

Tonle Sap

Map of River

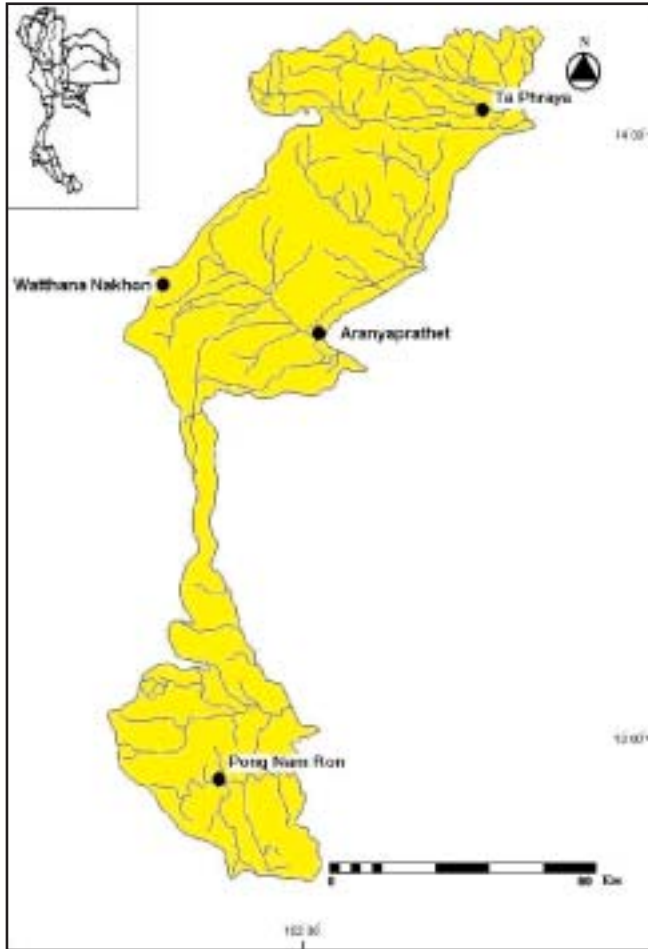


Table of Basic Data

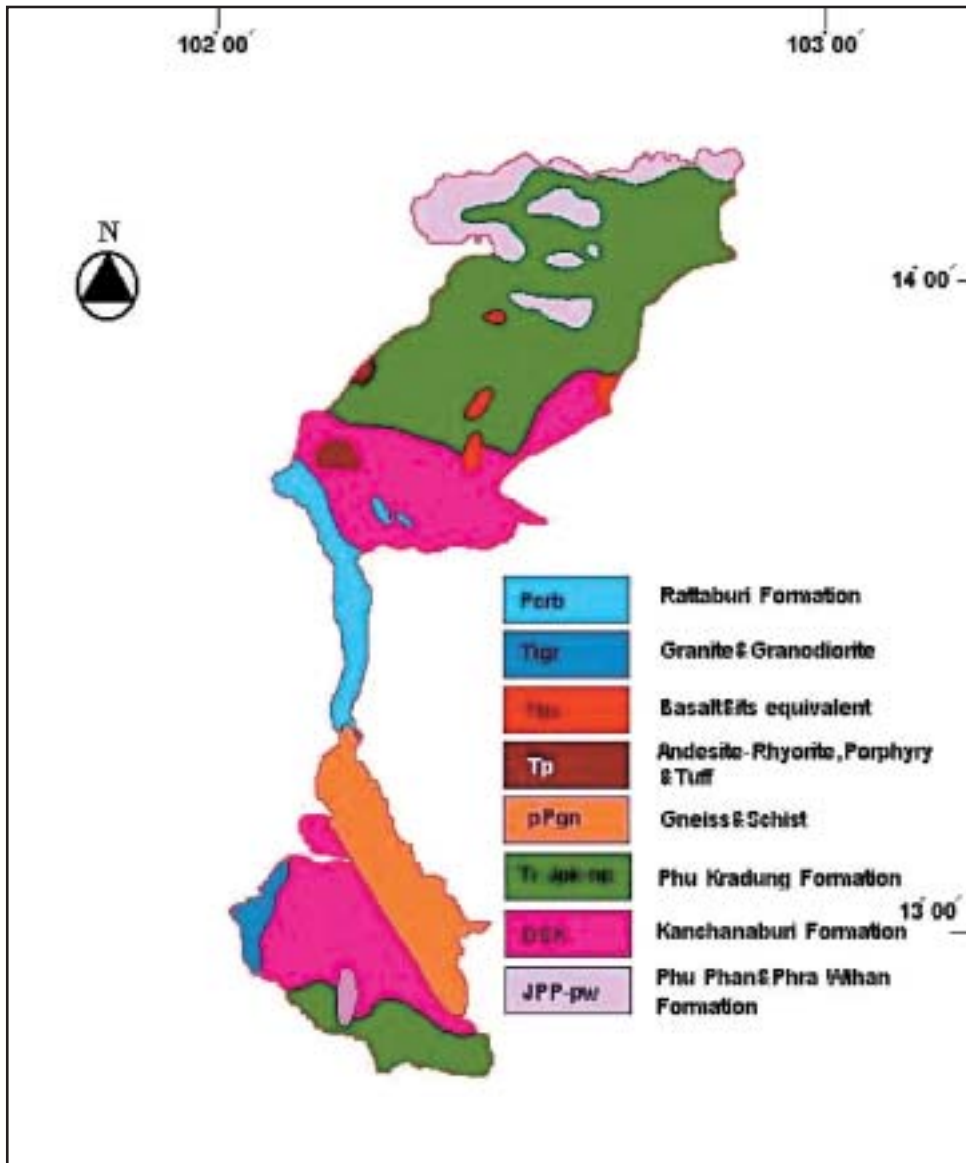
Name: Tonle Sap		Serial No : Thailand-8
Location: Eastern part of Thailand	N 12° 45' 03" - 13° 42' 43" E 102° 10' 13" - 102° 37' 40"	
Area: 4,142 km ²	Length of main stream: 187 km	
Origin: Upper - Mt. Bantud Phrom Hot - Mt. Tungpauy Lower - Mt. South Soidao	Highest point: Upper - 616 m Phrom Hot - 295 m Lower - 1,640 m	
Outlet: Upper - Huai Ta Khen Phrom Hot - Khlong Nam Sai Lower - flow to Kampuchai	Lowest point: Upper - 24 m Phrom Hot - 40 m Lower - 37 m	
Main geological formations: Phu Phan and Phra Wihan Formation, Kanchanaburi Formation, Phu Kradung Formation, Ratburi Formation, Gneiss and Schist, Granite and Granodiorite, Andesite-Rhyorite, Porphyry and Tuff, Basalt and its equivalents		
Major tributaries: Upper (1,626 km ²), Huai Phrom Hot (936 km ²), Lower (1,580 km ²)		
Major reservoirs: Huai Yang Reservoir (60 x 10 ⁶ m ³ , 1993)		
Mean annual precipitation: 1,387 mm. (1966-1997) at station 03170101 A. Aranyaprathet, Sakaeo		
Mean annual runoff: 5.30 m ³ /s (1964-1988) at station 01170201 A. Aranyaprathet, Sakaeo		
Population: 480,809 (1998)	Major cities: Sakaeo and A. Pong Nam Ron, Chanthaburi	
Land uses: Forest 32.4% Agriculture and urban Areas 67.6% Water resources 0.3% (1998)		

1 General Description

The basin of the Tonle Sap contains 8 separate rivers. The basin can be divided into 3 sub-basins, i.e., the Upper Tonle Sap, the Huai Phromhot, and the Lower Tonle Sap basins. All sub-basins are approximately rectangular in shape (compactness coefficient > 1). The drainage capacity of the basin is relatively low (drainage density < 1). There exist numerous streams within the basin. The important streams are the Lam Saton, the Huai Takean, the Huai Phromhot, the Khlong Pongnamron, the Khlong Dan, the Khlong Phraphut, the Huai Nangam, and the Khlong Namsai. The majority of the basin area is used for agriculture and is a major agricultural production area of the eastern sub-region.

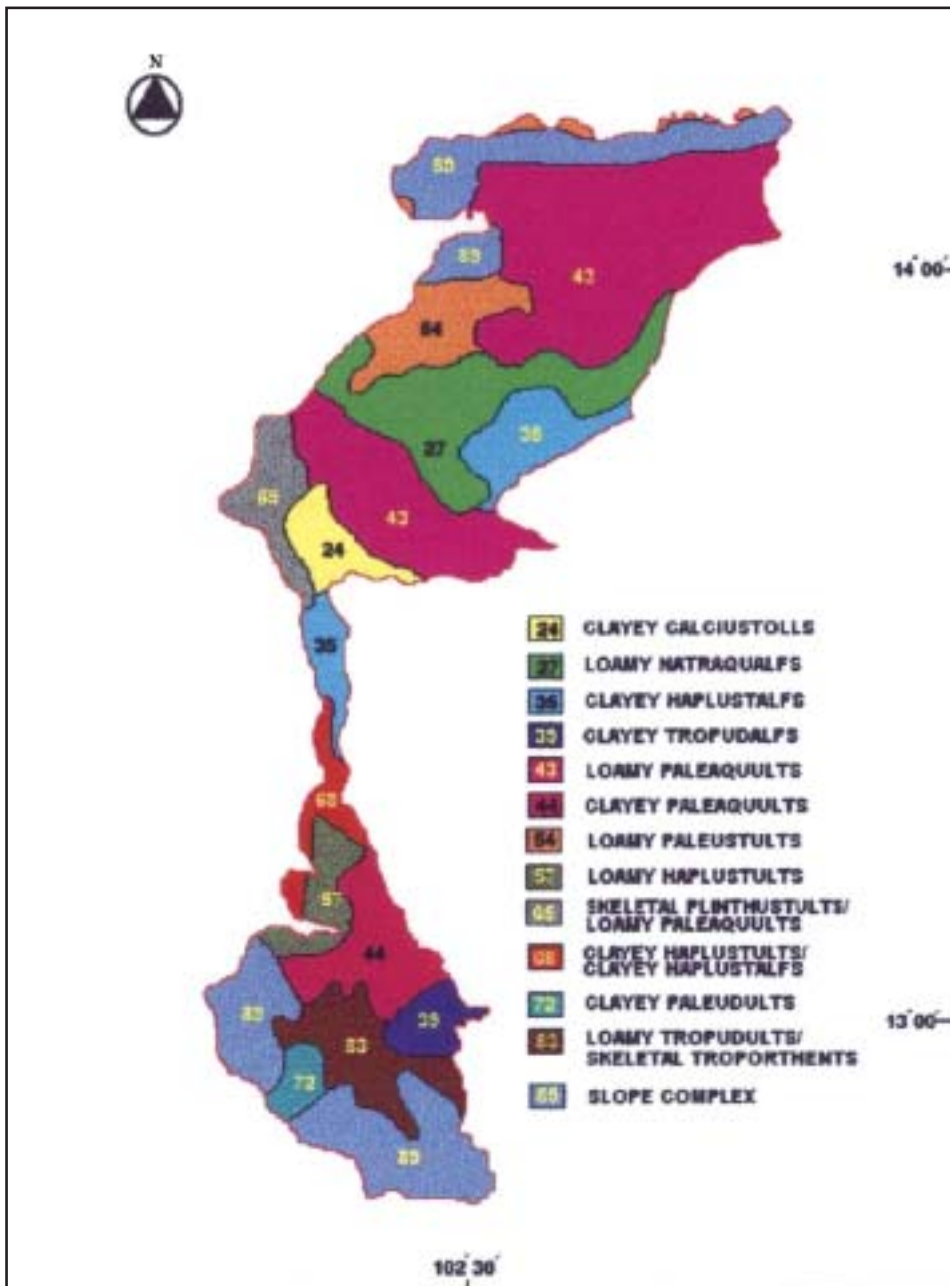
2 Geographical Information

2.1 Geological Map



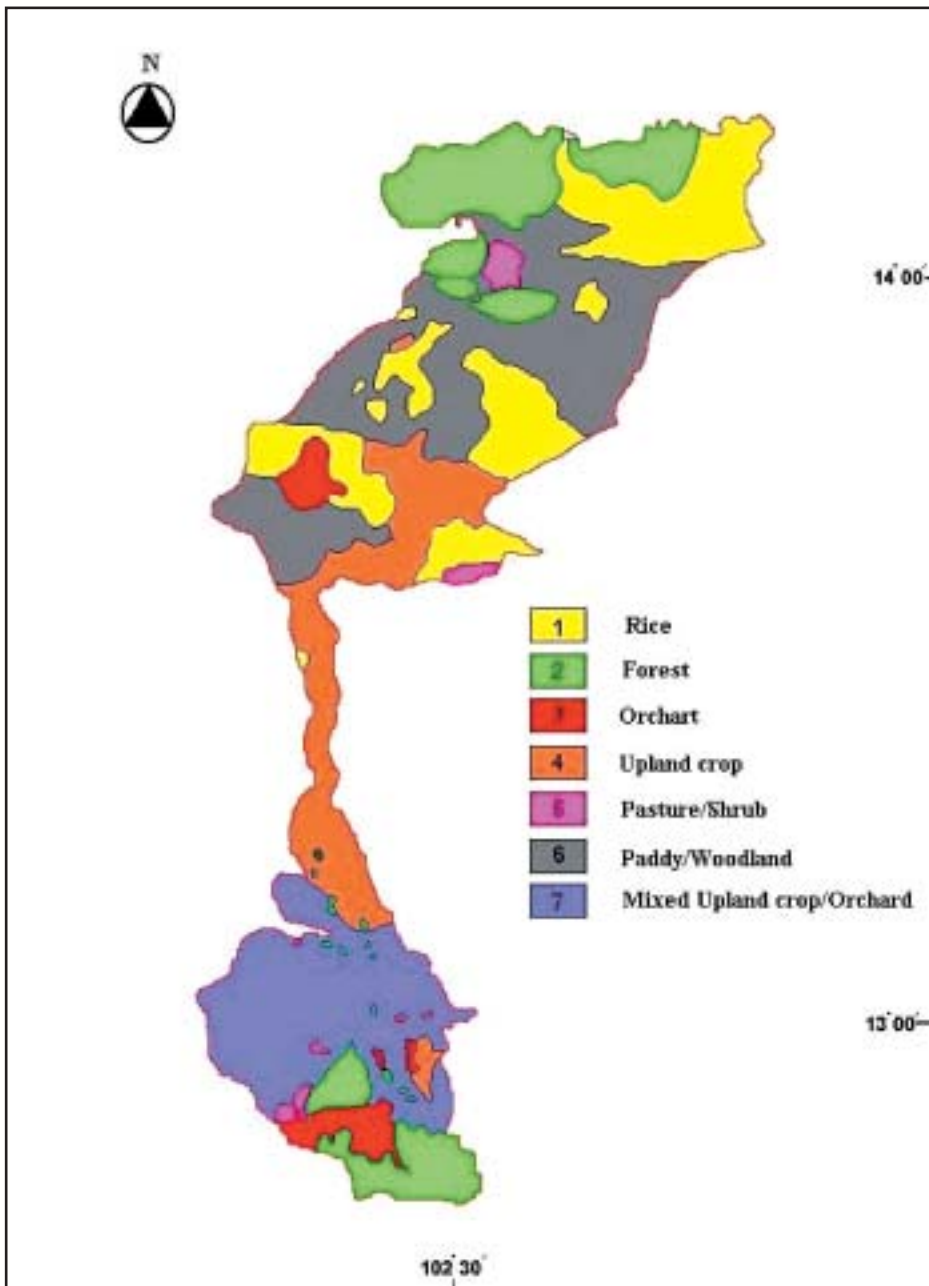
Source: Geological Map of Thailand, Jumchet C. and Javanaphet, 1969, Department of Mineral Resources

Soil Map



Source: Eastern Sub-region Land Use Map, 1998, Land Use Planning Div., Department of Land Development

2.2 Land Use Map



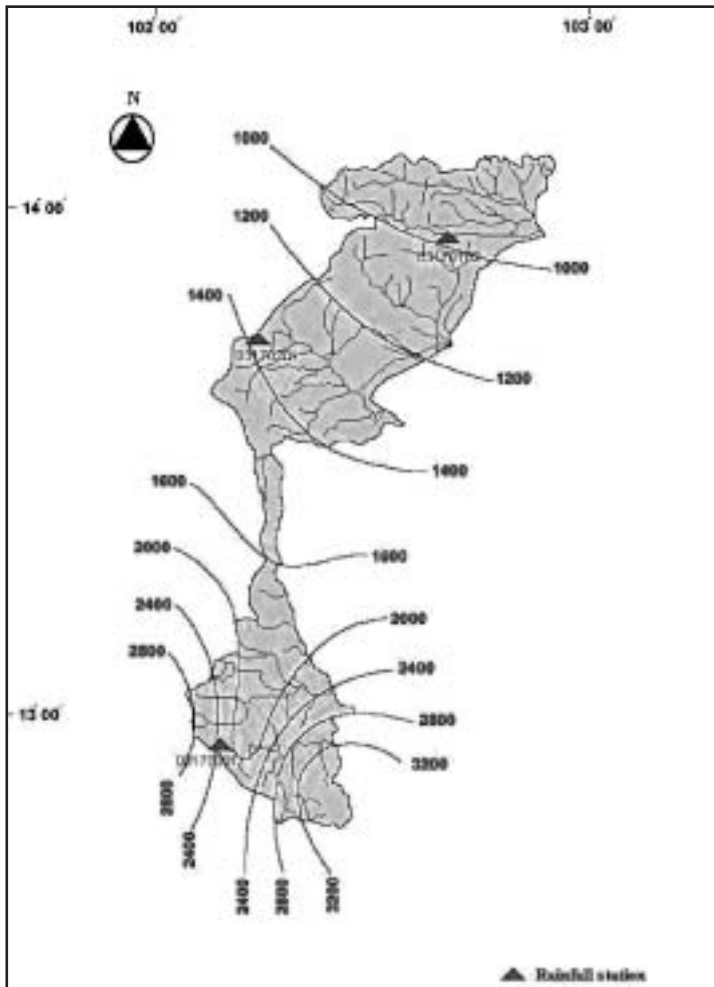
Source: Eastern Sub-region Land Use Map, 1998, Land Use Planning Div., Department of Land Development

2.3 Characteristics of the River and Major Tributaries

No.	Name	Length [km] Catchment Area [km]	Highest Peak Elevation [m]	Major cities
1	Upper Tonle Sap	63 1,625	Mt. Buntud 616	A. Ta Phraya, A. Watthana Nakhon, A. Mueang, Sakaeo
2	Huai Phrom Hot	71 936	Mt. Tungpauy 295	A. Aranyaprathet, A. Watthana Nakhon, Sakaeo
3	Lower Tonle Sap	53 1,580	Mt. South Soidao 1 640	A. Pong Nam Ron, Chanthaburi

3. Climatological Information

3.1 Annual Isohyetal Map



Source: Isohyetal Map of Thailand, 1966-1995, Meteorological Department

3.2 List of Meteorological Observation Stations

Code	Station	Equipment	Location	Duration	Annual average [mm]	Items
03170101	A. Aranyaprathet, Sakaeo	Standard	N 13° 42' 00" E 102° 35' 00"	1952 - 1997	1,386.8	Precipitation
03170105	Ban Ta Praya	Standard	N 13° 57' 00" E 102° 45' 00"	1965 - 1996	963.6	Precipitation
03170201	A. Watthananakhon, Sakaeo	Standard	N 13° 44' 06" E 102° 19' 08"	1952 - 1996	1,474.8	Precipitation
03170202	Khlong Nam Sai	Standard	N 13° 37' 53" E 102° 26' 21"	1964 - 1996	1,338.3	Precipitation
03170204	Ban Soi Dao	Standard	N 13° 35' 44" E 102° 18' 24"	1993 - 1996	2,855.6	Precipitation
03170301	A. Pong Nam Ron, Chanthaburi	Standard	N 12° 54' 20" E 102° 16' 03"	1956 - 1996	1,942.0	Precipitation

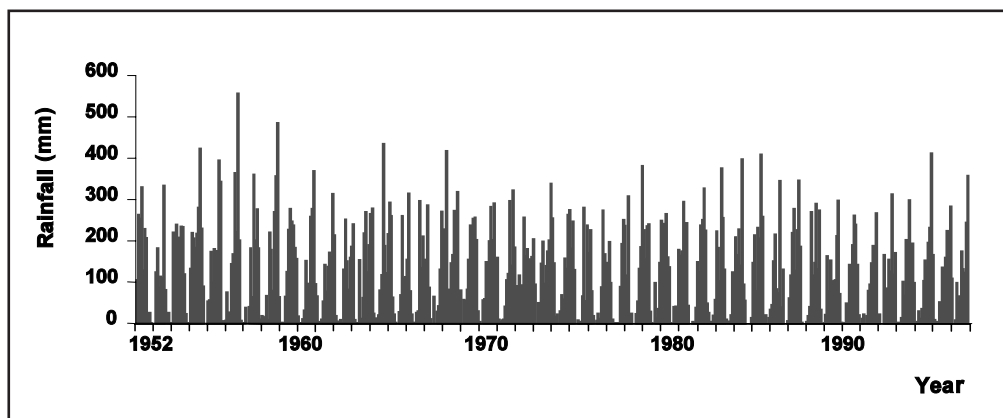
3.3 Monthly Climate Data

Station: A. Arayapathet, Sakaeo (03170101)

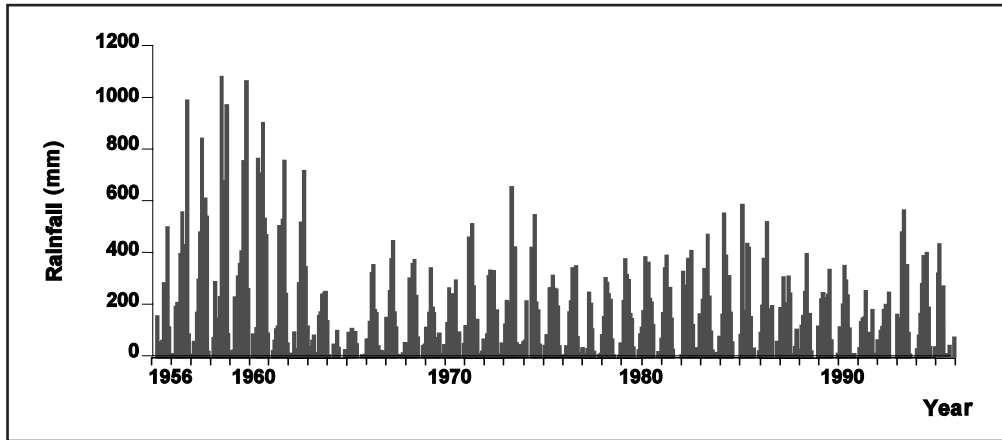
Observations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Mean	Period
Temperature [°C]	25.6	27.8	29.3	29.8	28.9	28.3	27.6	27.4	27.3	27.1	26.2	24.9	-	27.6	1966 - 1997
Precipitation [mm]	9.1	22.3	51.0	87.2	172.0	168.9	184.0	205.9	267.3	167.2	45.3	6.7	1,386.8	115.6	1966 - 1997
Evaporation [mm]	145.5	148.9	191.4	189.1	166.7	148.6	145.3	141.7	127.0	126.8	129.1	135.0	1,795.3	149.6	1966 - 1997

3.4 Long-term Variation of Monthly Precipitation

Station: A. Aranyaprathet, Sakaeo (03170101) (1952-1997)



Station: A. Pong Nam Ron, Chanthaburi (03170301) (1956-1996)



4. Hydrological Information

4.1 Map of Stream Flow Observation Stations



Source: Chantajitra, Y. et al., 1994, Location Map of Hydrologic and Meteorological Stations in Thailand, Office of National Research Council

4.2 List of Hydrological Observation Stations

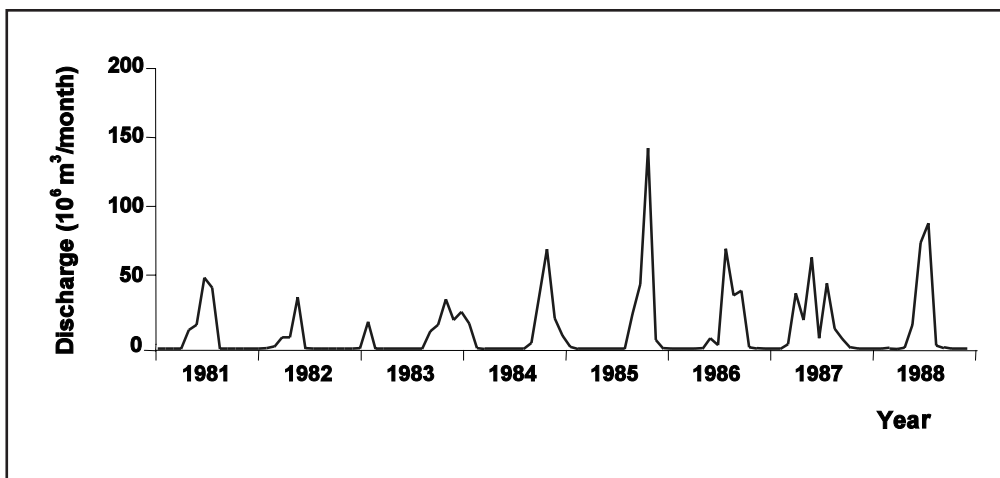
Station	Location	Catchment Area [km ²]	Observation Period	Average Flow [m ³ /s]	Items
01170201 A. Aranyaprathet, Sakaeo	N 13° 43' 12" E 102° 28' 06"	571	1964 - 1988	5.30	H5d, Q
04170301 A. Pong Nam Ron, Chanthaburi	N 12° 58' 00" E 102° 15' 02"	41.5	1979 - 1995	18.90	H5d, Q
04170302 A. Pong Nam Ron, Chanthaburi	N 12° 54' 07" E 102° 22' 05"	230	1979 - 1995	114.00	H5d, Q
04170303 A. Pong Nam Ron, Chanthaburi	N 12° 54' 04" E 102° 24' 05"	91	1979 - 1995	44.30	H5d, Q
01170305 A. Pong Nam Ron, Chanthaburi	N 13° 01' 36" E 102° 16' 21"	42	1987 - 1995	0.79	H5d, Q

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
01170201	5.30	435	122	0.00	0.93	76.2	1964 - 1988
04170301	18.90	269	44.5	0.06	45.5	648	1979 - 1995
04170302	114.00	196	227	0.16	49.6	300	1979 - 1994
04170303	44.30	258	114	0.18	48.7	284	1979 - 1994
01170305	0.79	118	48.2	0.01	1.88	281	1988 - 1995

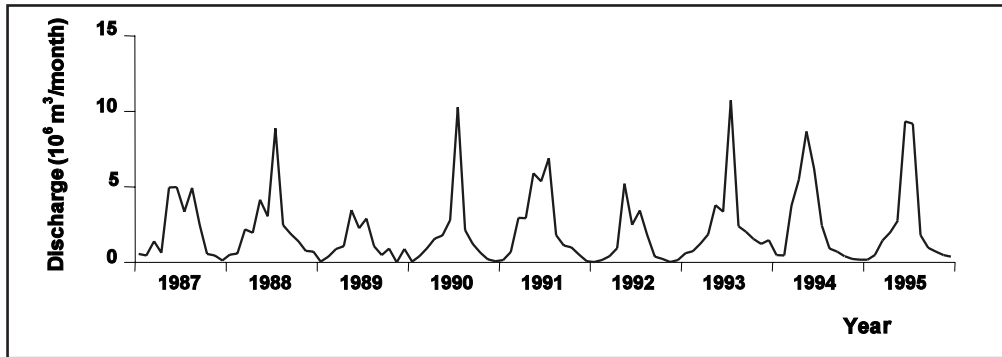
1) Q: Discharge H1: Water level (daily) H5d: Water level (5-day)
 2) Mean annual discharge 3) Maximum discharge 4) Mean maximum discharge
 5) Mean minimum discharge

4.3 Long-term Variation of Monthly Discharge

Station: A. Aranyaprathet, Sakaeo (01170201)



Station: A. Pong Nam Ron, Chanthaburi (01170305)



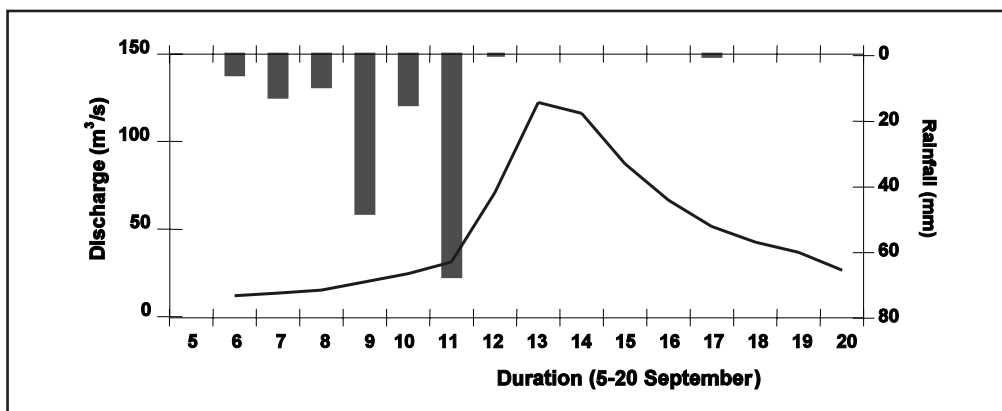
4.6 Annual Maximum and Minimum Discharges

Station: A. Aranyaprathet, Sakaeo (01170201) (571 km²)

Year	Maximum		Minimum		Year	Maximum		Minimum	
	Date	m ³ /s	Date	m ³ /s		Date	m ³ /s	Date	m ³ /s
1966	9.07	320	4.18	0.00	1976	9.01	108.0	3.03	0.00
1967	10.04	100	3.04	0.00	1977	9.16	42.0	3.13	0.00
1968	9.28	34	4.23	0.00	1979	7.13	47.6	4.27	0.00
1969	9.23	435	3.25	0.00	1980	10.27	103.0	5.16	0.00
1970	8.28	100	4.04	0.00	1981	8.11	48.0	1.02	0.00
1971	9.25	123	3.24	0.00	1982	8.26	67.5	4.15	0.00
1972	9.08	176	4.05	0.00	1983	10.05	82.1	4.21	0.00
1973	9.27	227	4.13	0.00	1984	8.16	59.4	4.28	0.00
1974	10.18	49	3.14	0.00	1985	9.20	50.7	2.02	0.00
1975	8.18	142	3.01	0.00	1986	9.11	124.0	3.28	0.00

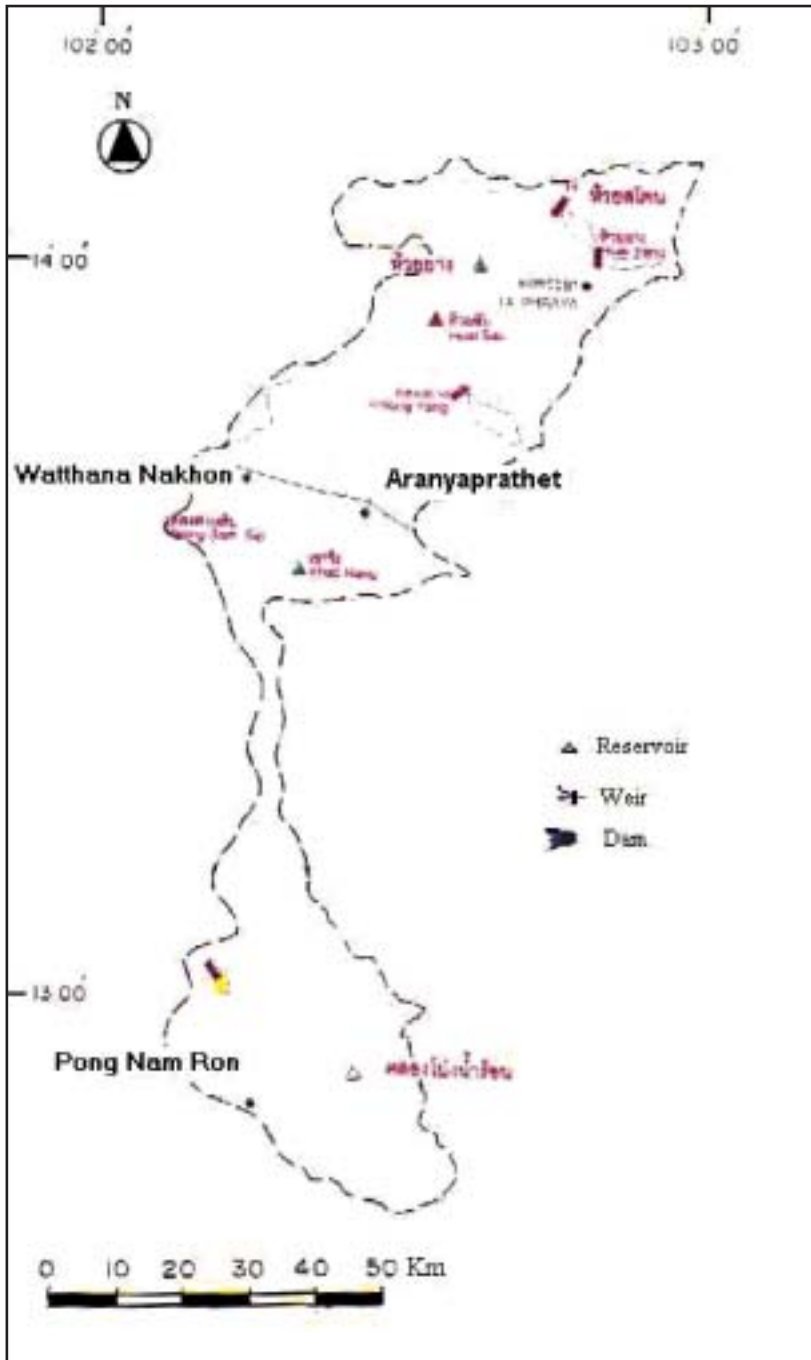
4.7 Hyetographs and Hydrograph of a Major Flood

Station: A. Aranyaprathet, Sakaeo (01170201)



5. Water Resources

5.2 Map of Water Resources System



Source: Map of Irrigation Projects in Thailand 1989 Planning and Budget Div., Royal Irrigation Department

5.3 List of Major Water Resources Facilities

There are no large water resources developments within the Tonle Sap River basin. However there are a number of medium and small water resources projects. The important one is the Huai Yang Reservoir (in the Upper Tonle Sap sub-basin) with capacity of $60 \times 10^6 \text{ m}^3$ (1993).

5.4 Major Floods

Station	Catchment Area [km ²]	Maximum Discharge		Date	Observation Period
		m ³ /s	m ³ /s/km ²		
01170201	571	435	0.762	23/9/69	1964 - 1995
04170301	41.5	269	6.482	13/5/86	1979 - 1995
04170302	230	691	3.004	9/6/86	1979 - 1995
04170303	91	258	2.835	8/9/86	1979 - 1995
01170305	42	118	2.810	10/4/90	1987 - 1995

5.5 Water Quality

Sampling Point	Year	pH	DO [ppm]	BOD [mg/l]	Coliform [MPN/100ml.]
Khlong Yang A.Ta Praya Sakaao	1997	7.0	9.63	-	-
Khlong Nong Wang A.Ta Praya Sakaao		6.7	4.70	-	-
Khlong Pong Nam Ron A. Pong Nam Ron, Chanthaburi		7.1 - 7.2	7.5	-	-

Source: Report on the "Hydrologic Data System"0, River Basin Hydrology Group, Land and Water Conservation Div., Department of Land Development, Ministry of Agriculture and Cooperative

6. Socio-Cultural Characteristics

The Tonle Sap River originates from the mountain ranges of the eastern sub-region within the provinces of Sakaao and A. Pong Namron, Chantaburi. The population of this sub-region is similar to that of the Central Plain in terms of culture, language, religion and beliefs. Some provinces may have local dialects e.g. in Chantaburi. The people living on river plain practice agriculture. Water related festivals are the Songkran and the Loy Kratong. In general, people in this region are diligent, but conservative, and prefer a peaceful life. This basin produces vegetables and fruit and the economic conditions are relatively good.

7. References

- Chantajitra, Y. et al. (1994): Location Map of Hydrological and Meteorological Stations in Thailand, submitted to Office of National Research Council.
- Brown Record, Thailand Pollution Status Report 1997, Department of Pollution Control, Ministry of Sciences, Technology and Environment.
- Dept. of Water Resources Engineering, Kasetsart University (1994): Study of the Potential Development of Water Resources in the Prachinburi River Basin, submitted to NESDB.

Eastern Sub-region Land Use Map 1998, Land Use Planning Div., Department of Land Development
 Electricity Generating Authority of Thailand (1992): Surface runoff and specific yield of river basins in
 Thailand, Survey and Ecology Department (February 1992), Meteorology and Hydrology Division.
 Isohyetal Map of Thailand, 1966-1995 Hydrometeorology Div., Department of Meteorology
 Jumchet, C., and Javanaphet (1969): Geological Map of Thailand, Department of Mineral Resources.
 Map of Irrigation Projects in Thailand 1989, Planning and Budget Div., Royal Irrigation Department
 Meteorological Department, Climatological Data of Thailand, 1952-1997, Bangkok, Thailand.
 Pal Consultant Ltd. (1994): Study of Potential Development of Water Resources in the Prachinburi
 River Basin, submitted to NESDB.
 Soils the Kingdom of Thailand, Explanatory Text of the General Soil Map, Soil Survey Division,
 Department of Land Development, 1972.
 Thailand Hydrological Yearbook, 1978-1996, Hydrology Division, Royal Irrigation Department,
 Bangkok, Thailand.