Nam Sane

Map of River

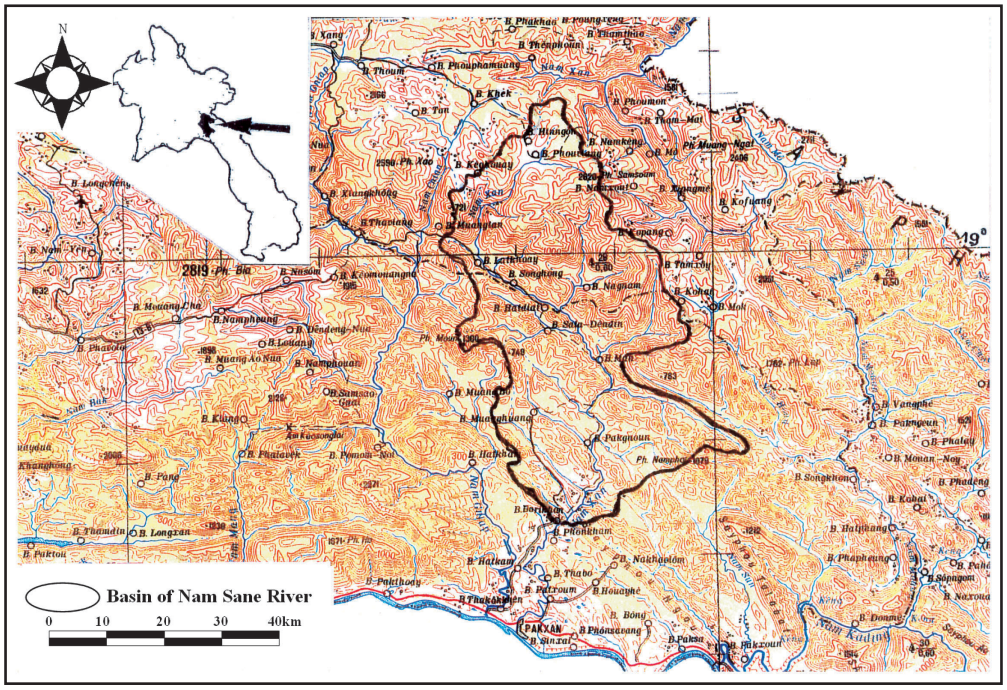


Table of Basic Data

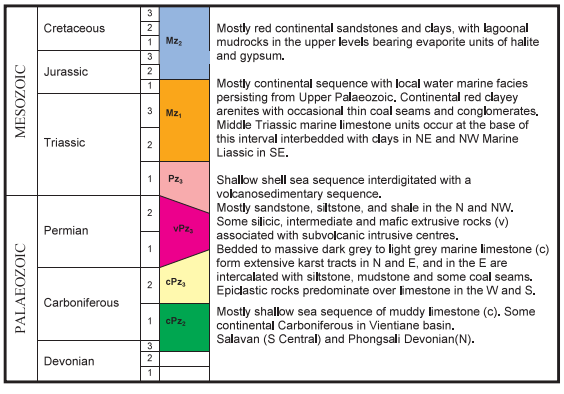
Name: Nam Sane		**Serial No. :** Lao-11
Location: Bolikhamxay Province, Lao	N 19° 16' - 18° 33'	E 103° 32' - 104° 03'
Area: 2,230 km^2	**Length of the main stream:** 120 km	
Origin: Piemond of Phousamsoum	**Highest Pt:** Phousamsoum, 2,620 m	
Outlet: Mekong river (Paksane)	**Lowest Pt:** Muang Kao, 160 m	
Main base rocks: upper basin: Cretaceous-Triassic; Middle: Caboniferous; Lower: Cretaceous, Triassic		
Main tributaries: Nam Phat (76 km^2), Nam Lat (55 km^2)		
Main lakes: None		
Main reservoirs: None		
Mean annual precipitation: 2,849 mm (basin average)		
Mean annual runoff: 135.44 m^3/s at Muang Kao, Bolikhan (1987 - 2002)		
Population: 21,324 (2002)	**Main cities:** Muang Kao, Province capital	
Land use: Forest (60.0), Paddy (24.0), Urban (3.0), Agriculture (8.0), Lake, river, marsh (2.0), Other (3.0)		

1. General Description

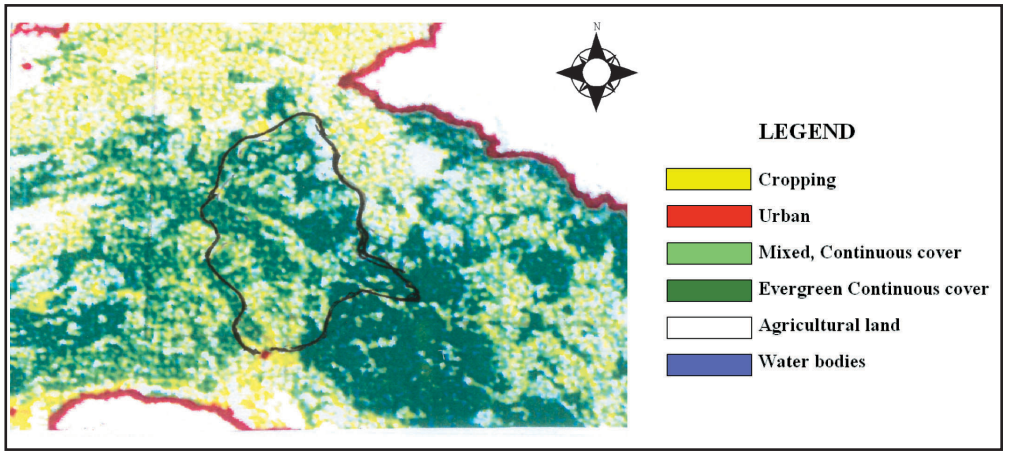
Nam Sane, locally known as steep river, originates from the piemond of Phou SamSoum 2,620 m, flows to the west-northwest through a group of villages around Ban Phouviang. It then flows down in the southwest to Ban Thathom, and continues to the southeast to the confluence with Nam Lat at 300 m altitude and finally to the south-southwest to meet the Mekong at Paksan. The river is 120 km long with a catchment area of 2,230 Km^2 at Muang Kao, Bolikhan and lies within 18°33' N - 19°16' N and 103°32' E - 104°03' E. Annual average basin rainfall is 2,849 mm and annual runoff at Muang Kao is 135.44 m^3/s. According to the Integrated Resources Center in Watersheds of the Lao P D R the following 5 classes of hydro-geology occur in the upper Nam Sane 2 and the lower Nam Sane 1. Sandy alluvium 56.6% for Nam Sane 1 and 4.2% for Nam Sane 2; Sandstone and conglomerate 4.0% for Nam Sane 1 and 23.5% for Nam Sane 2; Gneiss, Schist, Quartzite, Granite, Gab 3.8% for Nam Sane 1 and 62.5% for Nam Sane 2; Shale and impermeable rocks 0% for Nam Sane 1 and 7.6% for Nam Sane 2; various 35.6% for Nam Sane 1 and 3.3% for Nam Sane 2.

2. Geographical Information

2.1 Geological Map



2.2 Land Use Map

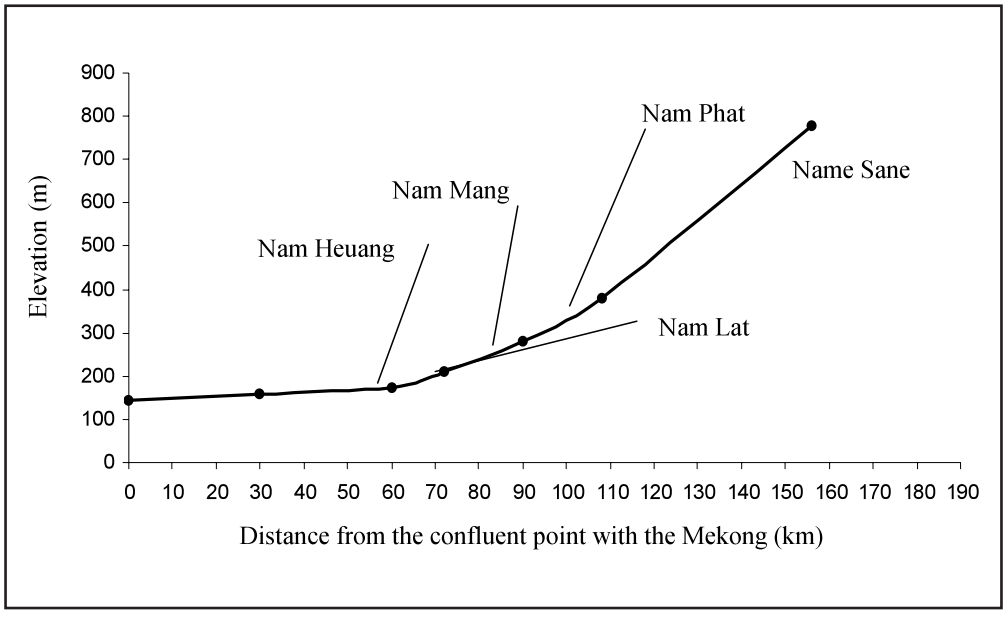


2.3 Characteristics of the River and Main Tributaries

No	Name of River	Length [km] Catchment area [km^2]	Highest peak [m] Lowest point [m]	Cities Population (year)	Land use[1)] [%]
1	**Nam Sane** (Mainstream)	120 2,230	Phousamsoum 2,620 Paksane, 157 m	Muang Kao 11,636	F (60.0)
2	**Nam Phat** (Tributary)	23 76	Pousamsoum 2,620 400	Ban Thasana 3,000	P (24.0) U (3.0)
3	**Nam Lat** (Tributary)	30 55	595 300	-	A (8.0)
4	**Nam Sane** (Lower branch)	20 42.9	330 157	Paksane	L (2.0) O (3.0)

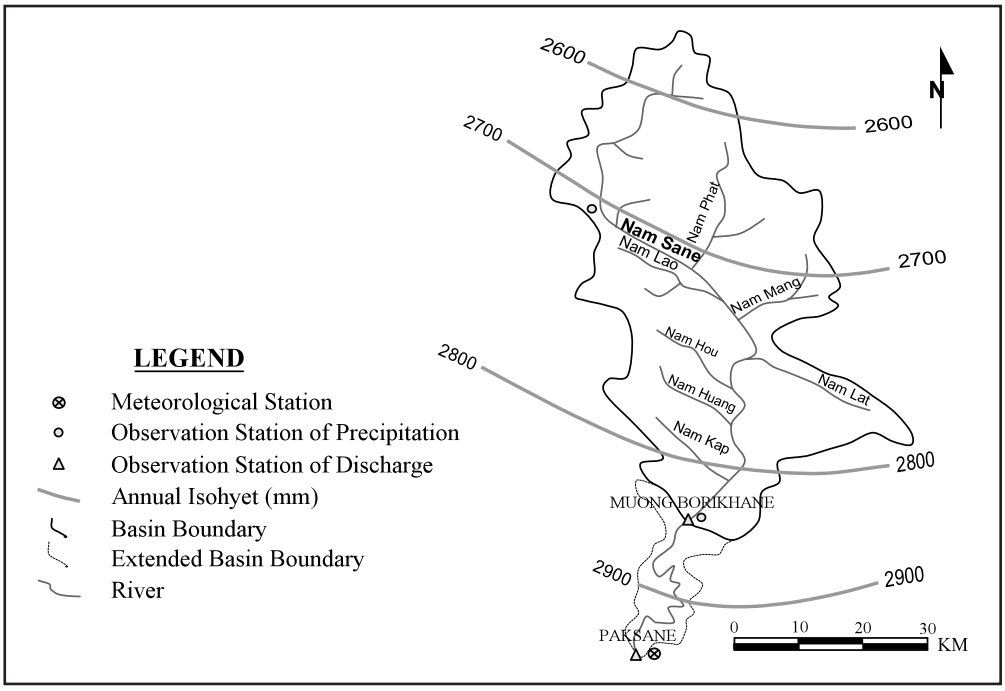
F: Forest; L: Lake, river, marsh; P: Paddy field; U: Urban; O: Orchard; A: Agricultural field (vegetable field, grass field)

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	**Thathom**	510	N 19° 00' E 103° 37'	1929 - 1941	2,720.2	-	P
2	**Muang Kao** (Bolikhan)	160	N 18° 34' E 103° 44'	1988 - 2002	2,886.8	-	P
3	**Paksane**	157	N 18° 24' E 103° 40'	1965 - 2000	2,939.6	1,759.7 (PAN)	P, T, E, S, Wind

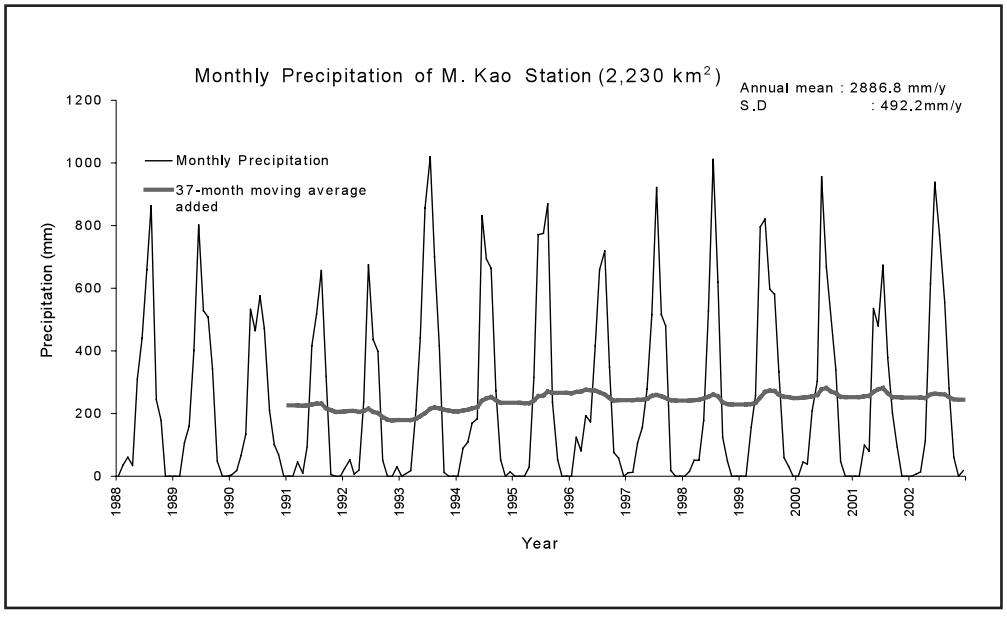
1) P: Precipitation T: Temperature E: Evaporation S: Solar radiation W: Wind

3.3 Monthly Climate Data

Observing station: Paksane

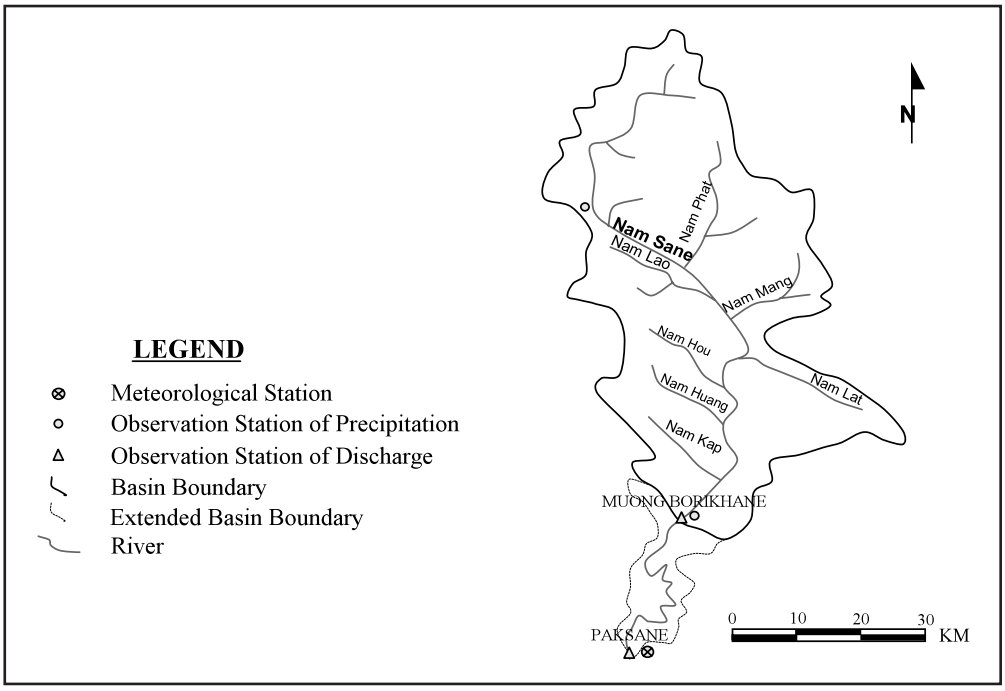
Observation item	Observation station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for the mean
Temperature [°C]	**Paksane**	21.9	24.3	27.4	28.7	28.2	27.8	28.0	27.6	27.4	25.9	24.5	22.6	26.2	1990 - 99
Precipitation [mm]	**Paksane**	4.8	26.0	43.3	116.2	374.8	679.1	633.9	636.1	332.2	79.7	11.8	1.7	2,940	1965 - 00
Evaporation [mm]	**Paksane**	193.6	111.8	191.5	160.1	125.3	98.5	112.2	123.4	138.1	156.8	133.2	215.2	1,759.7	1996 - 00
Solar radiation [$J/m^2/d$]	**Paksane**	16.08	17.12	18.09	19.59	18.04	15.49	14.61	13.65	15.95	16.66	16.45	15.32	1,6.42	1990 - 99
Duration of sunshine [hr]	**Paksane**	234.7	189.3	197.5	195.9	155.0	101.1	81.5	66.3	135.0	201.5	228.0	230.3	2,016.1	1990 - 99

3.4 Long-term Variation of Monthly Precipitation



4. Hydrological Information

4.1 Map of Stream flow Observation Stations



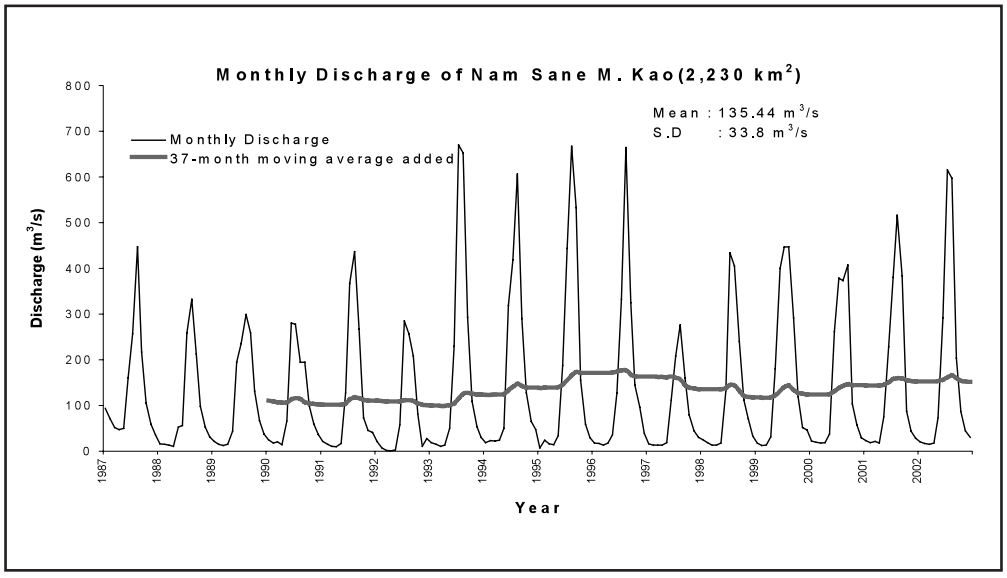
4.2 List of Hydrological Observation Stations

No. *	Station	Location	Catchment area (A) [km^2]	Observation period	Observation items (frequency)[1)]
1	Muang Kao	N 18° 33' 07" E 103° 44' 02"	2,230	1987 - 2002	H, Q = f (H)

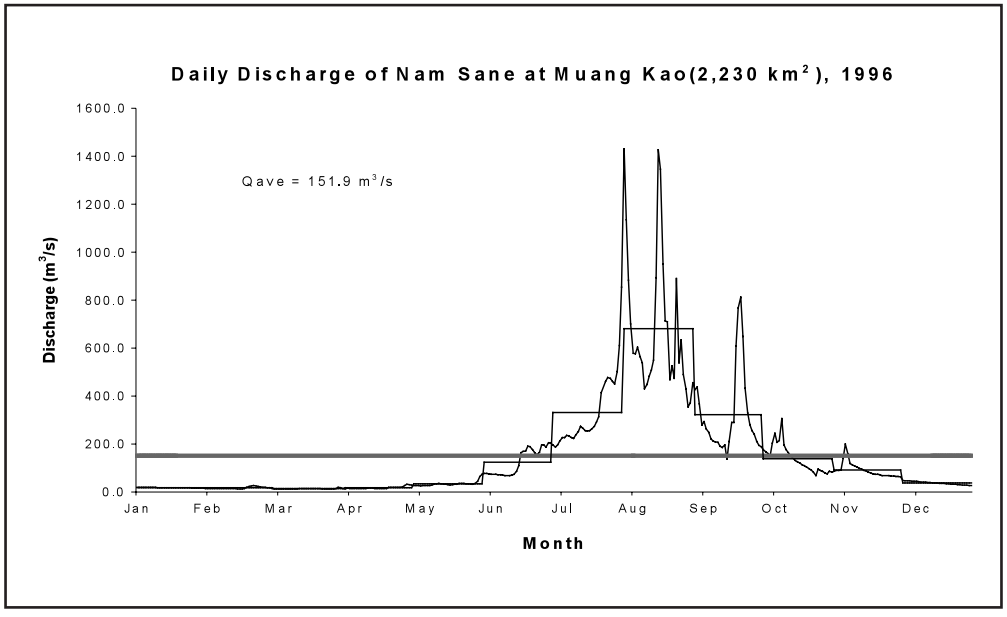
No. *	$\overline{Q}$[2)] [m^3/s]	Qmax[3)] [m^3/s]	Qmax[4)] [m^3/s]	$\overline{Q}$min[5)] [m^3/s]	$\overline{Q}$/A [m^3/s/100km^2]	Qmax/A [m^3/s/100km^2]	Period of statistics
1	135.44	1,911.6	1,160.58	10.66	52.044	85.722	1987 - 2002

1) Daily water level and discharge
2) Mean annual discharge
3) Maximum discharge
4) Mean maximum discharge
5) Mean minimum discharge
* Muang Kao, serial number used by MRC is 260101

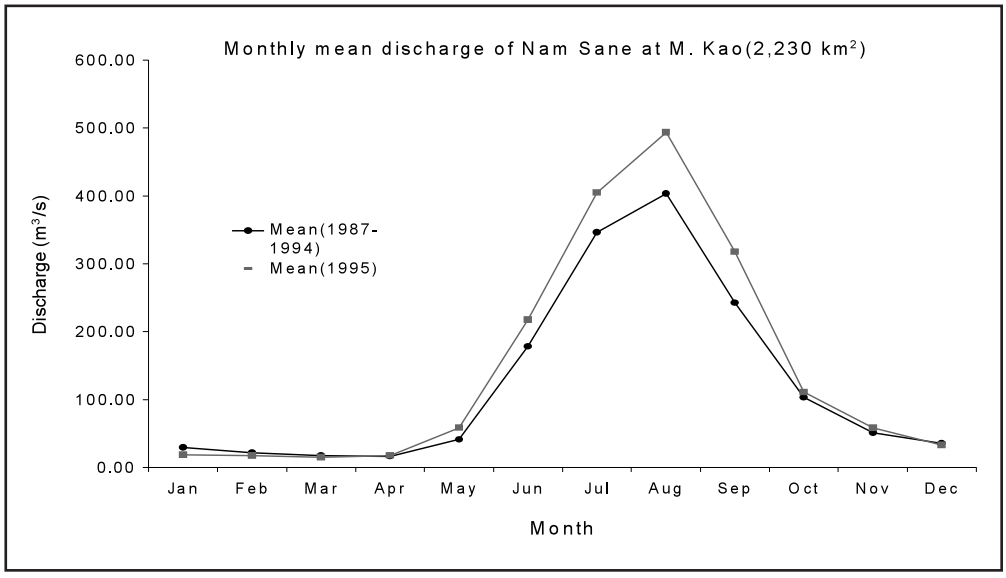
4.3 Long-term Variation of Monthly Discharge



4.4 Annual Pattern of Discharge



4.5 Unique Hydrological Features

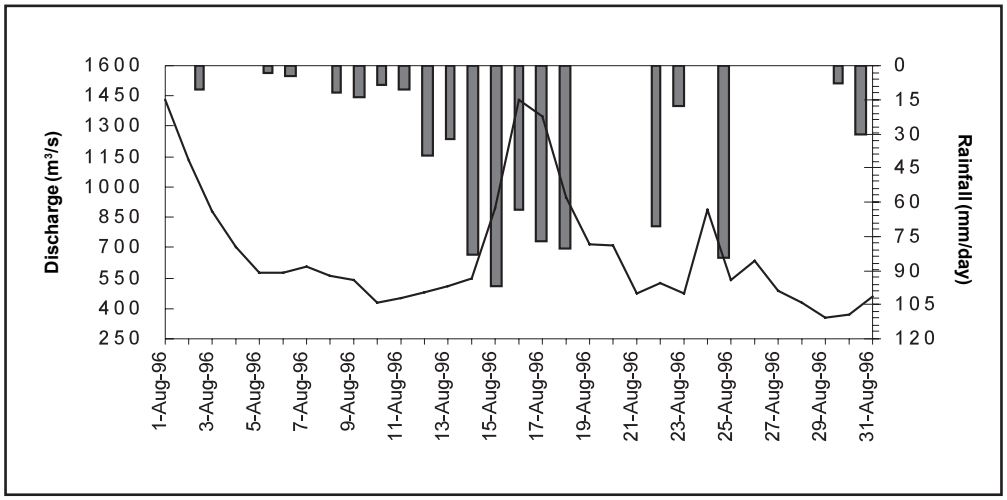


4.6 Annual Maximum and Minimum Discharges

At Muang Kao [2,230 km^2]

Year	Maximum		Minimum		Year	Maximum		Minimum	
	Date	Discharge [m^3/s]	Month	Discharge [m^3/s]		Date	Discharge [m^3/s]	Month	Discharge [m^3/s]
1987	24-Aug	788.00	Dec	23.60	**1995**	7-Aug	1,457.00	May	7.30
1988	16-Aug	647.00	March	9.26	**1996**	1-Aug	1,388.00	March	11.42
1989	25-Sep	662.00	April	7.58	**1997**	25-Aug	1,206.00	March	13.46
1990	28-Jun	1,310.00	April	7.58	**1998**	4-Jul	957.00	March	10.93
1991	16-Jul	1,240.00	May	6.86	**1999**	31-Jun	990.72	March	9.50
1992	26-Jul	725.00	May	0.18	**2000**	6-Sep	1,172.28	April	14.85
1993	15-Jul	1,850.00	April	8.21	**2001**	7-Sep	1,109.70	April	16.79
1994	1-Aug	1,155.00	March	9.05	**2002**	6-7-Aug	1,911.60	March	14.06
					Sum =		18,569.3		170.63
					Mean =		1,160.58		10.66

4.7 Hyetographs and Hydrographic of Major Floods



5. Water Resources

5.1 General Description

In Bolikhamxay Province there are 4 - 5 wetlands. Nam Kadan wetland site is located about 4 - 5 km from Nam Sane and approximately 15 km directly east of Paksane, the provincial capital. The total area of the Nam Kadan basin is 82 km^2 of which 51 km^2 has an elevation below 160 m, the lowest area is 140 m above seal level. Around Nongveng (lake) which is 1.7 m deep in the wet season, there are about ten small Nong with some remaining water. The wetland area is a mosaic of shrubland, grassland and degraded monsoon forest. The most common fish are: pakhoh, padouk, pasium, pakhao, panai, pakeng, and pakot (in wet season). Other aquatic animals are: shrimp (koung) craps (pou), and gastropod snails (hoicheup). Frogs are caught using traps and also setline baited with earthworms. People say that the fish harvest has decreased in the recent years because of population increase and ulcerative fish disease (appeared in mid 1980).

5.2 List of Major Water Resources Facilities

Major Reservoir: None

Major Interbasin Transfer

The study on small scale agricultural and rural development program conducted by JICA in 1998/1999 has selected two pilot model areas in Bolikhamxay Province; Ban Don in Bolikhan district and Ban Thana in Paksane area, located on the road No 13 about 13 km South of Paksane city. Detailed information of these two villages is as below:

Ban Don grouping with 3 villages (Ban Don, Phonekharm, Nahern in Bolikhan district), high demand of the beneficiaries; farmers seeking irrigation development with a size 100-300 ha and water resource management at the micro basin level with an irrigation system consisting of a pump scheme taking the water from Nam Sane River. In terms of basin water resource management there is no major problem except with flood hazard in wet season. Main activity of the communal organization is the construction of a canal by villagers of all 3 villages. Main problems: poverty low-income lack of irrigated land.

Ban Thana in Paksane district also has high demand of beneficiaries (farmers) for irrigation development of 100-300 ha. Flood hazard in the wet season is high. Main activities: improve and extend irrigation canal and structures and improve water management in the service area. As Ban Thana is selected for feasibility area more details are given: village history, year of establishment around 1798, number of households: 80, total population 462, land area: 405 ha. Water supply and sanitation: public well: 7, private dug well: 26. Poverty is considered to be average.

5.3 Major Floods and Droughts

Major Floods

Date	Peak Discharge [m^3/s]	Rainfall [mm] Duration	Meteorological cause	Dead and missing	Major damages (Districts affected)
7-Aug 95	1,457	427.2 mm 31/7-7/8	Monsoon	-	5,600 ha (flooded area) 3,200,000 USD
1- Aug 96	1,388	183.0 mm 29-31 Aug	Monsoon	-	2,566 ha (flooded area) 1,500,000 USD

Major Droughts

Period	Affected areas	Major damages and counteractions
1998/1999 (Jul/Aug)	15,570 ha	Rice culture and forest fires in February

5.4 Groundwater and River Quality

River Water Quality

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ph	7.2 (91)	7.4 (91)	7.5 (91)	7.7 (91)	7.5 (91)	7.4 (91)	6.0 (90)	6.4 (90)	5.5 (90)	5.1 (90)	6.2 (90)	5.0 (90)
COD_{Mn} [mg/l]	1.8 (91)	1.5 (91)	1.3 (91)	1.0 (91)	1.5 (91)	0.2 (90)	0.2 (90)	0.2 (90)	0.2 (90)	0.2 (90)	1.5 (90)	2.2 (90)

6. Socio-cultural Characteristics

In the Nam Sane basin the main ethnic group is Lao Lum Yo, particularly in the lower reach (Bolikhan and Paksane districts), where the villagers practise farming with about 51% directly involved in agricultural production and the main religion is Buddism. The annual festivities in water along Nam Sane are the racing boats as practiced by most people in the other plain areas of the major tributaries. A speciality of the people living in the plain areas between Paksane- Pakhinboun is the seasonal prediction of floods from traditional methods. To meet their needs for long-term forecasts for agricultural decisions, villagers have traditional methods of flood forecasting using observations of natural phenomena of which the most popular is to observe stripes on the tails of a young land iguana. If the dark bands are wider than the white bands there will be more rain in that year. Some fruit, such as Mak Khor, if heavy bearing means heavy rain and floods.

7. References, Databooks and Bibliography

- National Geographic Department: all scale maps since 1987.
- Department of Geology and Mines: 1 : 1,000,000 scale map 1991.
- MRC hydrologic year books available until 1998 and additional data from 1999-2002.
- IUCN, The World Conservation Union: Inventory of wetlands in Lao PDR, 1991.
- JICA, The study on small scale agricultural and rural development program along the Mekong river in Lao PDR, July 1999.