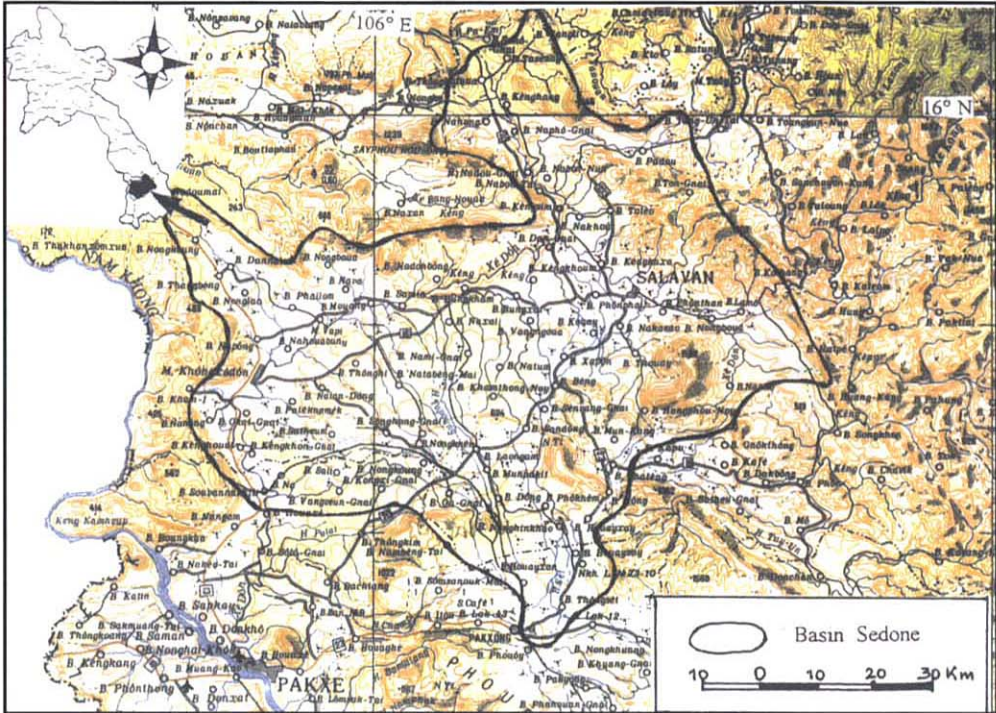


# Sedone

## Map of River

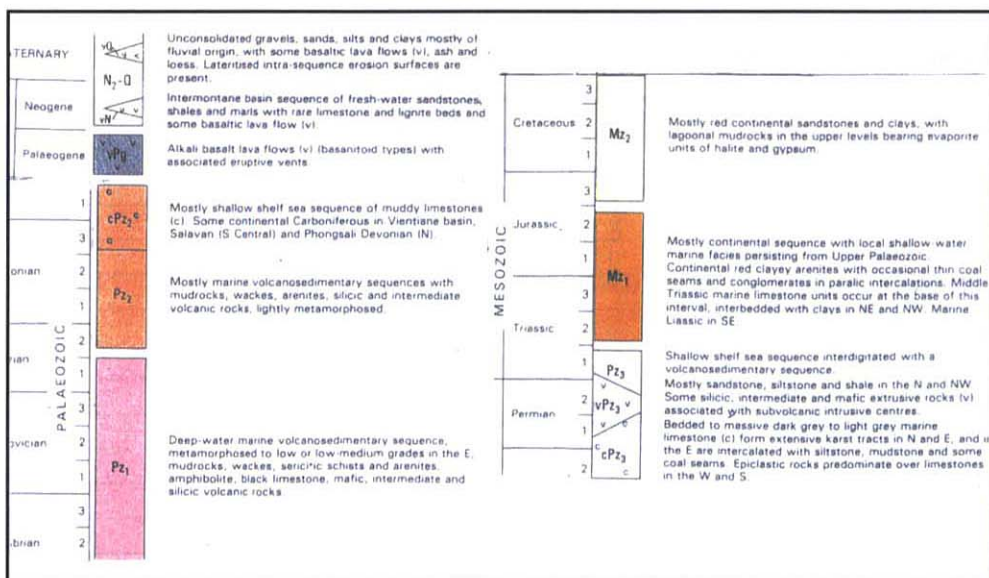
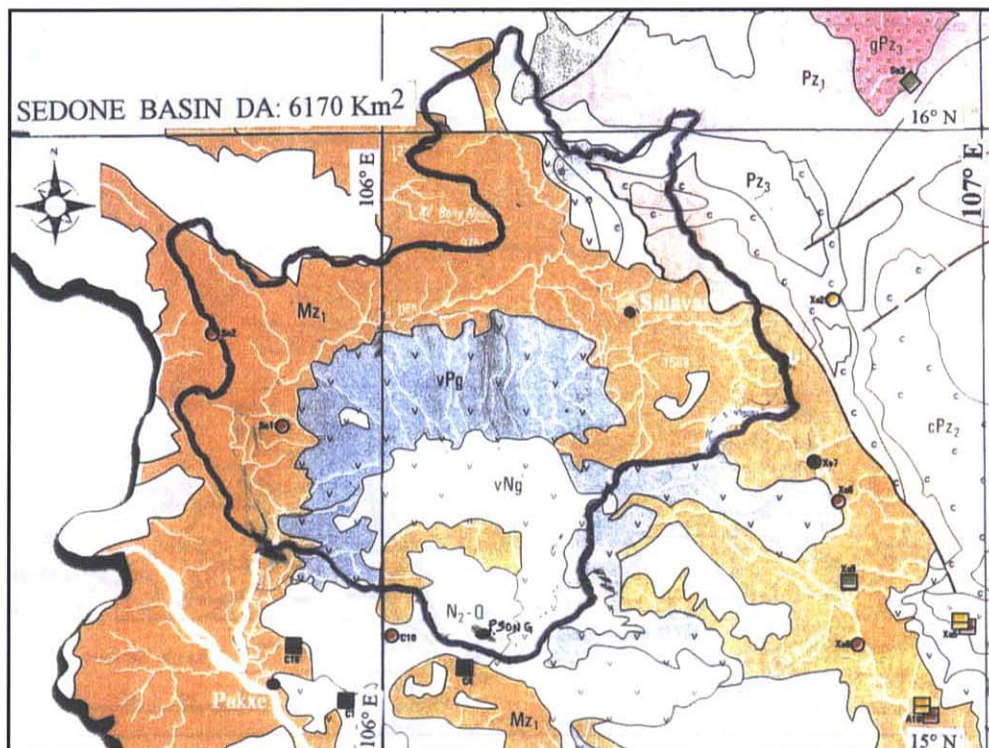


## Table of Basic Data

<b>Name:</b> Sedone		<b>Serial No.:</b> Lao-3
<b>Location:</b> Southern Lao P.D.R.	N 15° 07' ~ 16° 10'	E 105° 35' ~ 106° 40'
<b>Area:</b> 6,170 km <sup>2</sup>	<b>Length of main stream:</b> 1,574 km	
<b>Origin:</b> Bolaven Plateau (502m)	<b>Highest point:</b> Phou Kate Nua (1,588 m)	
<b>Outlet:</b> confluence with the Mekong	<b>Lowest point:</b> Souvannakhili (100 m)	
<b>Main geological features:</b> Mid mesozoic to cenozoic sandstone and conglomerate-Basalt, Sandy alluvium		
<b>Main tributaries:</b> Xeset (325 km <sup>3</sup> )		
<b>Main lakes:</b> None		
<b>Main reservoirs:</b> Xeset (0.39×10 <sup>9</sup> m <sup>3</sup> ) (Tributary)		
<b>Mean annual precipitation:</b> 2,000 mm (1960-1990)		
<b>Mean annual runoff:</b> 160.6 m <sup>3</sup> /s at Souvannakhili (5,760 km <sup>3</sup> ) (1987-1996)		
<b>Population:</b> 302,359 (1996)	<b>Main cities:</b> Saravane, Khongsedone, Pakxe	
<b>Land use:</b> Forest (56%), Rice paddy (25%), Agriculture (10%), Urban (12%)		

## 2. Geographical Information

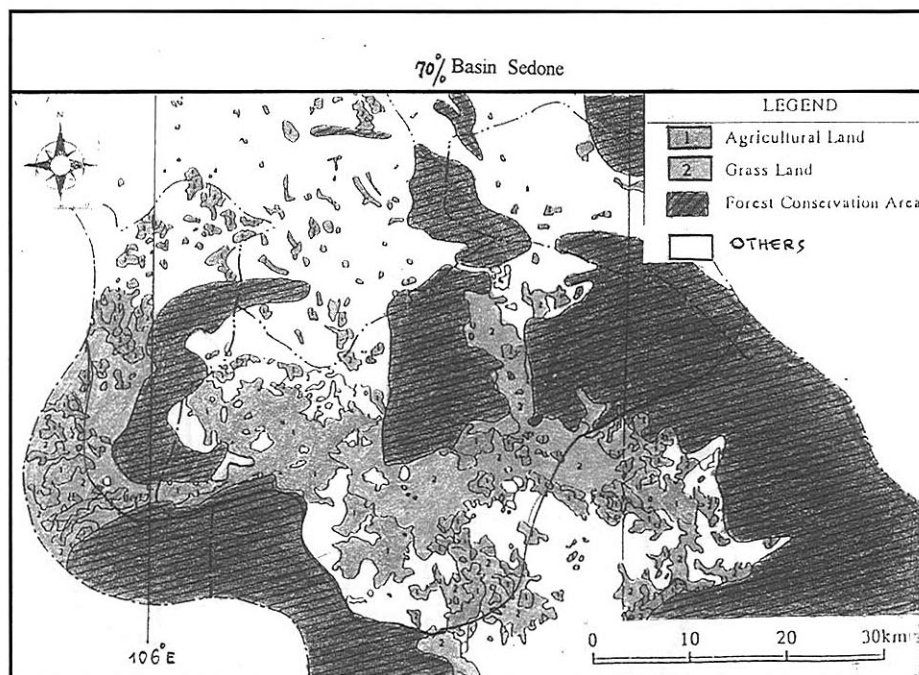
### 2.1 Geological Map



## 1. General Description

The Sedone river basin is located between the latitudes 15° 00' - 16° 00' N and the longitudes 105° 35' - 106° 40' E. The main river, with a total length of 1,574 km, has its origin in the north-eastern side of the Bolaven Plateau near Thateng district at 800 m above the sea level. It flows down 168 m to the plain at Saravan, then 122 m to Khongsedone, then 117 m to Nanay and 100 m to Pakse at the confluence with the Mekong. The drainage area at the gauging station Nanay is 6,170 km<sup>2</sup> representing about 77% of the total catchment area. Most of the tributaries on the left bank (e.g. Houay Namsai, Xeset, Houay Kpeu, Houay Palai and Houay Champi) have their origins in the Bolaven Plateau with steep slopes. On the right bank, there are many ungauged rivers, some with no flow in the dry season. The main Hydrogeology of the basin is comprised of 40.9% sandstone and conglomerate, 40% basalt, 17.5% sandy alluvium, and only 1.7% shale and impermeable rocks. In the lower reach of Sedone at Pakse city, there are two important bridges. The mean annual precipitation distributes like a coaxial circle ranging from 3,500 mm at Paksong to less than 1,800 mm in the plain area. As the basin is situated between the latitudes 15°-16°N, the south-west monsoon reverses its maximum activity, especially on the windward side. Extreme heavy rainfalls have frequently been observed in the area. An exceptionally high daily rainfall of 534 mm has been recorded at Paksong during the passage of the tropical storm in June 1983. This corresponds to the strong "ENSO" event during 1982 to 1983.

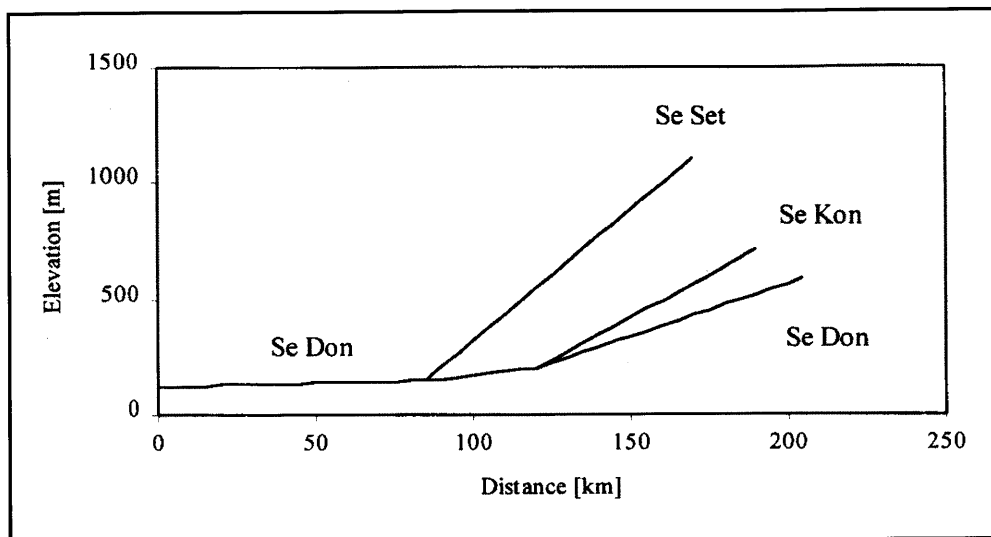
## 2.2 Land Use Map



## 2.3 Characteristics of River and Main Tributaries

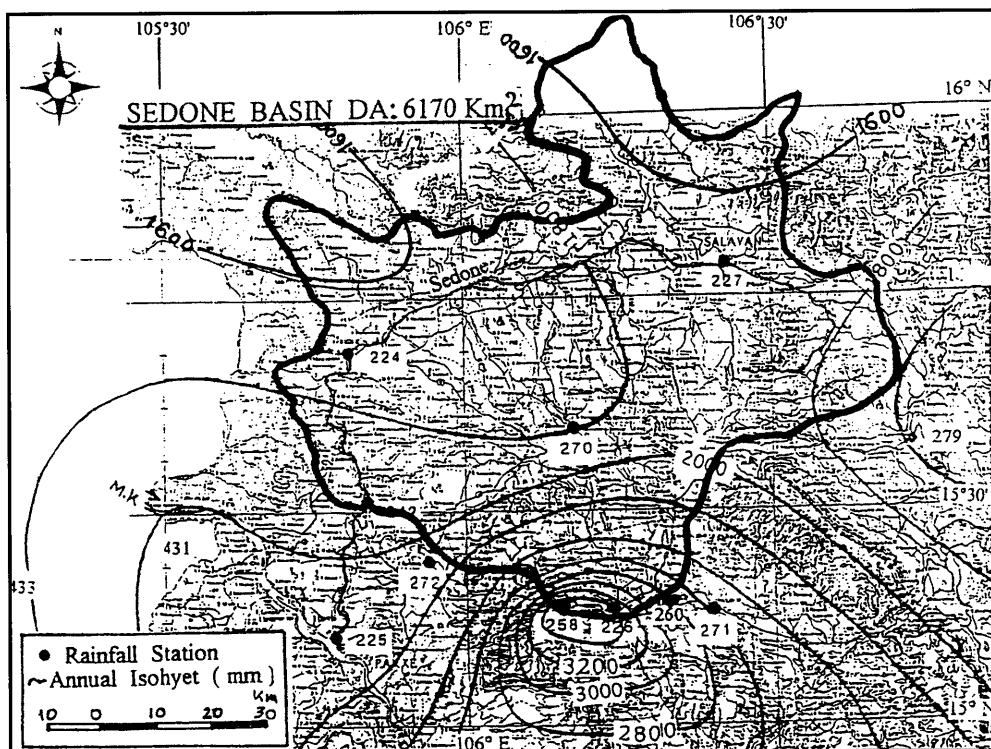
No.	Name of river	Length [km] Catchment area [km <sup>2</sup> ]	Highest peak [m] Lowest point [m]	Cities Population (1995)	Land use [%]
1	Sedone (Main river)	1,525 6,170	Phoukate 1,588 Khongsedone 122	Salavan 62,129	
2	Xeset (Tributary)	43 325	Nong Hine 1,200 Lao Ngam	Lao Ngam 41,122	

## 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 <sup>1)</sup>
224*	Khongsedone	122	N 15° 34' E 105° 48'	1965~1994 1929~1990	1,658 1,716		P, E
225*	Pakse	101.5	N 15° 07' E 105° 47'	1951~1996	1,942	1,550	P, E, SR, DS
226*	Paksong	1,200	N 15° 11' E 106° 14'	1965~1994	3,403	Piche 550	
227*	Salavane	168	N 15° 43' E 106° 26'	1960~1994	1,999	Pan "A" 2,073	P(TB), E, SR, DS
242*	Selabam	117	N 15° 24' E 105° 50'	1972~1994	1,929		P
270*	Lao Ngam	451	N 15° 28' E 106° 10'	1991~1995 1989~1993	1,760 1,780		P
	Vangkaman	302	N 15° 31' E 105° 59'	May~Dec. 1995			P(TB)
260	Nonghine	1,280	N 15° 13' E 106° 21'	1980~1994	2,844		P
	Thateng	800	N 15° 25' E 106° 23'	1993~1995	2,123		P
	Muang Vapi	160	N 15° 14' E 106° 1'	1991~1996	1,704		P
	Keng Sin	180	N 15° 51' E 106° 18'	1993~1996	2,416		P

\*: Serial number used by Mekong RC

1) DS: Duration of Sunshine, E: Evaporation, P: Precipitation, SR: Solar Radiation, TB: Tipping Bucket with recording chart  
Pan "A": Evaporation by using Class A Pan, Piche: Evaporation by using Piche

### 3.3 Monthly Climate Data

#### Station: Salavan

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for mean
Temperature [°C]	23.1	26.3	29.3	30.2	29.0	27.5	27.3	26.7	27.2	27.0	25.0	23.0	26.8	1981~1994
Precipitation [mm]	3.6	2.0	32.3	51.3	161.6	384.6	325.8	538.2	285.3	123.1	17.7	0.6	1,926.1	1981~1994
Evaporation [mm]	184.3	210.2	243.3	248.5	229.7	139.7	118.0	108.3	105.6	146.0	165.4	173.3	2,072.4	1991~1994
Duration of sunshine [hr]	194.4	253.7	229.4	198.0	213.9	132.0	127.1	111.6	147.0	201.5	252.0	229.4	2,290.0	1991~1994

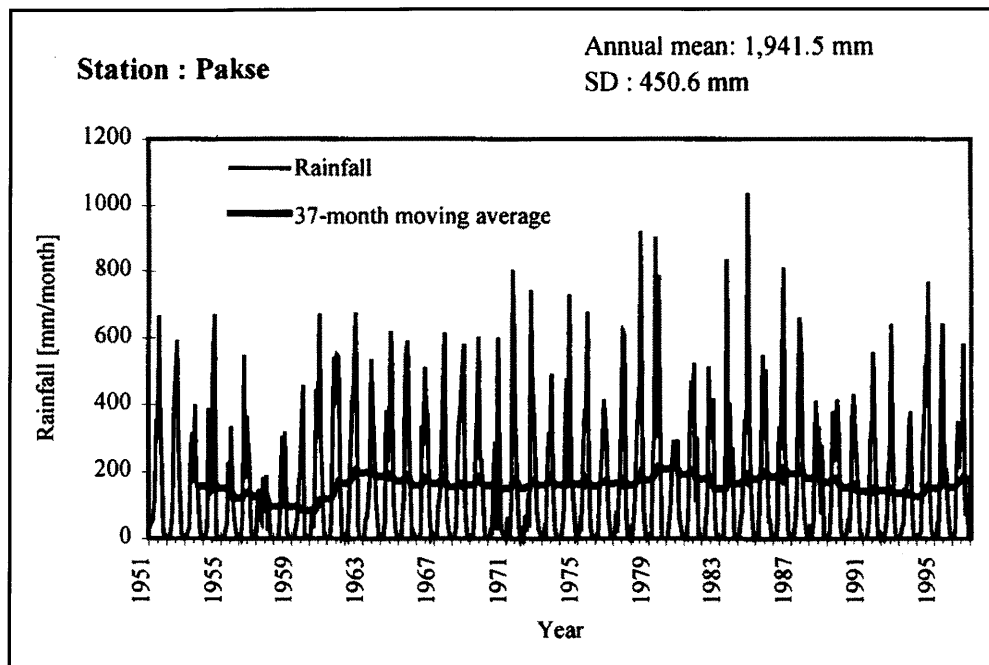
#### Station: Pakse

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for mean
Temperature [°C]	24.1	26.9	29.0	29.5	29.0	27.3	27.4	27.1	26.5	26.8	25.7	24.3	26.8	1951~1994
Precipitation [mm]	1.8	8.6	22.2	64.9	206.7	363.7	352.7	487.8	314.3	97.1	19.2	2.4	1,941.5	1951~1996
Evaporation [mm]	193.3	194.8	234.4	220.7	184.4	120.7	105.7	102.2	122.5	162.9	176.9	191.2	2,000.0	1989~1994
Duration of sunshine [hr]	272.8	222.3	232.5	228.0	220.1	126.0	145.7	127.1	141.0	173.6	231.0	244.9	2,365.0	1985~1994

#### Station: Paksong

Observation item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Period for mean
Temperature [°C]	17.1	18.5	20.4	21.7	21.7	20.7	20.3	20.0	20.4	20.0	18.6	17.4	19.5	1985~1994
Precipitation [mm]	9.8	10.9	104.1	243.8	347.8	457.3	688.4	790.3	427.0	212.5	37.6	14.6	3,374.1	1985~1994
Evaporation [mm]	67.7	54.3	57.4	48.6	44.8	38.8	33.8	33.3	28.6	39.1	47.5	56.6	550.5	1989~1994
Duration of sunshine [hr]	235.6	202.4	192.2	204.0	139.5	90.0	86.8	74.4	102.0	133.3	228.0	213.9	1,902.1	1991~1994

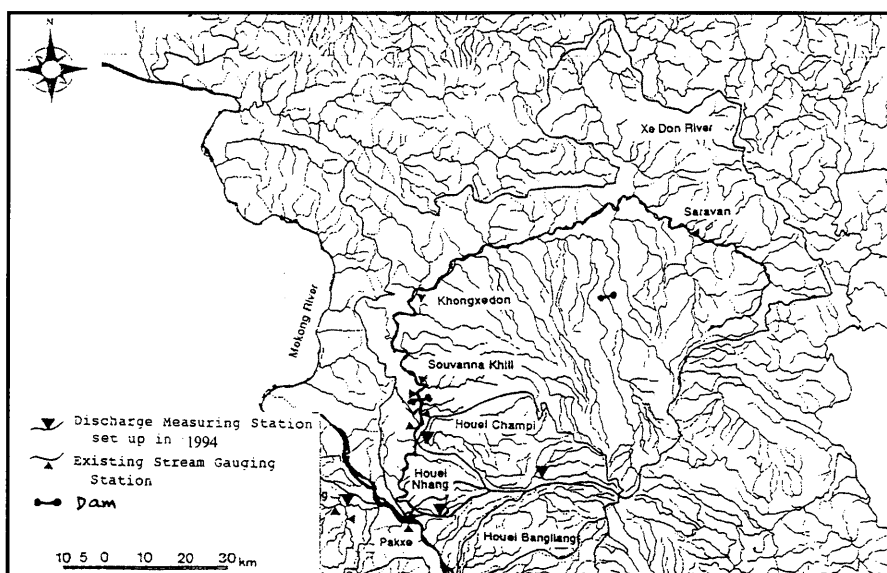
### 3.4 Long-term Variation of Monthly Precipitation



## 4. Hydrological Information

### 4.1 Map of Streamflow Observation Stations

Map and Legend



## 4.2 List of Hydrological Observation Stations

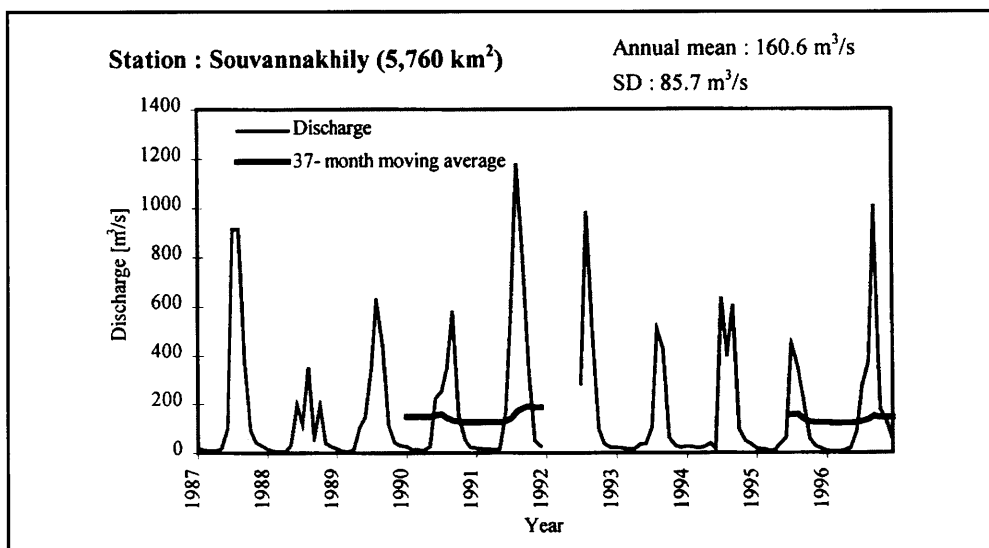
No.	Station	Location	Elevation [m]	Catchment area (A) [km <sup>2</sup> ]	Observation period	Observation items <sup>1)</sup> (frequency)
1	Salavan	N 15° 42.6' E 106° 27'	168	2,500	1987~1992	H2, Q(m), P
2	Khongsedone	N 15° 34.5' E 105° 48.9'	122	5,200	1967~1992	H2, Q(m), P
3	Souvannakhili	N 15° 23.8' E 105° 49.5'	115	5,760	1987~1996	H2, Q(m), P WQ(m)
4	Nanay	N 15° 22.7' E 105° 49.4'	117	6,170	1960~1996	H2, Q(m), P
5	Done Se	N 15° 19.9' E 105° 49.0'	100	6,500	1987~1992	H2

No.	$\bar{Q}$ <sup>2)</sup> [m <sup>3</sup> /s]	Q max <sup>3)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ max <sup>4)</sup> [m <sup>3</sup> /s]	$\bar{Q}$ min <sup>5)</sup> [m <sup>3</sup> /s]	$\bar{Q} / A$ [m <sup>3</sup> /s/100km <sup>2</sup> ]	Q max / A [m <sup>3</sup> /s/100km <sup>2</sup> ]	Period of statistics
3	162	3,770	3,249	8.2	2.81	65.45	1987~1996
4	220	4,000	2,054	20.1	3.57	64.83	1960~1996

1) H1: water level by recording chart, H2: water level by manual  
Q: discharge, P: precipitation, WQ: BOD etc.,  
m: monthly

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



## 4.6 Annual Maximum and Minimum Discharges

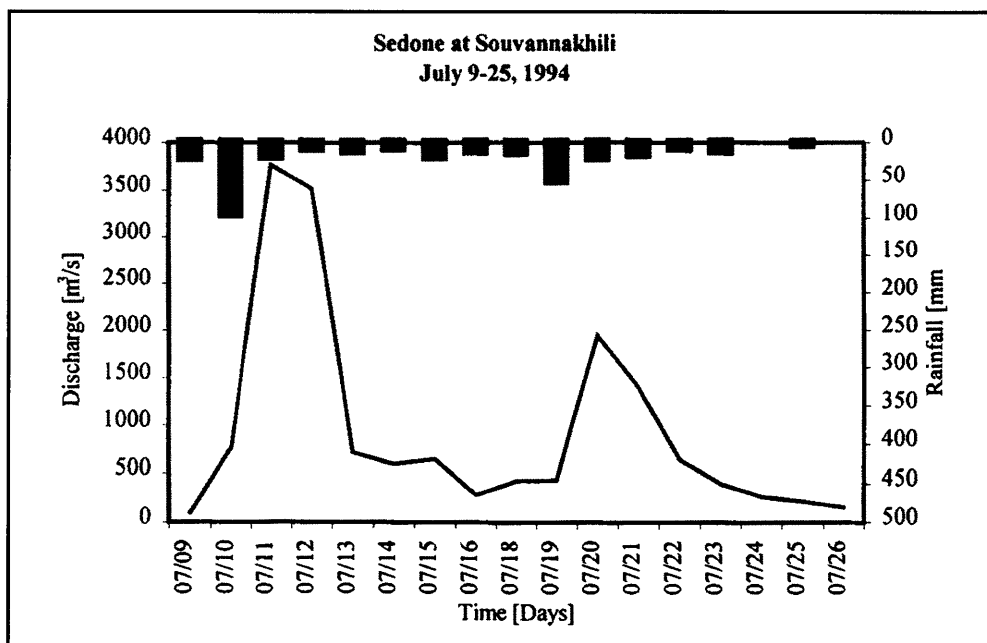
At Nanay [6,170 km<sup>2</sup>]

Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>		Year	Maximum <sup>1)</sup>		Minimum <sup>2)</sup>	
	Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]		Date	[m <sup>3</sup> /s]	Month	[m <sup>3</sup> /s]
1960	8.10	1,210	4	3.70	1979				23.0
1961	8.22	2,420	5	5.1	1980		3,400		20.0
1962	9.14	2,060	12	1.6	1981		1,400		27.7
1963	8.09	1,790	2	6.4	1982		2,090		35.0
1964	9.25	3,090	4	22.6	1983		990		38.0
1965		1,460		28.7	1984		989		
1966	7.25	1,460	4	20.9	1984		No obs		
1967		2,000		18.2	1985		No obs		
1968	9.08	4,000		15.8	1986		No obs		
1969		2,300		1.0	1987		2,600		10.0
1970		940		1.0	1988		1,600	4	23.0
1971		2,100		24.0	1989		2,015	4	16.0
1972		1,920		27.0	1990	8.30	2,050		16.0
1973		1,630		27.0	1991	7.22	2,055		19.0
1974		3,600		27.0	1992	8.26	2,080		20.0
1975		2,080		28.0	1993		No obs		
1976		No obs			1994		No obs		
1977				19.5	1995		No obs		
1978		No obs			1996		2,400		1.40

1) Observation interval: 3 hours, daily  
2) Observation interval: daily

Nature of minimum flow: daily  
No obs: No Observation

## 4.7 Hyetographs and Hydrographs of Major Floods





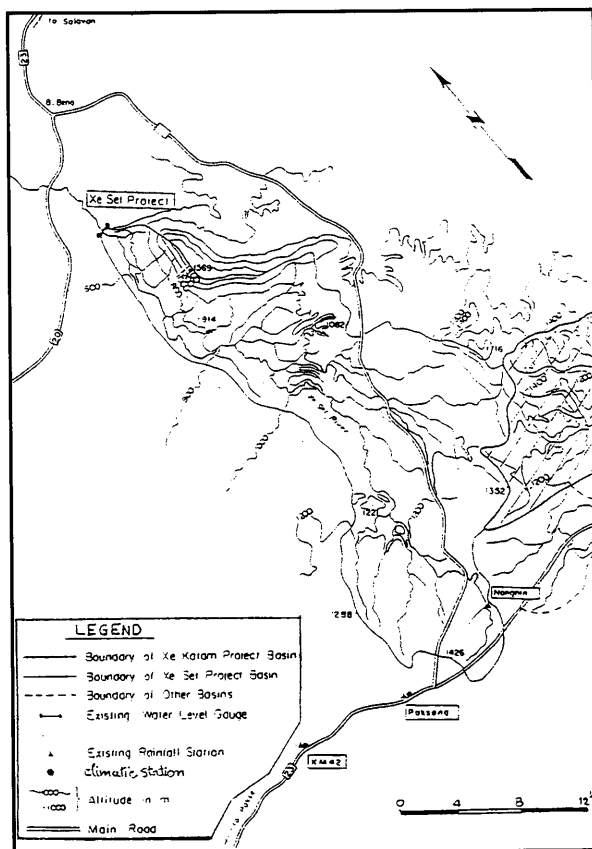
## 5. Water Resources

### 5.1 General Description

Most of small tributaries of Sedone, representing over 70% of the total Sedone drainage basin comes from the Bolavan Plateau. The Paksong area is the main source of all the rivers. They originate from 1,200 m and flows down to 168 m in the plain of Sedone at Salavan, and then to 100 m at Pakse. Water resources of the basin have been evaluated on the basis of the mean monthly flow records of the existing hydro-meteorological observation network. For the ungauged area between Sedone and Bolaven Plateau, the establishment of a runoff model is possible from the generating discharge records of Xeset power station.

Almost all the villages in the basin depend entirely upon nearby streams and rivers for their water supply. These villages are usually located within a few hundred metres from the perennial streams and rivers. However, some villagers face the difficult task of carrying water for more than 1.0 km, particularly in the dry season. Wherever a water source is available at an effective distance from the village, a gravity flow piped system is improvised by the villagers. The water supply system in Lao Ngam town at 450 m altitude, where the water source is a spring at Ban Tekit and the main distribution pipe is about 7 km long is an example. A total of 312 taps equipped with counter meters have been installed in households and for some communal use. The system is still primitive, and has neither water quality control nor protection from contamination. Some contamination is unavoidable in the rainy season.

### 5.2 Map of Water Resources Systems



Xeset Hydroelectric Power Plant produced 45 MW supplied Saravane Town, its surrounding area and Pakse City and exported the surplus power generated in wet season by 115 kw transmission line to Chong Mek, Thailand

## 5.4 Major Floods and Droughts

### Major Floods

Date	Station Catchment area [km <sup>2</sup> ]	Peak discharge [m <sup>3</sup> /s]	Rainfall [mm] Duration	Meteorological cause	Dead and Missing	Major damages (Districts affected)
1968	Na Nay (6,170)	4,000		Typhoon		Pakse, Saravane and Khongsedone
1974	-	360		Monsoon		Pakse, Saravane and Khongsedone
1984	-			Typhoon		Savannakhet, Pakse, Saravane and Khongsedone
1994	-	-		Monsoon Typhoon		Savannakhet, Pakse, Saravane and Khongsedone
1996		2,400		Typhoon		Pakse, Saravane and Khongsedone

### Major Interbasin Transfer

Period	Affected areas	Major damages and counteractions
1967	Savannakhet, Saravane, Paksong and Pakse	Mostly in Agriculture sector
1988	Saravane, Paksong and Pakse	Dry spells
1989	Saravane, Paksong and Pakse	Dry spells
1992	Savannakhet, Saravane, Paksong and Pakse	Dry spells

## 5.5 Groundwater and River Water Quality

Geological feature of the selected sites near and in the Sedone basin is characterised by basalt lava flows underlain by Jurassic Shale. Basaltic rocks of Tertiary and Quaternary ages are sporadically distributed in the Bolavan Plateau. Two sites were selected in the plain area, Salavan at B. Tong Noy and Khongsedone at B. Napong, for studying the relationships of rainfall and ground water level in 1994.

### Data from automatic ground water level recorders, during 1993 to 1994

Sites	Water level from two wells [m]	
	Highest	Lowest
Tong Noy	2.27	5.19
Napong (Khongsedone)	6.67	9.88

### River Water Quality during May 18-19, 1995

Location	Paksong 1	Paksong 2	B.H.Katuat (Xeset)	B.H.Khua (Xeset)	Lao Ngam (H.Tapoung)	H.Palai	Thateng (H.Namshi)
pH	5.56	6.38	6.36	7.00	7.15	7.09	7.12
COD [mg/l]	0.15	1.407	1.016	2.483	1.650	2.189	5.173
SS [mg/l]	0	9	9	7	6	1	4

## 5.6 Other Notable Features of Water Resources

In the Sedone River basin, there are many water resources projects. The Selabam Hydroelectric Power Plant was constructed twenty years ago on the Sedone River, approximately 35 km to the north of Pakse city, which is a load centre. The installed capacity is 2,040 kW with three 680 kW units. However, only 1,420 kW of output is currently available. Construction work started in 1991 to expand the output to 3,000 kW to cater for the demand in Pakse city and was completed by the end of 1993. During the historic flood in 1978, the Selabam dam was heavily affected by the backwater from Mekong River. In the plain area from Selabam to Pakse, there are several water supply facilities. Many villages along Sedone (e.g. Saran, Vapi and Khongsedone) have hand pumps and irrigation facilities. However, the majority of rivers and streams on the left bank (in the Bolaven Plateau) have steep slopes, and soil erosion of river banks have been accelerated by floods. Moreover, a large number of boulders, rocks and weathered rock layers can be found in the river bed and banks. These make it difficult to tap water by gravity.

It is planned to further develop the lower Xeset project area to increase the hydroelectric power.

## 7. References, Databooks and Bibliography

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