Gap-chun

Map of River

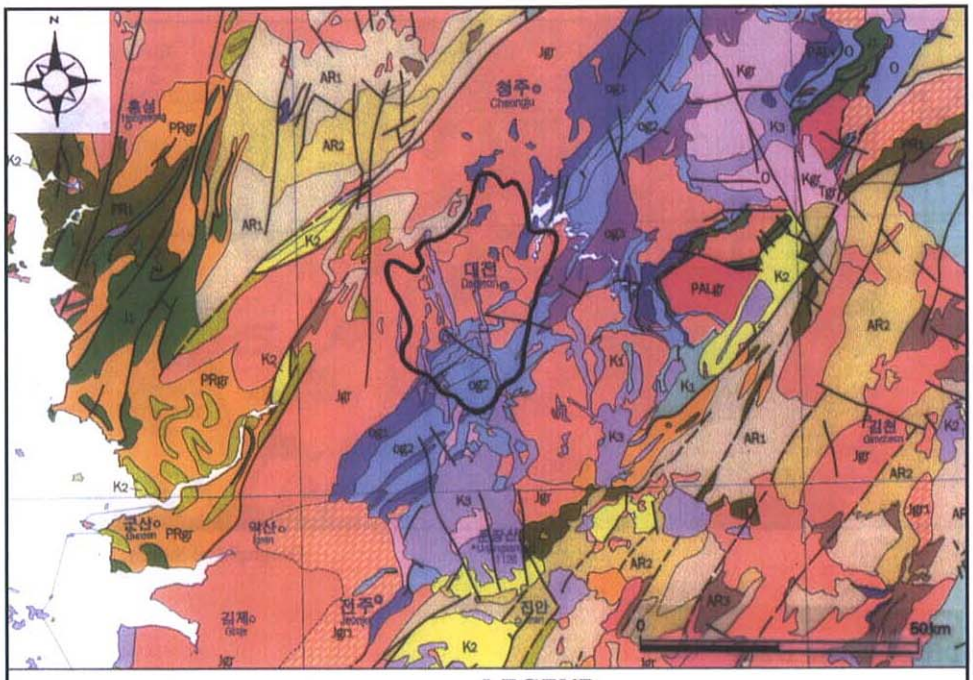
Geographical Survey, MOC, Korea

Table of Basic Data

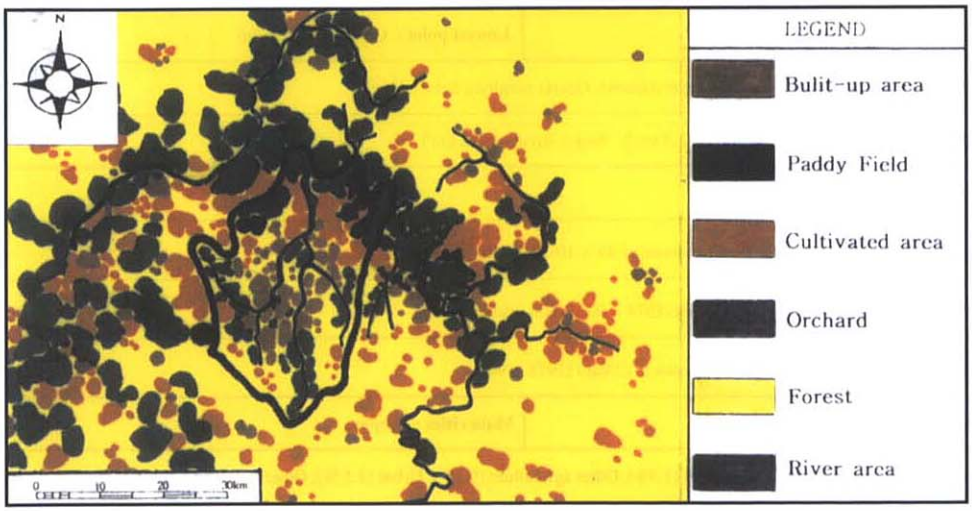
Name: Gap Stream (in Geum River)		**Serial No. :** Korea (R. of) - 6
Location : Central South Korea	N 36° 05′ ~ 36° 27′	E 127° 10′ ~ 127° 30′
Area : 646.6 km^2	**Length of main stream :** 62.8 km	
Origin : Mt. Dae Dun (877.7m)	**Highest point :** Mt. Dae Dun (877.7m)	
Outlet : Geum River	**Lowest point :** Confluence (21.3m)	
Main geological features : Alluvial layer; Granite, Quartz porphyry, Schist, Diorite		
Main tributaries : Yudung stream (282.3 km^2), Taejon stream (87.8 km^2)		
Main lakes : None		
Main reservoirs : Daechong Dam Reservoir (1.49 × 10^9 m^3, 1980)		
Mean annual precipitation : 1,268 mm (1974 ~ 93) (basin average)		
Mean annual runoff : 2.74 m^3/s at Haeduk (612 km^2) (1975 ~ 94)		
Population : 1,021,000 (1990)	**Main cities :** Taejon	
Land use : Forest (63.9%), Rice paddy (11.4%), Other agriculture (9.3%), Urban (4.5 %), Others (10.9%) (1990)		

2. Geographical Information

2.1 Geological Map



2.2 Land Use Map



1. General Description

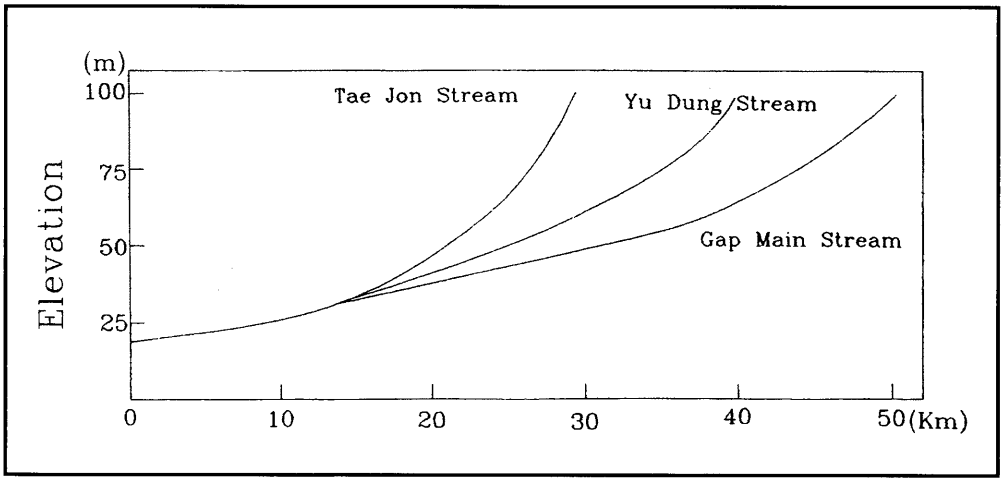
The Gap stream is one of the main tributaries of the Geum river flowing through the west central part of the Korean peninsula. Originating from Mt. Dae dun (877.7m) and flowing to the downstream of Dae Chong Dam, the Gap-chun is 62.8 km long and drains an area of 646.6 km^2. The average annual precipitation in the basin is 1,268 mm and the average annual runoff at Haeduk (612km^2) is 2.74m^3/sec. In 1990, the population in the basin was 1,021,000. Dae Chong multi-purpose dam which has a storage volume of 1.49x10^9 m^3 was constructed in the basin in 1980. The basin consists of relatively low mountainous areas and well developed plains. The Gap-chun which runs through the Tae Jon area is a typical urban stream in the central province of Korea.

2.3 Characteristics of River and Main Tributaries

No.	Names of river	Length [km] Catchment area [km^2]	Highest Peak [m]	Cities (Population, 1990)	Land use [%](1991) F	P	A	U
1	**Gap stream**	62	Mt. Dae dun	Tae Jon City				
	(Main river)	646.6	878	1,021,000	64.0	11.4	9.3	4.5
2	**Yu Dung stream**	15.7	Mt. Dae dun	Tae Jon City				
	(Tributary)	282.3	878	1,021,000				
3	**Tae Jon stream**	8.7	Mt. Bo mun	Tae Jon City				
	(Tributary)	87.8	458	1,021,000				

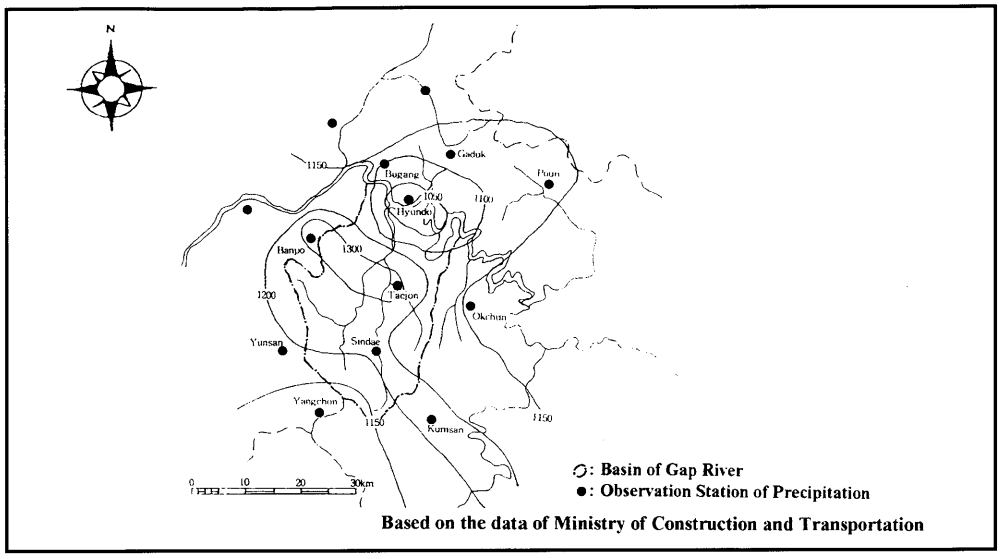
A: Agricultural field (vegetable field, grass field) F: Forest P: Paddy Field U: Urban

2.4 Longitudinal Profiles



3. Climatological Information

3.1 Annual Isohyetal Map and Observation Stations



Based on the data of Ministry of Construction and Transportation

3.2 List of Meteorological Observation Stations

No.	Station	Elevation [m]	Location	Observation period	Mean annual precipitation[1] [mm]	Mean annual evaporation[2]	Observation items
197*	Yunsan	32.0	N 36°12' 35″ E 127° 49' 10″	1960~present	1,198.95		P(TB)
204*	Banpo	80.0	N 36° 24' 02″ E 127° 14' 43″	1960~present	1,390.42		P(TB)
210*	Bugang	80.0	N 36° 31' 35″ E 127° 22' 19″	1960~ present	1,102.20		P(TB)
213*	Hyundo	30.0	N 36° 27' 06″ E 127° 26' 47″	1993~present	1,030.30		P(TB)
214*	Sindae	120.0	N 36°08' 20″ E 127° 22' 46″	1993~present	1,205.60		P(TB)
216*	Yangchon	40.0	N 36° 08' 13″ E 127° 14' 37″	1993~present	1,084.20		P(TB)
223*	Okchun	75.0	N 36° 18′ 20″ E 127° 34′ 33″	1931~present	1,148.78		P(TB)
24**	Taejon	67.1	N 36° 22′ 00″ E 127° 44′ 00″	1969~present	1,309.23	1,086.9	P(TB)
27**	Poun	170.0	N 36° 29′ 00″ E 127° 44′ 00″	1971~present	1,172.15	1,096.4	P(TB)
29**	Kumsan	170.7	N 36° 06' 00″ E 127° 28' 00″	1971~present	1,219.40		P(TB)

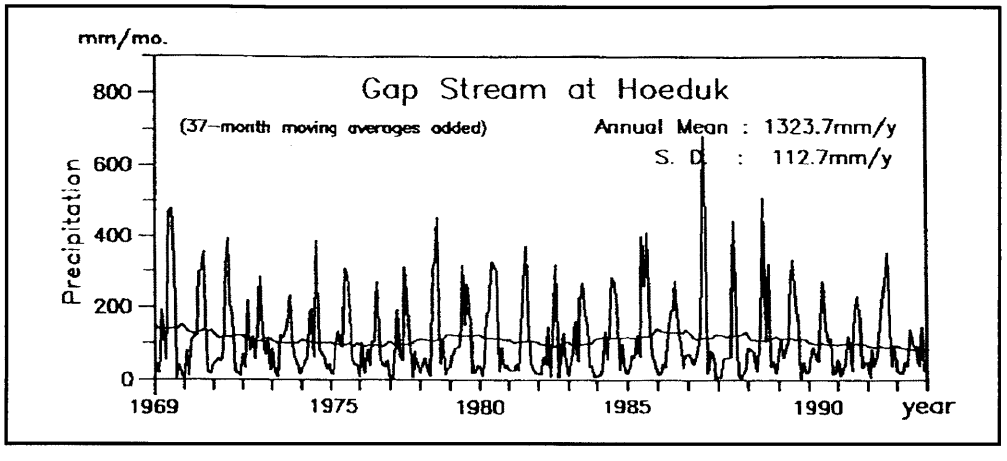
*: Serial number used by Ministry of Construction and transportation
**: Weather Office, Korean Meteorological Agency
P: Precipitation, TB: Tipping bucket with recording chart
1) Period for the mean is from the beginning of the observation period to 1992
2) Measured by 20cm pan

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]	Taejon	-4.85	-0.13	4.95	12.2	17.5	21.9	24.6	25.4	20.2	13.6	6.5	0.85	12.15	1970 ~1991
Precipitation [mm]	Taejon	32.3	42.3	62.2	92.8	92.4	158.5	304.1	262.3	148.9	53.7	47.3	32.2	1,329.0	1970 ~1991
Evaporation [mm]*	Taejon	35.1	43.6	79.9	120.3	148.9	139.5	127.9	134.2	103.2	82.2	47.3	36.2	1,098.0	1970 ~1991
Duration of sunshine [hr]	Taejon	153.6	149.2	197.3	219. 6	241.3	199.8	161.1	190.3	182.0	199.9	149.4	143.5	2,187.0	1970 ~ 1991

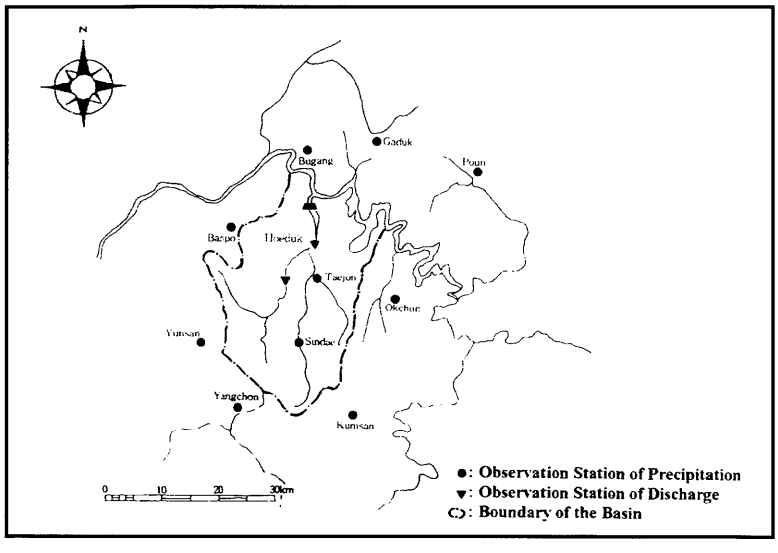
*measured by 20cm pan

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

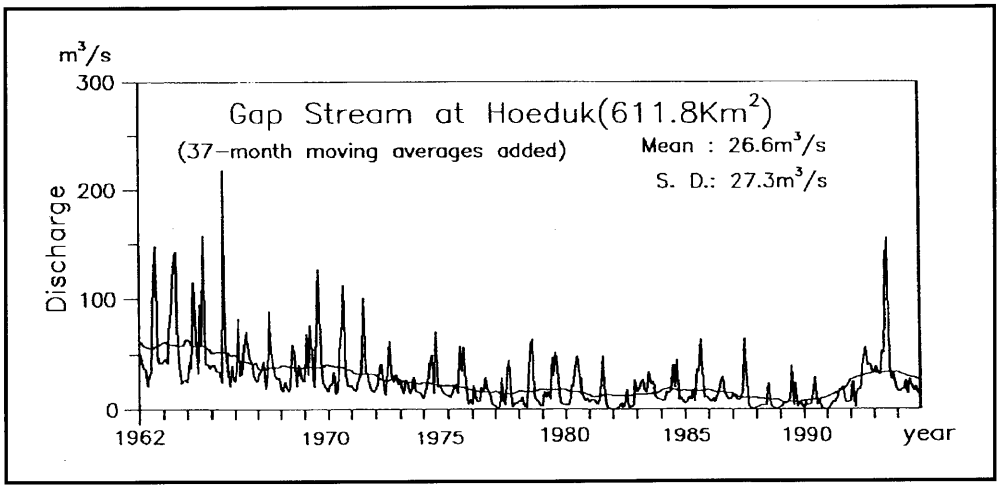
No.*	Station	Location	Catchment area(A) [km²]	Observation period	Observation items**
131*	Hoeduk	N 36° 22' 49″ E 127° 24' 53″	39.897	1917. 6 ~ present	H1, Q
157*	Yusung	N 36° 20' 58″ E 127° 21' 07″	46.508	1985. 3 ~ present	H1

No.	$\overline{Q}$ [1] [m³/s]	Q max [2] [m³/s]	$\overline{Q}$ max [3] [m³/s]	$\overline{Q}$ min [4] [m³/s]	$\overline{Q}$ / A [m³/s/100km²]	Q max / A [m³/s/ 100km²]	Period of statistics
131*	3.74	1,071.57	416.3	0.62	0.61	1.752	1975~1994

*: Serial number used by Ministry of Construction
**: H1: water level in recording chart
Q: discharge

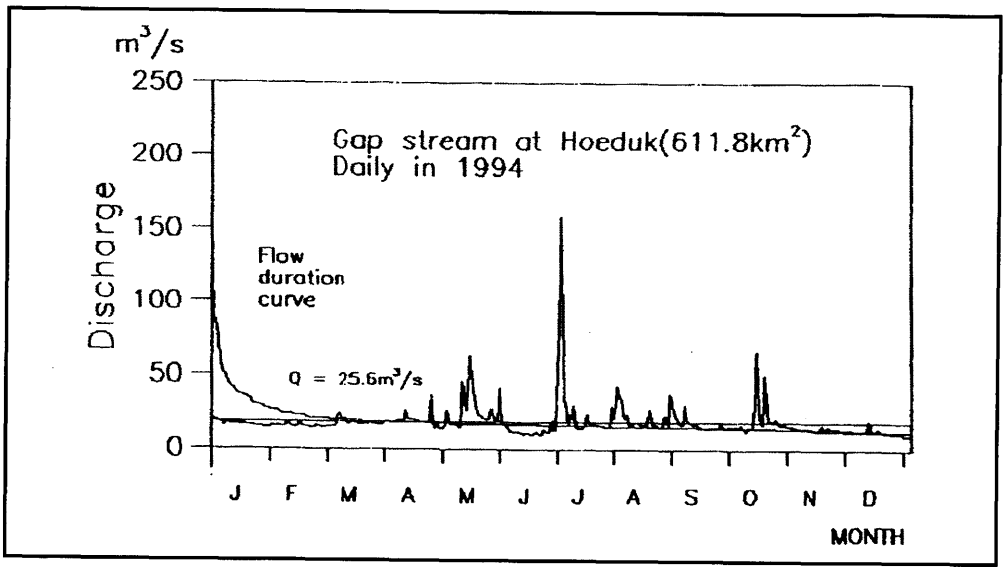
1) Mean annual discharge
2) Maximum discharge
3) Mean annual maximum discharge
4) Mean annual minimum discharge

4.3 Long-term Variation of Monthly Discharge

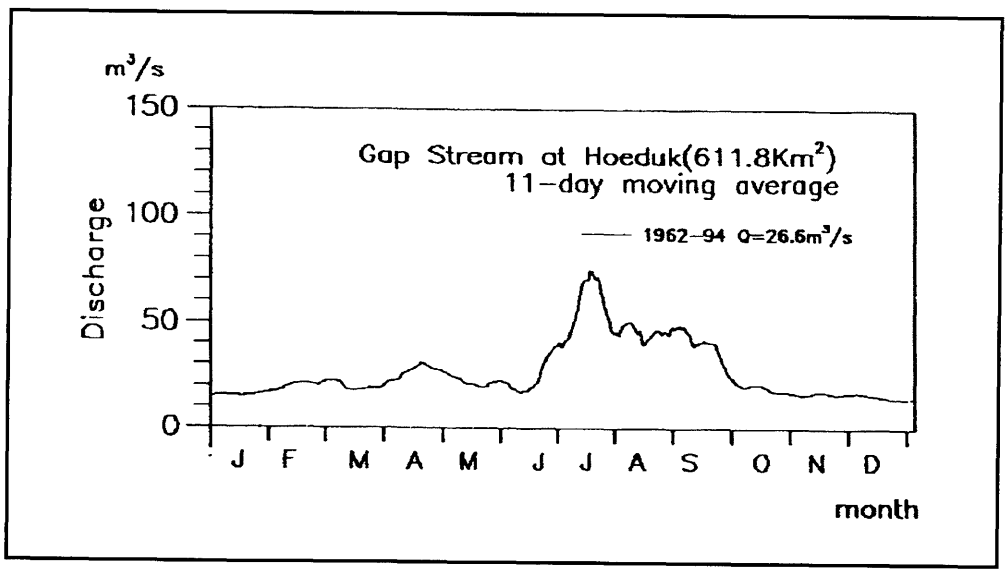


Note that upstream water supply has been increased since 1962

4.4 Annual Pattern of Discharge



4.5 Unique Hydrological Features



4.6 Annual Maximum and Minimum Discharges

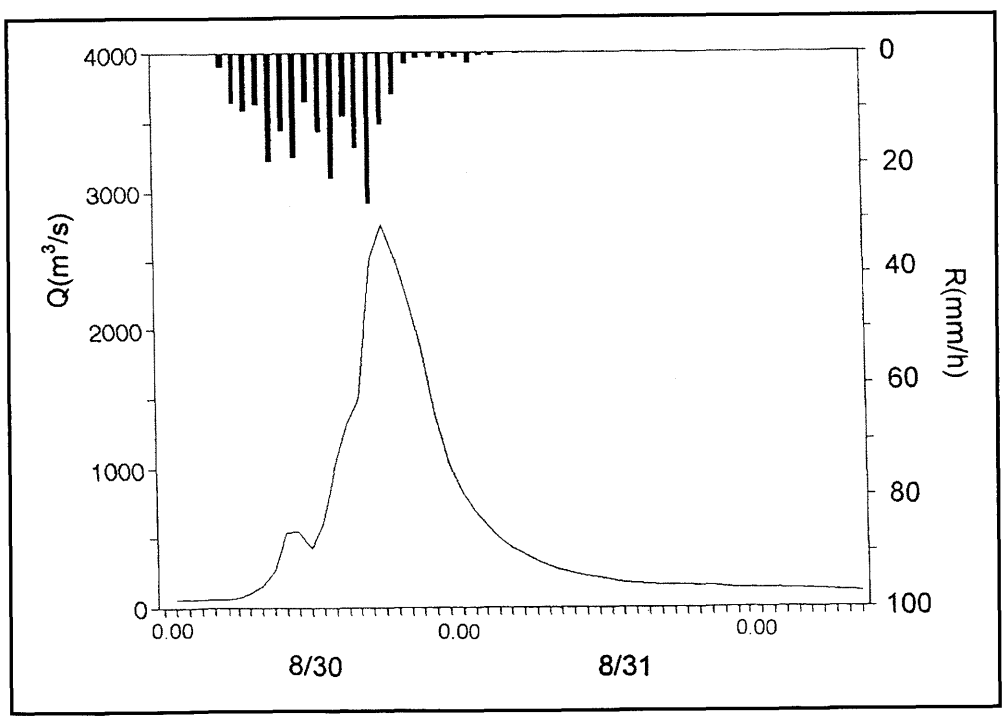
At Hoeduk (611.80 km^2)

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]
1970	8.24	382.6	5	0.62	**1983**	4.28	171.1	6	0.63
1971	7.26	521.4	3	0.60	**1984**	9.02	526.4	11	0.63
1972	8.20	248.0	6	0.63	**1985**	9.19	421.7	2	0.00
1973	8.02	235.1	6	0.63	**1986**	8.13	264.7	4	0.63
1974	7.09	552.2	7	0.63	**1987**	7.22	974.7	10	0.60
1975	7.11	271.5	11	0.62	**1988**	7.14	282.0	1	0.60
1976	8.05	83.7	4	0.62	**1989**	7.16	421.7	12	0.54
1977	8.08	1,071.6	1	0.61	**1990**	7.16	222.6	11	0.62
1978	8.20	511.4	4	0.62	**1991**	9.06	114.3	1	0.62
1979	8.05	771.2	6	0.62	**1992**	7.17	145.8	3	0.62
1980	8.27	740.0	2	0.51	**1993**	8.02	417.2	12	0.64
1981	8.30	960.3	11	0.00	**1994**	7.02	173.8	6	0.64
1982	8.21	241.5	2 5	0.61					

1) , 2) Instantaneous observation by recording chart

4.7 Hyetographs and Hydrographs of Major Floods

At Hoeduk (646.6 km^2) August 1995



Based on the data of Ministry of Construction and transportation
Hyetographs of basin average rainfall

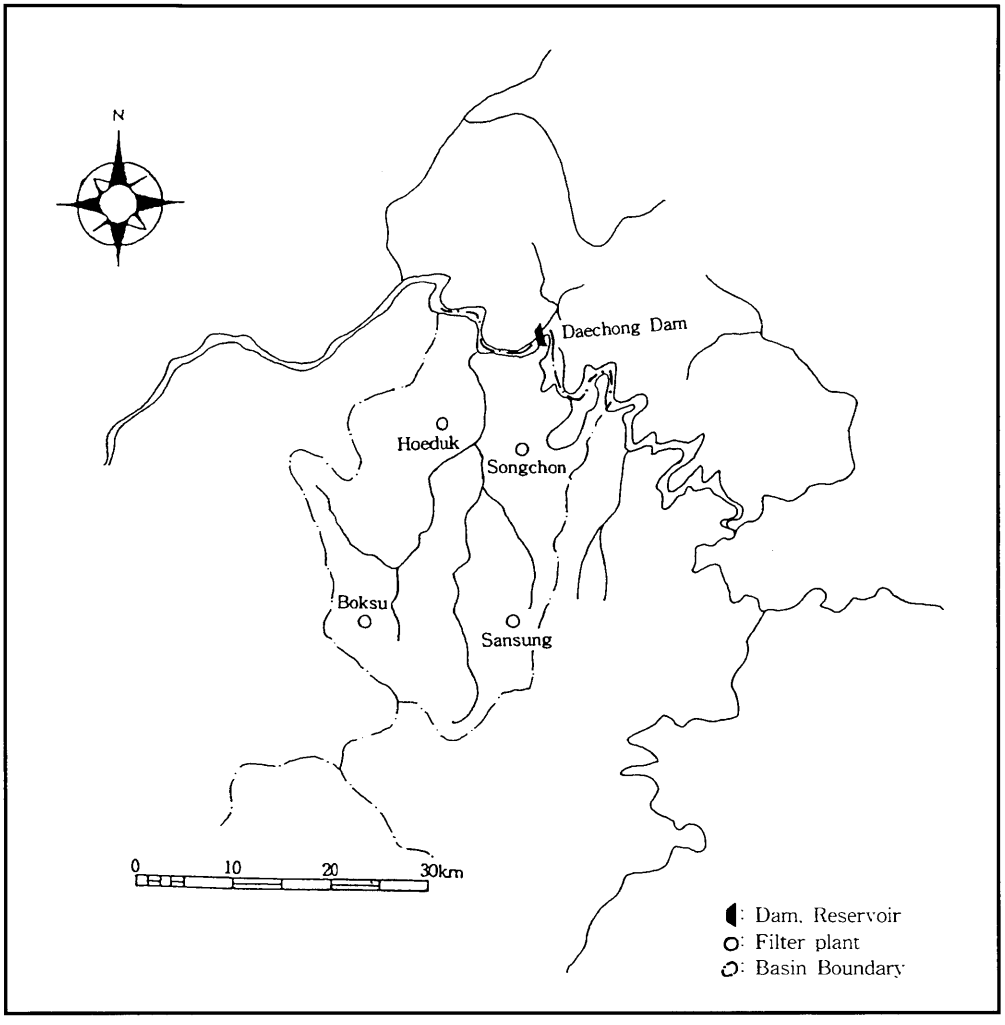
5. Water Resources

5.1 General Description

Gap-chun, a tributary of Geum River is a mountainous stream having 646.6 km^2 of watershed area. The agricultural and forest areas respectively occupy about 21% and 64% of the total watershed area. The runoff in the stream in the dry season is very little even though there are frequent floods in the rainy season. Therefore, the drinking and industrial water which is necessary for the cities in the watershed is supplied from Daechong reservoir to which water flows through watershed transfer. However, the agricultural water is supplied from Gap stream and several small reservoirs which are owned by the Association for Improvement of Farmland.

The demand for drinking water in Taejon city, which is the largest city in the watershed, is about 400,000 m^3/day and is supplied through 4 water treatment plants at Kongchon, Hoeduk, Boksu and Sansung. The water for the former two plants is supplied from Daechong reservoir, and that for the latter plants is supplied from Gap stream and Yudung stream in the watershed.

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 [m^2]	Gross capacity [10^6m^3]	Effective capacity [10^6m^3]	Purposes[1]	Year of completion
Geum	Daechong	4,134	1,490	760	F,A,I,W,P	1980

Major Inter-basin Transfer

Name of transfer line	Names of rivers and places connected		Length [km]	Maximum capacity [m^3/s]	Purpose[1]	Year of completion
	From	To				
Songchon - filter plant	Daechong Dam	Songchon filter plant	3.9	3.47	W	1987
Hoeduk - filter plant	Daechong Dam	Hoeduk filter plant	2.5	0.69	W	1970
Boksu filter plant	Gap Stream	Boksu filter plant	2.2	0.23	W	1973
Sansung - filter plant	Yudung Stream	Sansung filter plant	0.1	0.23	W	1962

1) A: Agricultural use, F: filter, P: plant, I: Industrial use , W: Municipal water supply,

5.4 Major Floods and Droughts

Major Floods at Hoeduk (Catchment area 646.6 km^2)

Date	Peak discharge [m^3/s]	Rainfall [mm] Duration	Meteorological cause	Dead and missing	Major damages (Districts affected)
1977. 8. 7	1,071. 57	194 8. 7 ~ 8	Storm	1 1	Daeduk
1987. 7.21	947.72	383 7.21~ 23	Storm	10 2	Daejon
1995. 8.30 9	17.847.44	174 8. 29 ~30	Storm	- -	Downstream of Gap stream

Major Droughts

Period	Affected areas	Major damages and counteractions
1981. 01 ~ 07	Daejon 21 block Daeduk 102 block	Supply cut ratio at the first stage: 10%

5.5 Groundwater and River Water Quality

River Water Quality[1] at Singu bridge[2], 1994

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pH	7.1	7.4	7.5	6.1	7.5	7.2	7.2	7.2	7.0	7.5	7.3	5.8
BOD [mg/l]	8.7	9.0	8.9	8.8	9.1	9.3	8.8	9.1	9.2	8.7	6.1	7.1
COD_{Mn} [mg/l]	12.6	13.8	13.7	10.1	10.2	15.1	10.0	10.9	10.7	8.8	8.7	11.2
SS [mg/l]	19.4	14.8	15.2	16.0	15.2	18.4	17.2	11.2	16.0	15. 6	14.4	18.4
Coliform Group [MPN/100ml][3]	7.0×10^3	5.0×10^2	3.4×10^2	7.0×10^2	9.0×10^2	1.1×10^3	2.3×10^3	2.1×10^3	1.2×10^3	9.0×10^2	1.4×10^3	1.1×10^3
Discharge [m^3/s][4]	0.64	0.63	0.64	0.66	0.67	0.62	0.67	0.64	0.64	0.66	0.63	0.62

1) Observed once a month on a dry day normally several days after rainfall.
2) Located near Chongju City 12km from the river mouth.
3) Measurement method: BGLB (brilliant green lactose bile) method.
4) Discharge on the observation date.

6. Socio-cultural Characteristics

The Gap Stream is located in the middle of the whole country and plays a very important role for the traffic in the main highways and railroads, namely, the Seoul-Busan highway, the Seoul-Taejon highway, the Seoul-Busan railroad and the Seoul-Kwangju railroad. Taejon, which is the capital city of the Chung Chong province is the centre of administrative, economic, social, and cultural activities in the middle part of the country. The city also hosted the Expo Activities in 1993, and has eight administration halls of administrative organizations in the country.

7. References, Databooks and Bibliography

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