

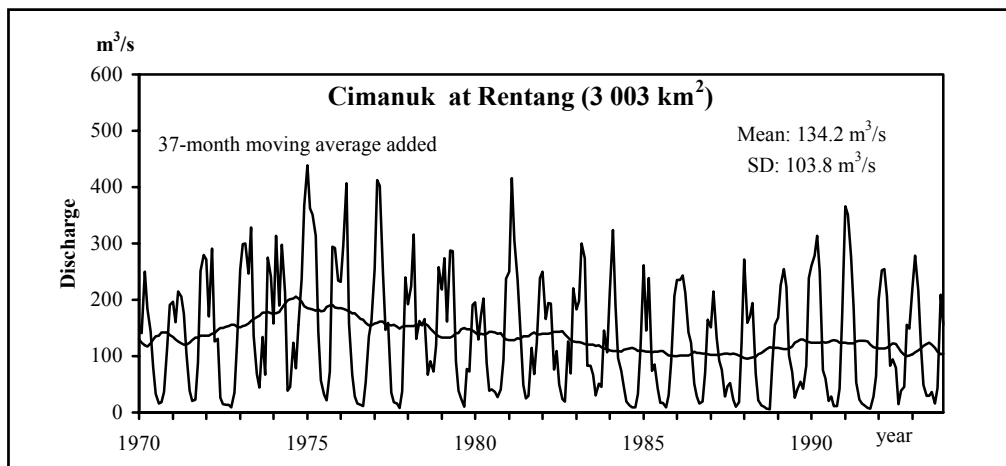
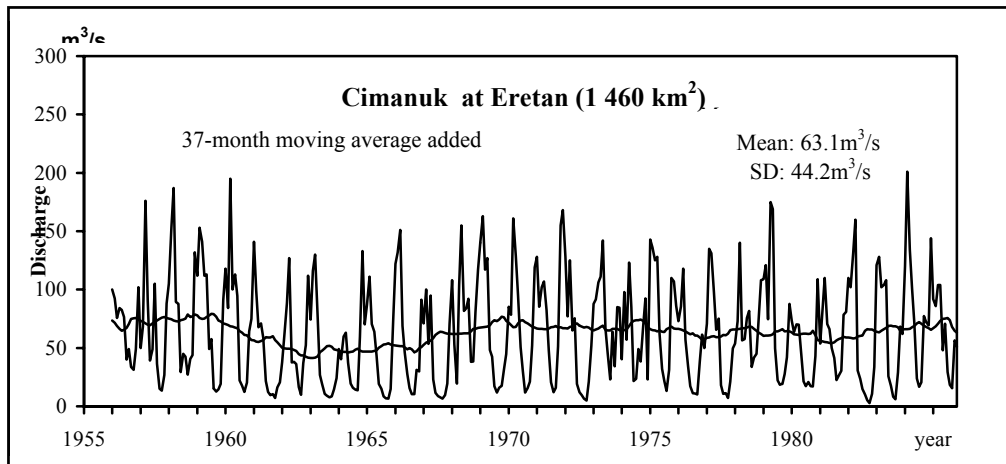
No.	Station	Location	Catchment area (A) [km ²]	Observation period	Observation items ¹⁾ (frequency)
1	Eretan	S 06° 54' 00" E 108° 02' 00"	1 460	1956~1985	Q(d)
2	Rentang	S 06° 43' 00" E 108° 10' 00"	3 003	1970~1997	Q(d)

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
1	63.4	201	137.2	13.37	4.34	13.76	1956~1985
2	134.7	438.4	305.6	19.95	4.48	14.59	1970~1997

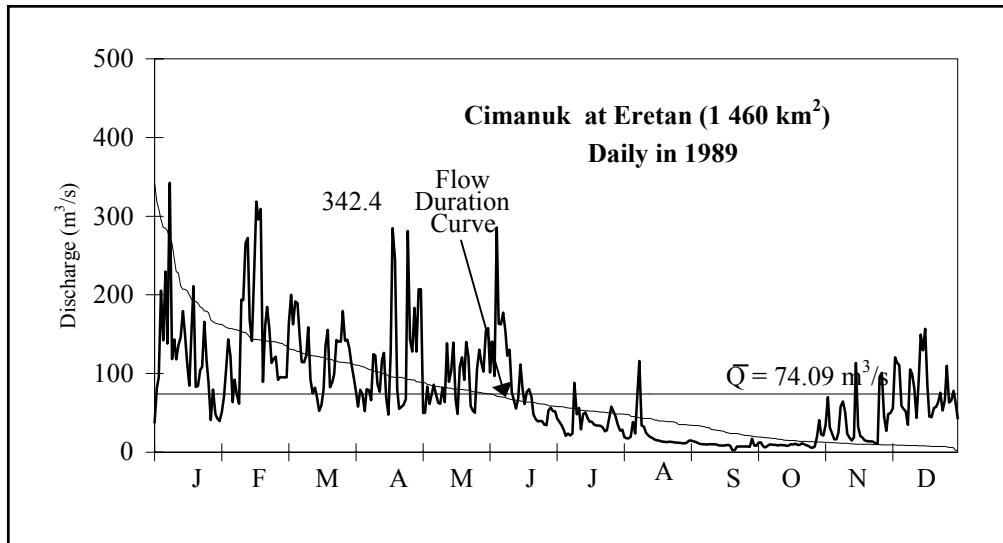
¹⁾ Q: discharge, d: daily; ²⁾ Mean annual discharge; ³⁾ Maximum monthly discharge; ⁴⁾ Mean maximum monthly discharge;

⁵⁾ Mean minimum monthly discharge.

4.3. Long-term Variation of Monthly Discharge Series



4.4. Annual Pattern of Discharge Series



4.5. Unique Hydrological Features

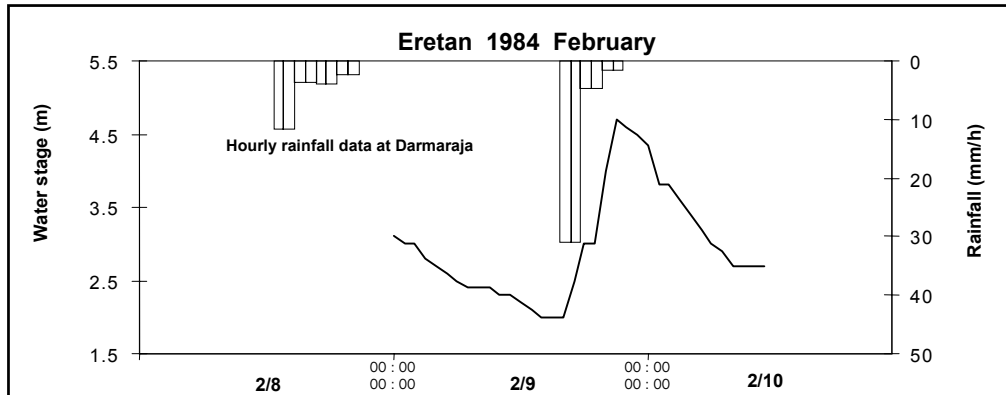
The Cimanuk has a unique catchment area from Rentang to the downstream. It becomes narrow and brings about in that area the maximum discharge making the discharge at the downstream point to be smaller than one at the upstream point. The computed discharge of 25 year return period at Kertasemaya (3 271 km²) is 1 000 m³/s while that at Rentang (3 003 km²) with the same return period is 1 440 m³/s. The river lengths from Kertasemaya and from Rentang to the river mouth are 51.40 km and 86.40 km, respectively. This means that the difference of river length between the two points is 35 km but the difference in the catchment areas is “only” 268 km². The narrow catchment area causes the channel storage to be dominant enough to reduce the maximum discharge compared with the influence of the additional catchment area to increase it.

4.6. Annual Maximum and Minimum Discharges at Rentang (3 003 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]
1970	3.27	508	7	7	1981	2.18	843	8	7
1971	11.20	624	9	11	1984	2.10	811	7	25
1972	1.15	598	10	9	1985	4.04	709	9	19
1973	5.09	834	8	23	1986	3.07	613	8	31
1974	12.04	960	7	19	1987	2.17	838	9	9
1975	2.12	953	8	15	1988	1.22	854	9	9
1976	3.21	953	9	4	1989	1.08	700	9	16
1977	12.23	1 268	10	3	1990	2.02	625	10	11
1978	3.24	681	8	21	1991	12.14	507	9	6
1979	5.17	865	9	6	1992	3.14	685	7	26
1980	12.24	553	8	13					

^{1), 2)} Instantaneous observation by recording chart

4.7. Hyetographs and Hydrographs of Major Floods

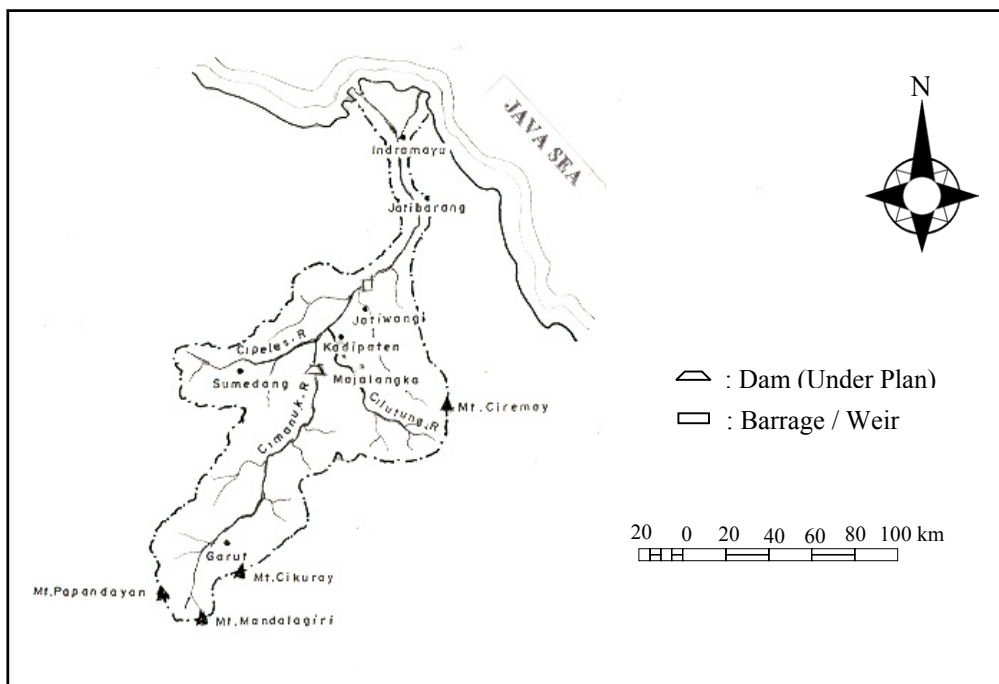


5. Water Resources

5.1. General Description

The Cimanuk has about 3 600 km² of catchment area or about 2.75 % of the extent of Java Island (130 777 km²). There is a seasonal variation characteristic of discharge in the Cimanuk, with the average monthly flow in the lower Cimanuk ranging from 260 m³/s in the wet season to 20 m³/s in the dry season. As a result, the irrigated paddy fields that can be planted in the wet season is estimated to be 118 000 ha although flooding which is a regular hazard can destroy the harvest. In the dry season, less than 50 000 ha only can be fully irrigated in the lower basin because of water shortage. To develop the Cimanuk basin and provide flood mitigation in the lower part, the Cimanuk Basin Development Project was established on May 1, 1979. Some of the previous investigations were mainly to develop the water resources in Cimanuk basin. A feasibility study of the Jatigede Dam and hydro-electric facility had been done by SMEC in 1977, but up to now, the dam has not been constructed. The Construction of Rentang Weir (3 003 km²) was completed in 1983, providing irrigation facilities to some 90 000 ha. Flooding of the Rentang irrigation area, downstream from Rentang, has been a serious problem over recent years although the peak discharges in the Cimanuk has been greatly reduced in the downstream from Rentang due to routing effects.

5.2. Map of Water Resources System



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
Cimanuk	Jatigede	1 460	1 465	979.5	A, F, P	Under plan

Floodway

Name of transfer line	Name of rivers connected		Length [km]	Maximum capacity [m ³ /s]	Purpose ¹⁾	Year of completion
	From	To				
Rambatan	Cimanuk	Java Sea	25	1 000	F, N	
Indramayu bypass	Cimanuk	Cimanuk				

Others

Name of river	Facilities	Purpose ¹⁾	Capacity [ha]	Year of completion
Cimanuk	Rentang Weir	A	90 000	1983

1) F: Flood control, A: Agricultural use, P: Hydro-power, N: Maintenance of normal flow,

5.4. Major Flood and Drought Experiences

Major Flood at Tomo (1 966.3 km²)

Date	Peak discharge [m ³ /sec]	Rainfall duration [mm]	Meteorological cause	Dead and missing	Major damages (Districts affected)
30 Jan 1993	674	-	Thunderstorm	None	Jatibarang and Indramayu

Major Drought

Period	Affected Area	Major damage and counteractions
June ~ November 1997	Indramayu	Agriculture, Fisheris. Water Supply

5.5. Water Quality

River Water Quality at Monjot

Date	December 14, 1992	February 2, 1993
pH	7.4	7.7
BOD [mg/l]	1.3	1.2
COD [mg/l]	2.8	3.0
Suspended Solid [mg/l]	559	317
Alkalinity [mg/l]	63.5	66.0
Fecal coli ¹⁾ [10 ⁴ colonies/100ml]	6.0	4.2
Discharge ²⁾ [m ³ /sec]	140.0	218.0

1) Membrane Filter Methods

2) Mean discharge

6. Socio-Cultural Characteristics

The municipality of Cirebon is situated on the northern coast of Java, near the provincial boundary between West Java and Central Java. It is the only city in West Java that has a harbour, namely Jati Wangi. The word Cirebon itself originates from “cai” meaning water and “rebon” meaning juvenile shrimp, so Cirebon is also known as “Kota Udang” or the city of shrimps. As a tourism and cultural city, there are many historical buildings and places of religious background that have architectural characteristics special to northwest Java. These buildings include Kraton Kasepuhan (built in 1529), Kraton Kanoman (built in 1588) and Kraton Kacirebonan (built in 1800), which have become the most attractive places in Cirebon. Sunyaragi Cave was a special place for the Sultan of Kasepuhan and his family to meditate (Sunya means silent) during the fighting era. So, it was bombed by the Dutch and part of the cave was broken. About 5 km northward from the City center is Gunung Sembung, which is a graveyard complex where Sunan Gunung Jati, one of the Wali Songo (nine Saints of moslem), was buried. “Tari Topeng” is a traditional dance created by Sunan Kali Jaga, one of the Wali Songo in the 16th century. Tarling, the combination of *gitar* (guitar) and *suling* (flute), is nowadays the most popular musical art that has been then developed into a drama that tells a legendary story. And Linggarjati, 26 km away to the south of Cirebon, is a historical place for the Indonesian people, where the Linggarjati Negotiation between the Netherlands and Indonesia took place in 1946. The diorama indicating the process of negotiation can be seen in Linggarjati museum.

7. References, Databooks and Bibliography

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