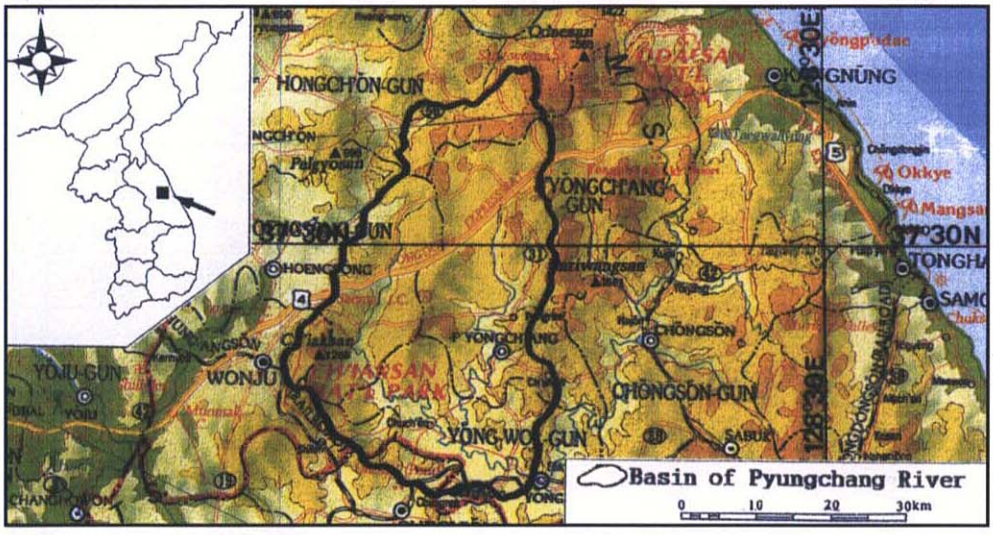
Pyungchang-gang

Map of River



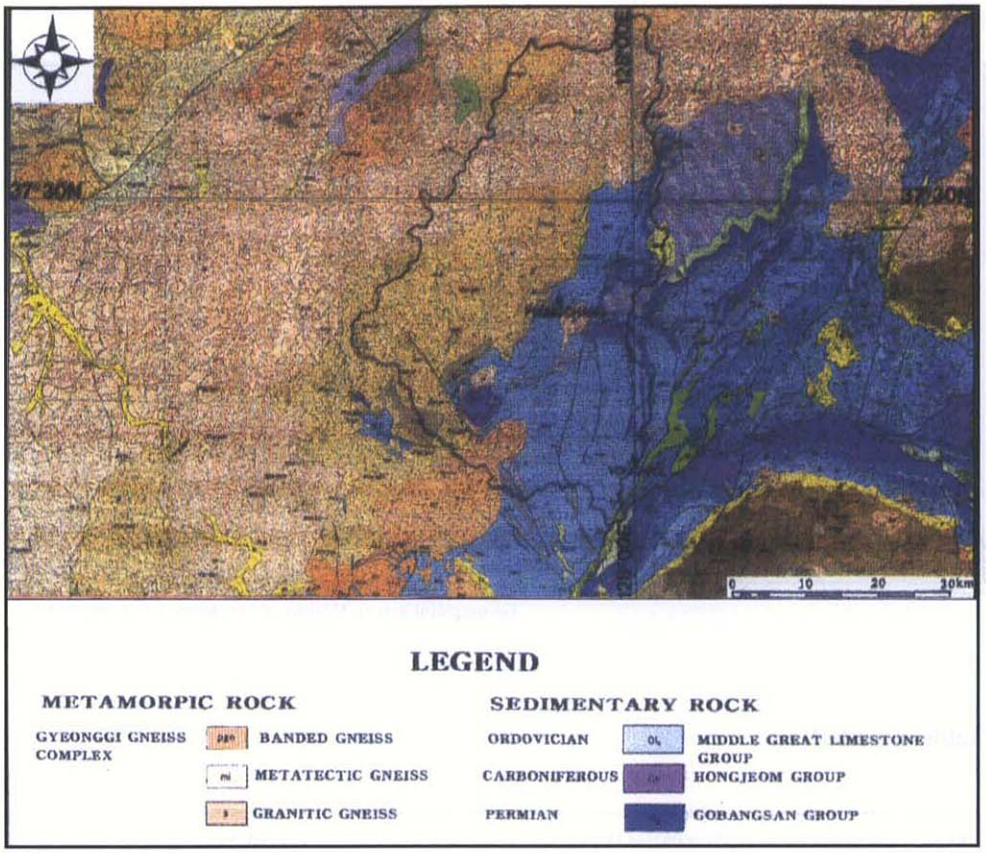
Geographical Survey, Ministry of Construction, Republic of Korea

Table of Basic Data

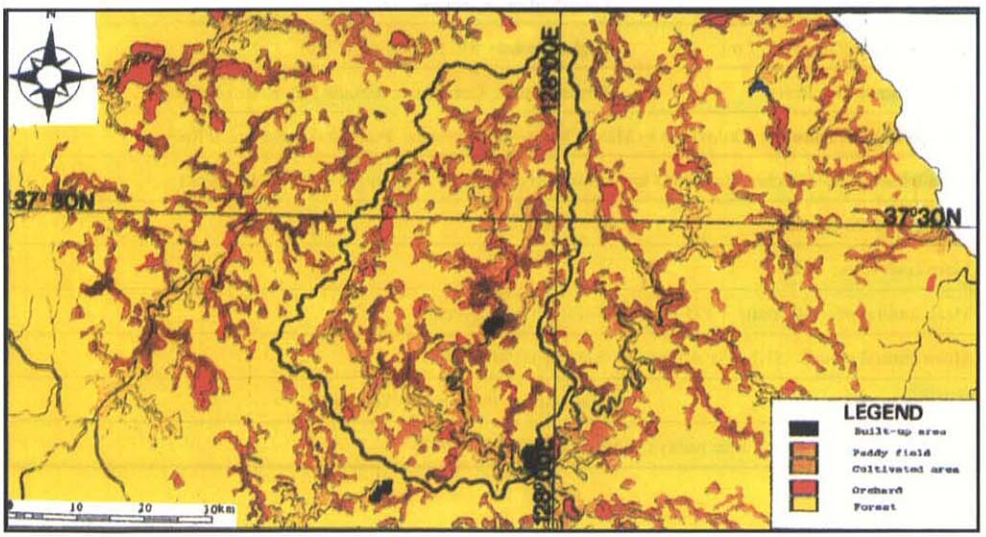
Name: Pyungchang River (Right branch of Han River)		**Serial No.:** Republic of Korea-1
Location: Kangwon Province, Korea	N 37° 06′ 34″ ~ 37° 43′ 55″	E 128° 02′ 17″ ~ 128° 31′ 30″
Area: 1 781 km^2	**Length of main stream:** 149 km	
Origin: Mt. Kebang (1 577 m)	**Highest point:** Mt. Kebang (1 577 m)	
Outlet: South Han River	**Lowest point:** Confluence at South Han River (175 m)	
Main geological features: Ordovician to Middle Mesozoic; Limestone, Precambrian Basement Rock		
Main tributaries: Chuchon River (613 km^2), Soksa River (120 km^2), Heungjeong River (146 km^2)		
Main lakes: None		
Main reservoirs: None		
Mean annual precipitation: 1 135 mm (1964~1992) (basin average)		
Mean annual runoff: 51.7 m^3/s at Hoopo (1 621 km^2) (1976~1985)		
Population: 72 500 (1991)	**Main cities:** Pyungchang, Yongwol	
Land use: Forest (81.7%), Rice paddy (12.8%), Other (5.5%) (1991)		

2. Geographical Information

2.1 Geological Map



2.2 Land Use Map



1. General Description

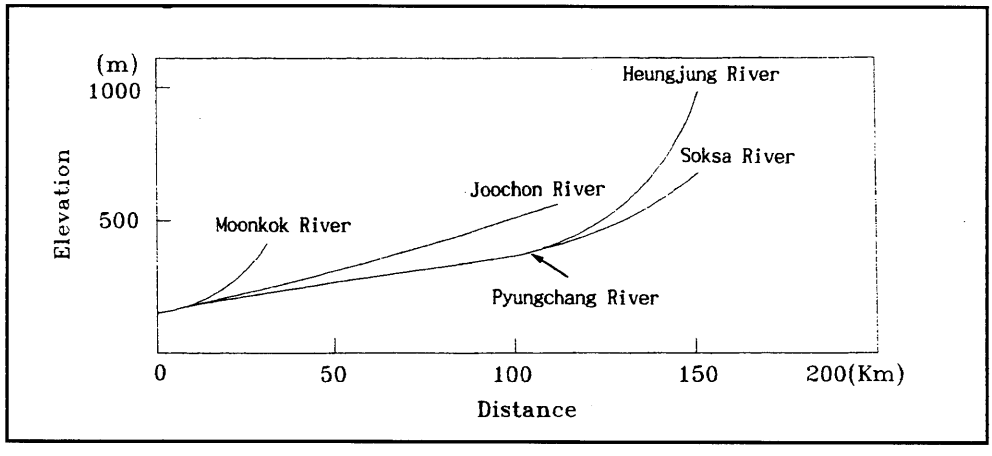
The Pyungchang is one of the major tributaries of the Han river flowing through the middle eastern part of the Korean peninsula. The Pyungchang river that has a length of 149 km and a catchment area of 1 781 km^2 originates from Mt. Kebang (1 577 m) and flows into the upper part of the South Han river which is its southern main stream. Two main tributaries, the Pyungchang river and the Chuchon river, flow from north to south through the basin. The catchment, in its northern part, has one of the International Hydrological Program research basins with an area of 528 km^2. The basin average annual precipitation during the period 1964~1992 has been 1 135 mm while the average annual discharge at Hoopo (1 621 km^2) has been 51.7 m^3/s (0.032 m^3/s/km^2) during the period 1976~1985. The population of the basin was 72 500 in 1991.

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 (1985)	Land use [%] (1991)
1	**Pyungchang** (Main River)	149 902	Mt. Kebang, 1 577 ----------	Pyungchang 10 900	A(5.5) F (81.7) P (12.8)
2	**Chuchon** (Tributary)	75 613	Mt. Daemi, 1 232 ----------		
3	**Soksa** (Tributary)	29 120	Mt. Jubang, 1 576 ----------		
4	**Heungjeong** (Tributary)	26 146	Mt. Heungjeong, 1 277 ----------		

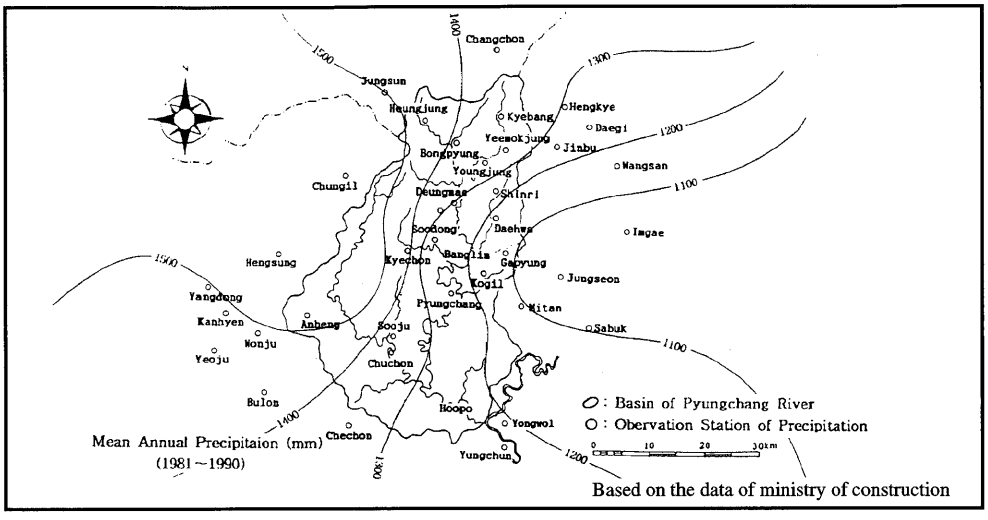
A: Other agricultural field F: Forest P: Paddy field

2.4 Longitudinal Profiles



3. Climatological Information

3.1 Annual Isohyetal Map and Precipitation Observation Stations



3.2 List of Meteorological Observation Stations

No.	Station	Elevation [m]	Location	Observation period	Mean annual precipitation[1] [mm]	Mean annual evaporation[2] [mm]	Observation items[3]
114**	Wonju	150	N 37° 20′ 00″ E 127° 57′ 00″	1973~present	1 287	1 123	P(TB) E, DS
221**	Chechon	220	N 37° 08′ 00″ E 128° 12′ 00″	1972~present	1 295	1 007	P(TB) E, DS
71*	Banglim	480	N 37° 25′ 25″ E 128° 23′ 50″	1964~present			P(TB)
72*	Kapyung	470	N 37° 26′ 40″ E 128° 29′ 05″	1915~present			P(TB)
73*	Daehwa	400	N 37° 29′ 40″ E 128° 27′ 40″	1964~present			P(TB)
76*	Deungmae	500	N 37° 32′ 55″ E 128° 23′ 55″	1982~present			P(TB)
77*	Heungjung	640	N 37° 38′ 50″ E 128° 19′ 45″	1982~present			P(TB)
79*	Kebang	700	N 37° 40′ 15″ E 128° 27′ 55″	1982~present			P(TB)

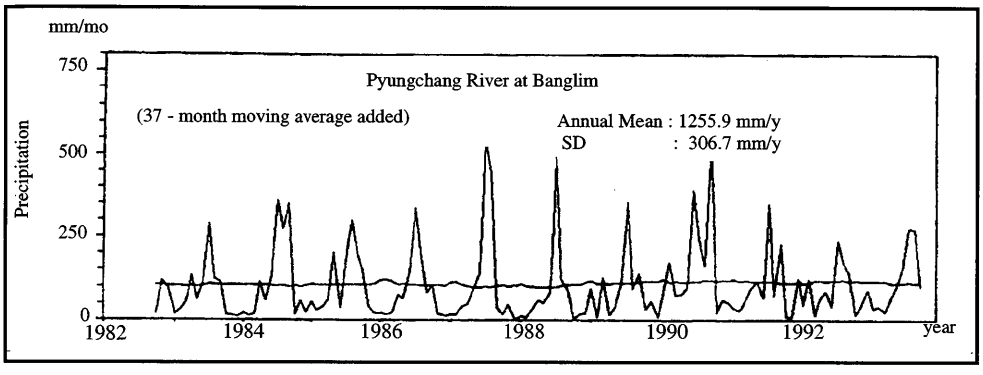
*: Serial number used by Ministry of Construction
**: Serial number used by Weather Office, Korea Meteorological Agency
1) Period for the mean is from the beginning of the observation period to 1992
2) Measured by 20 cm pan
3) P: Precipitation, E: Evaporation, DS: Duration of sunshine, TB: Tipping bucket with recording chart.

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]	Wonju	-5.5	-2.4	3.7	11.0	16.6	21.1	24.3	24.4	18.7	11.8	4.3	-2.5	10.5	1973~1990
Precipitation [mm]	Wonju	25.3	25.4	52.5	88.5	89.2	145.1	334.4	261.6	149.0	44.9	43.5	27.6	1 287.0	1973~1990
Evaporation [mm]*	Wonju	36.1	45.8	82.5	124.8	155.8	149.5	130.7	131.6	102.7	80.7	48.2	34.7	1 123.1	1973~1990
Solar radiation [MJ/m^2/d]	Wonju	6.9	8.8	11.3	13.9	16.0	15.4	13.3	13.8	12.4	10.4	6.9	6.1	11.3	1973~1990
Duration of sunshine [hr]	Wonju	196	195	235	255	280	262	224	236	222	220	175	178	2 679	1973~1990

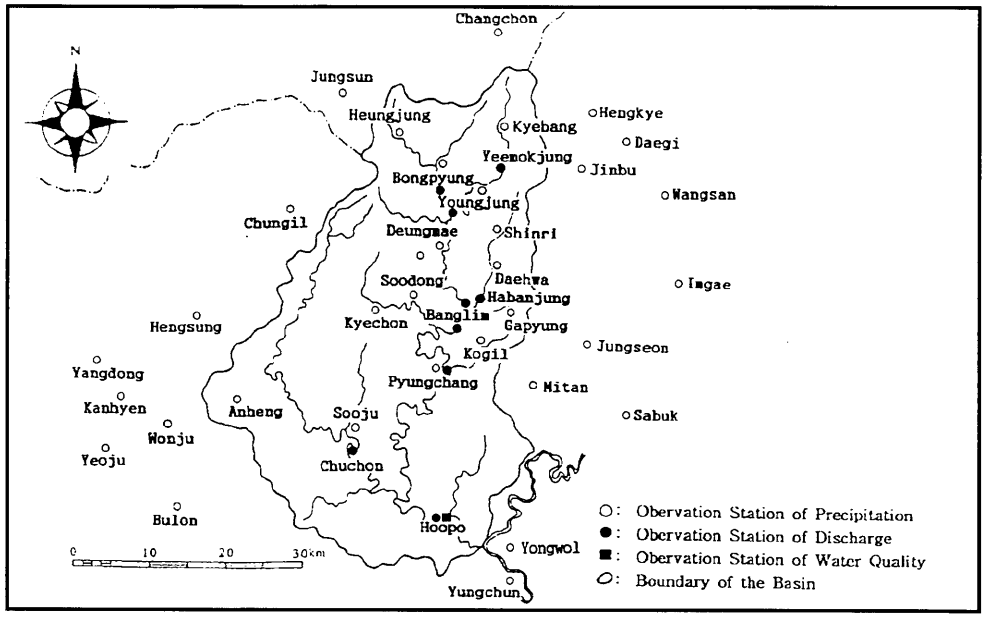
* measured by 20 cm pan

3.4 Long-term Variation of Monthly Precipitation



4. Hydrological Information

4.1 Map of Streamflow Observation Stations



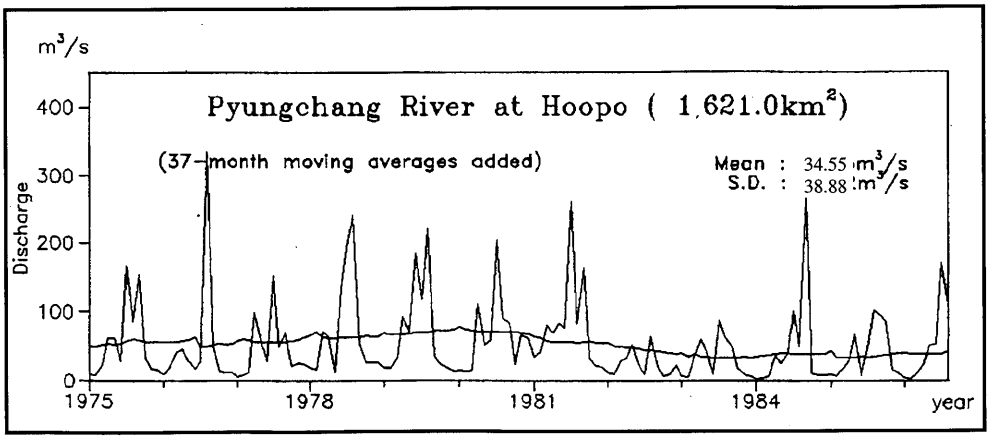
4.2 List of Hydrological Observation Stations

No.*	Station	Location	Catchment area (A) [km^2]	Observation period	Observation items [1]
37*	Banglim	N 37° 25′ 40″ E 128° 25′ 10″	520	1982~present	H1
38*	Habanjung	N 37° 21′ 10″ E 128° 26′ 30″	84	1982~ present	H1
39*	Sanganmi	N 37° 28′ 15″ E 128° 24′ 45″	369	1982~ present	H1
40*	Baekokpo	N 37° 34′ 55″ E 128° 24′ 35″	142	1982~ present	H1
41*	Jangpyung	N 37° 35′ 00″ E 128° 24′ 55″	104	1982~ present	H1
16*	Hoopo	N 37° 11′ 37″ E 128° 24′ 20″	1 621	1962~ 1986	H2

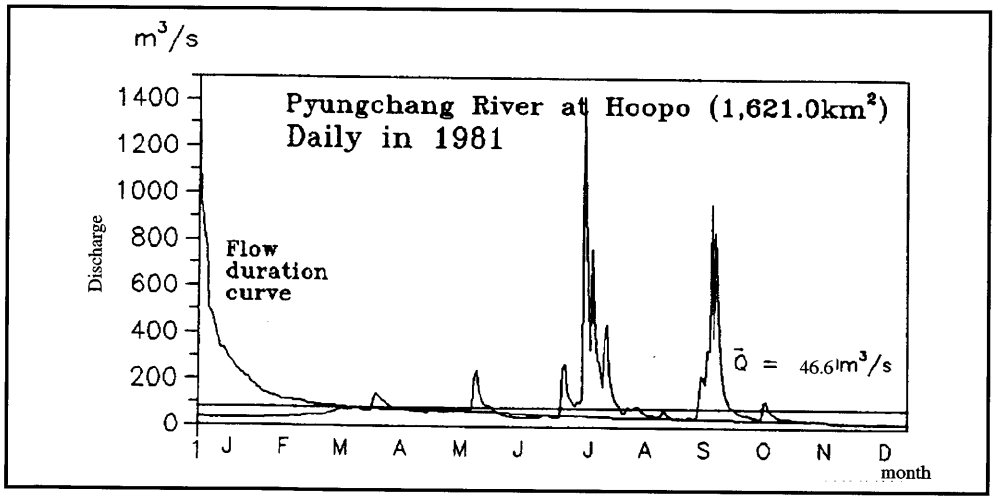
No.*	$\overline{Q}$ [2] [m^3/s]	Q max [3] [m^3/s]	$\overline{Q}$ max [4] [m^3/s]	$\overline{Q}$ min [5] [m^3/s]	$\overline{Q}$ / A [m^3/s/100km^2]	Q max / A [m^3/s/100km^2]	Period of statistics
37*	16.8	2 643	823	0.9	3.2	509	1982~1993
38*	4.2	626	203	0.0	5.0	745	1982~1993
39*	12.8	1 383	480	0.8	3.5	375	1982~1993
40*	7.0	848	264	0.3	4.9	596	1982~1993
41*	5.1	882	262	1.0	4.9	848	1982~1993
16*	51.7	3 924	1 607	6.3	3.2	242	1976~1985

*: Serial number used by Ministry of Construction
1) H1: Water level in recording chart
H2: Water level by manual reading
2) Mean annual discharge
3) Maximum discharge
4) Mean annual maximum discharge
5) Mean annual minimum discharge

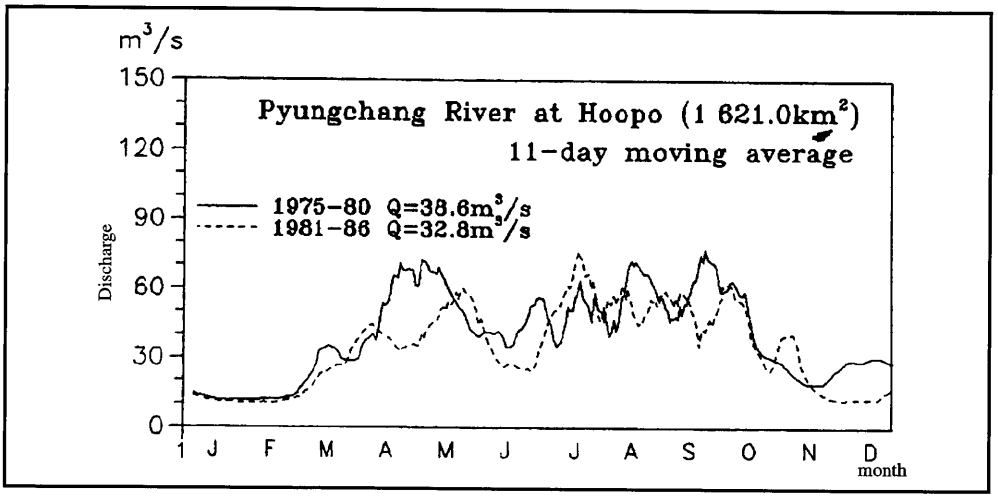
4.3 Long-term Variation of Monthly Discharge



4.4 Annual Pattern of Discharge



4.5 Unique Hydrological Features



Since 1981, municipal water supply (53 000m³/day) have been provided to the Chechon City which is not in the basin.

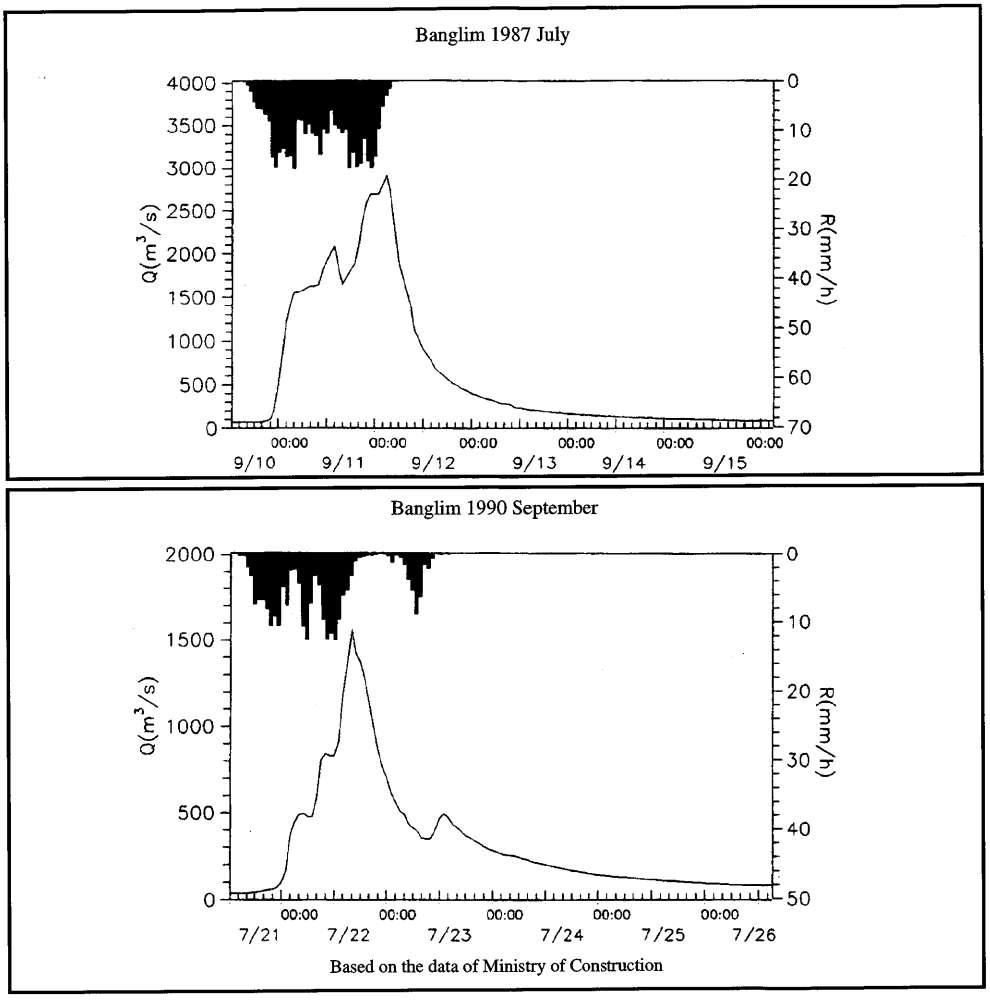
4.6 Annual Maximum and Minimum Discharges

At Hoopo [1 621 km²]

Year	Maximum [1]		Minimum [2]		Year	Maximum [1]		Minimum [2]	
	Date	[m³/s]	Month	[m³/s]		Date	[m³/s]	Month	[m³/s]
1975	9.16	1 726	2	6.7	**1981**	7.02	1 420	12	16.3
1976	8.14	3 641	2	7.2	**1982**	5.14	305	7	4.2
1977	7.13	552	1	4.2	**1983**	4.29	386	12	4.2
1978	8.21	799	5	6.7	**1984**	9.02	3 924	1	2.6
1979	8.05	3 503	12	11.0	**1985**	10.13	790	2	2.6
1980	7.22	1 153	2	8.4	**1986**	7.19	103	1	1.9

1), 2) : Instantaneous observation by recording chart.

4.7 Hyetographs and Hydrographs of Major Floods



Based on the data of Ministry of Construction

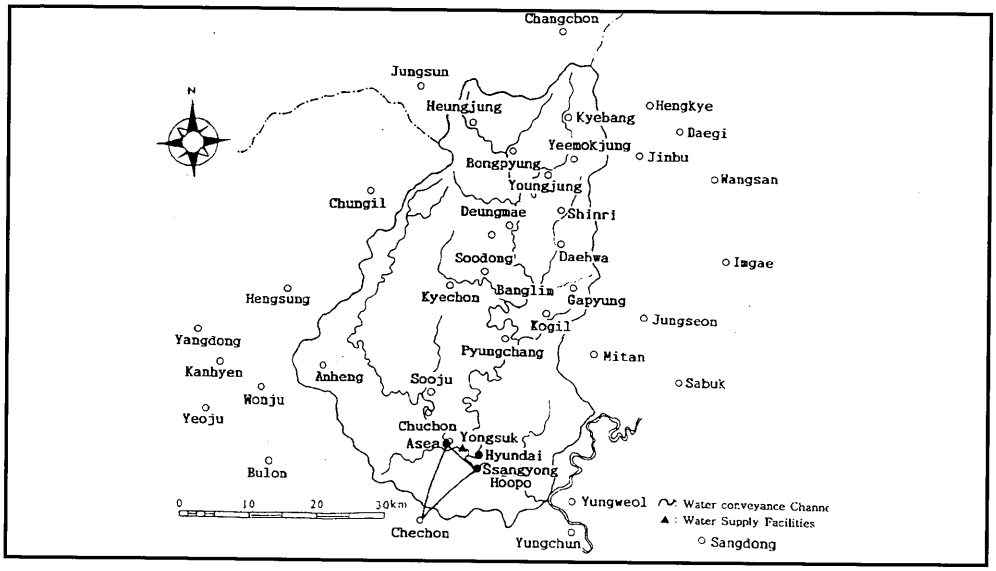
5. Water Resources

5.1 General Description

The Pyungchang occupies about 26.8% of the basin of the Choongju dam, which is one of the major multi-purpose dams in Korea. The basin is composed of complex geological formations, and the groundwater zone seems to be well developed in limestone layers. Except for some narrow flat areas between valleys, most of the basin consists of mountainous areas covered by shallow well-drained soil layers. The upstream area of the basin has more precipitation than the downstream area.

During the 12 years period from 1975~1986, major floods with discharges in excess of 1 000 m^3/s at Hoopo (1 621 km^2) have occurred 7 times. The maximum flood flow observed at Hoopo has been 3 924 m^3/s in 1984. The Yongsuk water supply facility with a capacity of 32 000 m^3/day was built in 1981 and diversion of water is made to the Chechon city, which is 4 km away from the southern boundary of the basin. The Jangkok facility with a capacity of 53 000 m^3/day, which is another water system planned for the Chechon city is expected to be completed in 1995.

5.2 Map of Water Resources Systems



5.3 List of Major Water Resources Facilities

Major Reservoirs

There are no major reservoirs in the basin. However, there are 23 small reservoirs for agricultural use, with a total catchment area of 3.4 km^2.

Major Interbasin 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				
Chuchon-Chechon Conveyance pipe	Pyungchang River	Chechon City	10.5	0.37	W	1982
Jangkok-Chechon Conveyance pipe	Pyungchang River	Chechon City	10.3	0.61	W	1995[2]

1) W: Municipal water supply
2) *: Under construction

5.4 Major Floods and Droughts

Major Floods at Hoopo [1 621 km^2]

Date	Peak discharge [m^3/s]	Rainfall [mm] Duration	Meteorological cause	Dead and missing	Major damages (Districts affected)
1984. 9.02	3 995	309 8.31~9.02	Typhoon	7	Pyungchang
1987. 7.22	4 577	331 7.20~7.22	Typhoon	2	Pyungchang, Yongwol
1988. 7.14	1 516	196 7.13~7.14	Typhoon	2	Pyungchang, Yongwol
1990. 9.11	9 275	465 9.10~9.11	Typhoon	4	Pyungchang, Yongwol

Major Droughts

Period	Affected areas	Major damages and counteractions
1982.8~10	Chechon City	Water supply cut ratio at the first stage: 5%
1994.7~9	Chechon City	Water supply cut ratio at the first stage: 5%

5.5 Groundwater and Water Quality

River Water Quality [1] at Pyungchang[2] in 1993

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pH	7.7	8.0	8.0	7.2	7.9	7.6	8.5	7.4	7.9	8.1	7.7	8.2
BOD [mg/l]	0.8	0.8	0.8	0.6	0.7	0.7	0.7	0.7	0.8	0.7	0.6	0.7
COD_{Mn} [mg/l]	1.5	1.6	1.8	1.8	1.6	1.7	1.9	1.8	1.8	1.9	1.7	1.5
SS [mg/l]	1.6	1.4	1.2	1.4	1.8	2.2	2.6	2.4	2.0	1.6	1.4	1.0
Coliform group[3] [MPN/100ml]	2.7 x 10^2	2.6 x 10^2	2.2 x 10^2	2.1 x 10^2	2.2 x 10^2	2.1 x 10^2	1.7 x 10^2	2.2 x 10^2	1.7 x 10^2	1.4 x 10^2	1.7 x 10^2	1.2 x 10^2
Discharge[4] [m^3/s]	31.3	29.5	52.5	56.3	63.9	41.6	64.9	92.5	68.7	48.9	45.8	45.1

1) Observed once a month on a dry normally several days after rainfall.
2) Location near Yongwol City 14 km from the river mouth.
3) Measurement method: BGLB (brilliant green lactose bile) method.
4) Discharge on the water quality observation date.

6. Socio-cultural Characteristics

Yongwol is the largest town in this area. The Yungdong expressway between Seoul and Kangneung, an eastern coastal city, runs along the northern part of the Pyungchang basin. The Chiaksan National Park is located in the western part of the basin. This basin is adjacent to the Choongju dam which is one of the largest dams in Korea. Many tourist attractions such as the Koshi cave, the Paengyong cave, and the Changneung royal tomb are also close to the basin area.

7. References, Databooks and Bibliography

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