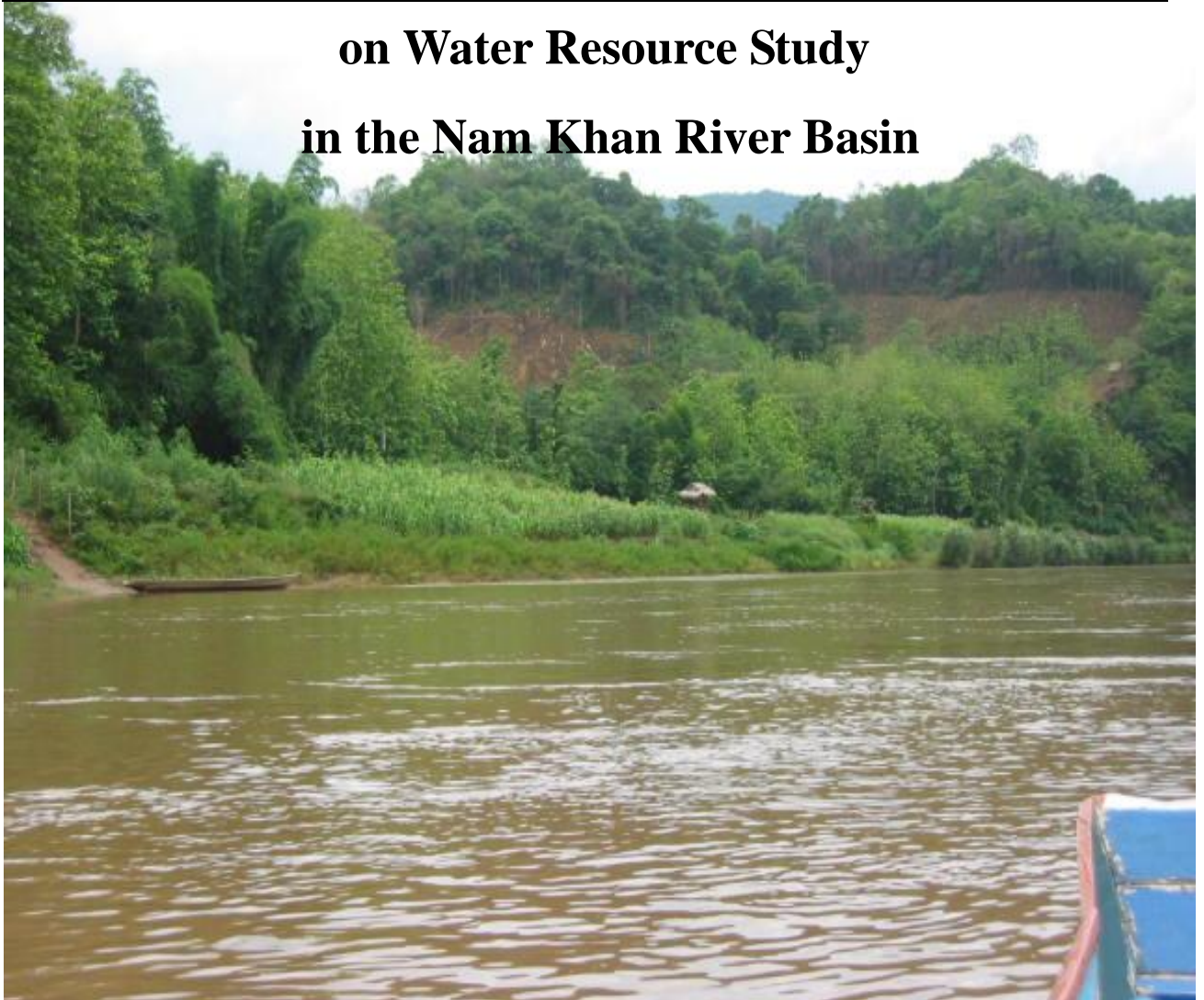




Report



on Water Resource Study in the Nam Khan River Basin



National Case Study 2009
Information and knowledge management programme- IKMP (Component#4)
Decision Support Framework Applications for Water Resources Development in Lao PDR

National Modeling Unit /Water Resources Research Center-WRC/ Water Resources and Environment
Research Institute-WERI

Water Resources and Environment Administration-WREA

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Modeling Unit
December 2009

ABSTRACT

The Lao PDR has rich water resources, its contribution about 35% of flow is running to the Mekong river so case study of the year 2009 which is selected Nam Khan River Basin. Furthermore, It is situated North of Lao PDR for Nam Khan rises from Nam Et-Phou Louei Protected Area which

Situated a source of water at Ban Napourk from Nam Et-Phou Louei Protected Area in the Huaphan Province where it provides habitats for various threatened bird, mammal and plant species. Previous research has shown land degradation results from agricultural practices and other activities upstream.

According BDP sub-area L1 about normal and fast track scenarios, it can estimate for future in Nam Khan basin where is created a livelihood and colorful ethnic-tribes of local for long time. This case study include flow change, climate change, land cover change and hydropower development scenarios. This basin is a rich natural resources in terms of in proportion to the population, with high potential for future economic growth and many potentialities for development. This watershed has a multitude of uses - agricultural, domestic, industrial, hydropower, tourism, fishing, navigation as well as associated cultural and spiritual values. Further development offers beneficial opportunities for the local communities, yet could also create potential conflict between upstream downstream users, as pressure on the water resources intensifies.

Nam Khan River Basin is very rich with forest and water resources and biodiversity which existing industry of eco-tourist of Luangprabang project. Its total catchment area is approximate 7,451 km². Watershed of Nam Khan is one of the most important watersheds in Lao PDR, providing water and water-services to the people of Luang Prabang, Xiengkhuang and Huaphan provinces. The Nam Khan river enters the Mekong mainstream at Luang Prabang where is tourist industry development (increases), particularly in the World Heritage city of Luang Prabang. For the near future it should be estimate as pressures on the watershed. Presently there are two proposed dams for the Nam Khan I and II tributary of Nam Ming. Minimal information is available about these dams, yet their construction and operation will impact on a local scale, as well as for downstream users.

A tools of Water Utilisation Programme (WUP) and Information and knowledge management programme (IKMP) are under the MRCS TSD were developed DSF in riparian country which assist from MRC DSF modeling team. It was setting up activities such as "National Case Study" from 2006 until 2009.

There are seven Subbasins of "National DSF Case Studies of Lao PDR" During 2006-2009, see Appendix 9-8. About a selection of basin using the national case study on 2009, it was to study the potential of water resources of Nam Khan River Basin by applying into Decision Support Framework (DSF). Weather and water use's time series data of the period 1996-2006 were applied. Results are under testing as such impact analysis tools and their interpretations.

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LIST OF ACRONYMS & ABBREVIATIONS

BDP	Basin Development Plan
DMH	Department of Meteorology and Hydrology
DE	Department of Electricity
DoE	Department of Environment
DWR	Department of Water Resources
DSF	Decision Support Framework – MRC’s suite of computer-based numerical modelling and knowledge based tools
GOL	Government of Laos
.gw	(HRU level file) Groundwater input file. This required file contains information about the shallow and deep aquifer in the subbasin. Because land covers differ in their interaction with the shallow aquifer, information in this input file is allowed to be varied at the HRU level.
HRU	Hydrological Response Unit
HYMOS	Hydrologic and Meteorologic Database at MRCS using HYMOS software from Delft Hydraulics, the Netherlands
IATs	Impact Analysis Tools of MRC DSF
IKMP	Information and Knowledge Management Programme
ISIS	hydrodynamic model which is a comprehensive software system developed by Halcrow and Wallingford Software, UK, for managing change in river basins.
IQQM	Integrated Quantity and Quality Model, river simulation model tool developed by the Department of Land and Water Conservation (DLWC), New South Wales, Australia used for planning and evaluating water resource management policies
KB	Knowledge Base (DSF Database)
Lao PDR	Lao People’s Democratic Republic
LNWRM	Lao National Water Resources Models
LNMC	Lao National Mekong Committee
LNMCs	Lao National Mekong Committee Secretariat
LMB	Lower Mekong Basin
MAF	Ministry of Agriculture and Forestry
MRB	Mekong River Basin including China-Hunan and Myanma
.mgt	(HRU level file) Management input file. This required file contains management scenarios and specifies the land cover simulated in the HRU.

MRC	Mekong River Commission
MEM	Ministry of Energy and Mining
MOPW	Ministry of Public Work
NAFRI	National Agriculture Forestry Research Institute
NMCS	National Mekong Committee Secretariat
PMO	Prime Minister's Office
.rte	(Sub-basin level file) Main channel input file. This required file contains parameters governing water and sediment movement in the main channel of the subbasin.
SCS	Soil Conservation Service (Under US Department of Agriculture)
.sol	(HRU level file) Soil input file. This required file contains information about the physical characteristics of the soil in the HRU
SMs	Simulation Models
SWAT	Soil and Water Assessment Tools
VNMCS	Vietnam National Mekong Committee Secretariat
WAD	Waterway Administration Division
WASA	Water Supply Authority
WERI	Water Resource and Environment Institute
WREA	Water Resource and Environment Administration
WRC	Water Resources Research Center
WUP	Water Utilization Program

CHAPTER I

INTRODUCTION

1.1 Background

The Mekong River Commission (MRC) is an international river basin organisation built on a foundation of nearly 50 years of knowledge and experience in the region. On the 5th of April 1995, Cambodia, the Lao PDR, Thailand and Viet Nam, signed the “Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin”. The main current modelling tools at MRCS, the DSF and the WUP-FIN tools, were developed and implemented within the Water Utilisation Programme (WUP) which lasted 2000-2006. The DSF was developed by the Halcrow Group consultants 2001-2004, with substantial involvement of riparian experts for data collection, checking and model set-up. International experts were trained to riparian modellers through both formal training sessions and on-the-job training and since 2001 and they became the core modellers of MRCS. In 2004 Decision Support Framework (DSF) has been developed by MRC/ Halcrow and Accepted by MRC Join Committee and approved by MRC Council so the DSF was used to evaluate different development scenarios and their impact on the hydrological regime of the Lower Mekong Basin (LMB). The results were documented in a report requested by and submitted to the World Bank in 2004. Since then the DSF system has been upgraded by fixing certain bugs and improving pre- and post-processing features of the system in 2006 and 2007. The original model setup has been refined and re-calibrated by the modelling team for better and more accurate results.

According of Component 4 of IKMP 's Work plan 2009 will further develop modelling tools that generate data and information for forecasting, decision making, planning and impact assessment. Activities wall also focus on building the MRC's and the national capacities for problem analysis, model application and the provision of decision support services. During the year 2009, Modelling Unit at the WRC/WERI, LNMC also Line Ministries have been selected one case study namely “NamKhan River Basins and Capacity building” into six new young Modellers.

Above study will use DSF model such as SWAT, IQQM and DSF Interface for one case study of number two as NamKhan River Basin which covers the fresh water part of the northern Lao PDR also upper Lower Mekong Basin(LMB).

Based on the experience from this national case studies during the year 2009, modellers of Lao PDR have been receiving experiences for applications of DSF models which are often complex and in general very data intensive also learning by doing and complete the national case studies has been the biggest workload in 2009. Their output will be usefull for preliminary a forecasting of water resource, decision making, water resources planning and impact assessment tools whole NamKhan River Basin.

New Modeling team was received a studying of integrated model during calibration in each sub-basins including a suite of model components simulating the flow on series of SWAT parameters such as overland also in the unsaturated and saturated zone, evapotranspiration losses to the atmosphere including evaporation from underground and an extension of the IQQM such as a description of rivers/canals, flows into irrigation water uses , return flow water demands,

junctions and outlets. The technical calibration including hydrological management is the key for better improving within skills of Lao modelers also enhancement of DSF utility in Mekong riparian state member.

1.2. Justification

1.2.1 General Description

Nam Khan river basin is located in the northern region of Lao PDR (see Figure 1.1) and is characterised by rugged terrain interspersed with narrow valleys along rivers and streams starting from source of water where is Houaphan Province through Xienkhong and finally Luangprabang province also rivermouth is world heritage city. It is significant tourist industry for using water level of Namkhan. Due to surface of Nam Khan basin is estimated that more than 80 % of area is mountainous which limits the area of land available for paddy land development, and dictates that upland rain fed farming systems dominates the landscape.

People is used paddy land on the higher altitudes there are isolated pockets of elevated rolling plateaus which support both natural forest and grasslands, and are used by highland villagers to raise cattle also.

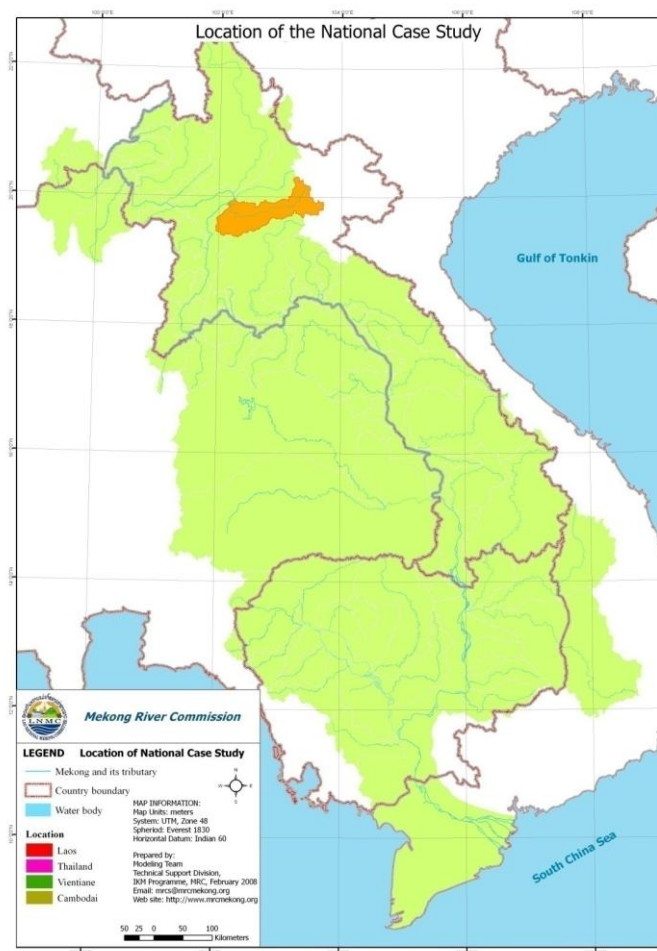


Figure 1.1. Location of Nam Khan Basin

The situation of Nam Khan area is almost limited areas of natural forest remaining, the most important and least disturbed being from the Nam Et- Phou Loie National Biodiversity Conservation Area (NBCA) and two adjacent areas, bordered by the Nam Khan River.

These areas still have fairly rich forest stands and support a range of protected wildlife species. They are also important non-timber forest production areas and livelihood contributors for villagers. Other areas in the District were declared as Provincial Conservation and Provincial Protection Forests in 1996, however the status of these requires a review because they have been degraded by upland cultivation. Nam Khan catchment is located a main part of three provinces such as Luangprabang and Xiengkhoung and Houaphan. The are five districts of Luangprabang such as Luangprabang , Xieng Ngeung, Phonexay, Phoukhoun and Nan, two districts of Xiengkhoung provinces such as Kham and Phoukout and three in Houaphan province namely Viengkham , Houameung and Viengthong (see figure 1-2 and table 1-1).

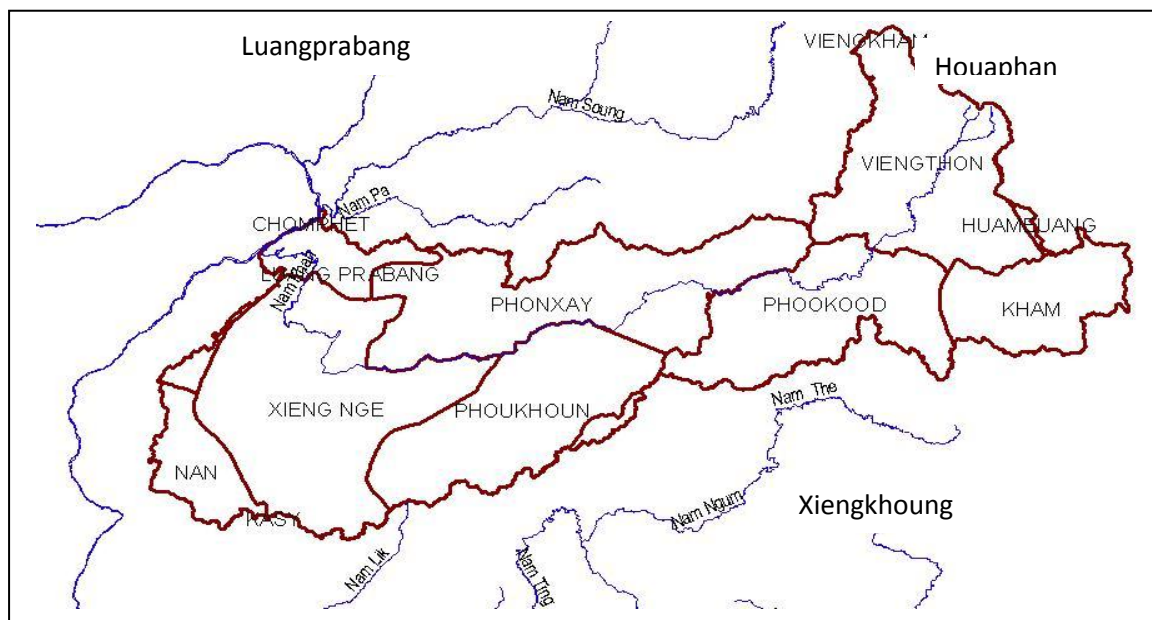


Figure 1-2: Map of province and district of Nam Khan basin

The Total of whole Catchment area is 7,451 Km² and a calculate of drainage area is up to observation point at Ban Mixay station has 6,100 Km² .

Table 1-1 Names of District in Nam Khan River basin

Names of Provinces	Luangprabang	Houaphan	Xiengkhoung
Names of Districts	Luangprabang	Viengkham	Kham
	XienNgeung	Viengthong	Phoukout
	Phonexay	Houameung	
	Phoukhone		
	Nan		

According Appendix 9-2 with map of SWAT Sub-basins in page57 Nam Khan river profile with comparison of MSL, it indicated slope of river see figure 1-3.

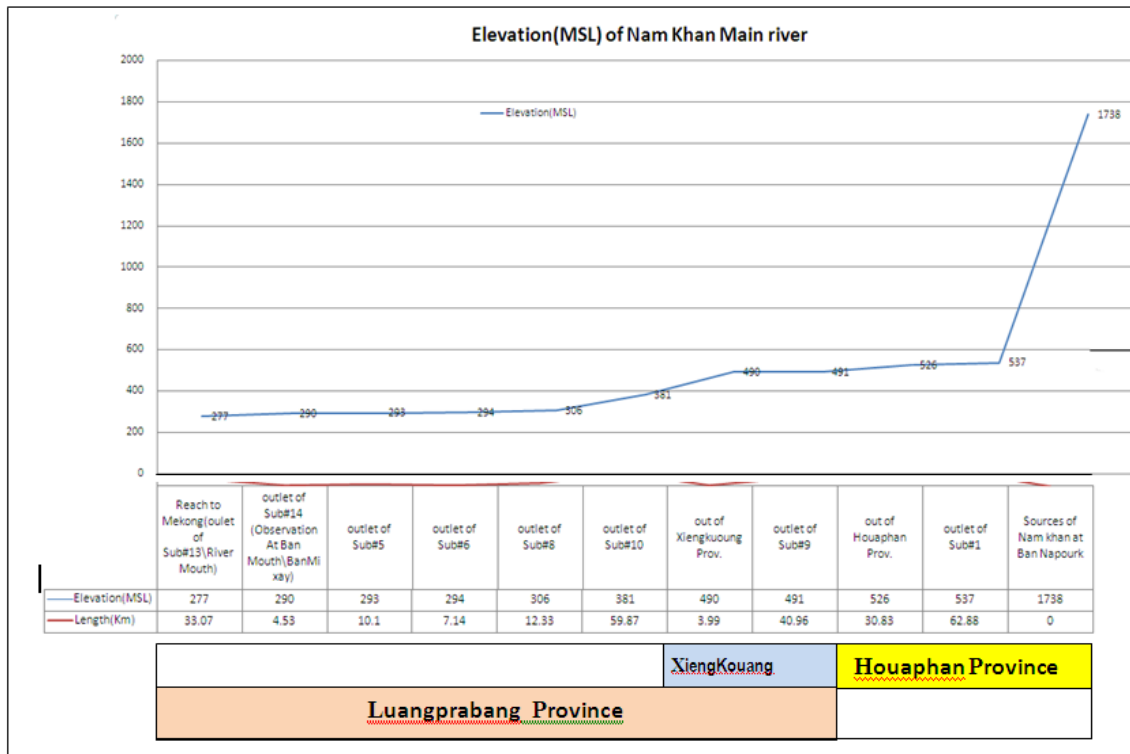


Figure 1-3: Diagram of Elevation along Nam Khan river

1.2.2 Socio-Economic Characteristics

Number of Villages in the Nam Khan river basin has 241 and total Population is 118,854.

They can divided population such as male of 59,777 and female: 59,077 (Data Sources

at the Department of National Statistic Center-DNSC2005). It is created livelihood and colorful of ethnic-tribes of local for long time. A flow of Nam Khan river is through Houaphan, Xiengkhoung and Luangprabang Provinces than finally flows itself into junction of the Mekong mainstream at the Luangprabang city where is located at the outlet of sub-basin number 13 also it is situated a world cultural heritage site by UNESCO in 1996 so along Nam Khan river is significant for future development of eco-tourist. Here, it is a colourful about a cultural, aesthetic, historical, economic and biodiversity values that comprise Luang Prabang's World Heritage status critically depends on a functioning ecosystem and the quality of goods and services it provides to upstream and downstream stakeholders.

Though there is high rate of poverty in this area, the NamKhan River Basin is strong in that the basin is still rich in land, water, forest, biodiversities and other natural resource, and rich in cultures and colorful of ethnic-tribes. The use of water, land, forest and related natural resources for economic development are un-sustainable due to poor management and inadequate practice. The forest lost has been reported very high in this basin but the basin is still rich in natural resources, support from the government policy and regional cooperation is ongoing. There are great opportunities for development in the basin, including forestry development, agriculture and animal husbandry, fisheries, flood management and mitigation, eco-tourism along Nam Khan river

is significant from Xiengngeung into Luangprabang districts, hydropower, river transports(Navigation), multi-sector development, more income for local people through non-timber products trade. As water resources are the key factor for tourist and agriculture in this river basin in the past there is no study in details on the potential of water resources and opportunities for development in the Nam Khan basin.

1.2.3 Water Resources Characteristics

The source of the NamKhan river is located at the Ban Napouar in Viengthone district-Houaphan province. The average annual rainfall in the basin is 1,300 mm while the annual runoff is about 600mm. The length of the NamKhan river is approximately 265.7 km.

Nam Khan River is a tributary of Mekong River which has four main tributaries such as Nambak, Namming, Namkhao, and Namthouang see Figure 1-4. Ban Mouth(Ban Mixay) has been selected as a gauging station in 1996 for avoiding the effect of back water from river floods in Mekong. National water resources planning should suggest that from Nam Ming at Phoukhoun to connect a junction of Nam Khan through sub-basin numbers 11,8,12,14 and 13 for a development of eco-tourists so a discharge should be a maintain water level . It is available data if measurement of discharge. We are an average flow from 1996-2005 and it is approximate 99 m³/s at the gauge station Ban Mouth(Ban Mixay).

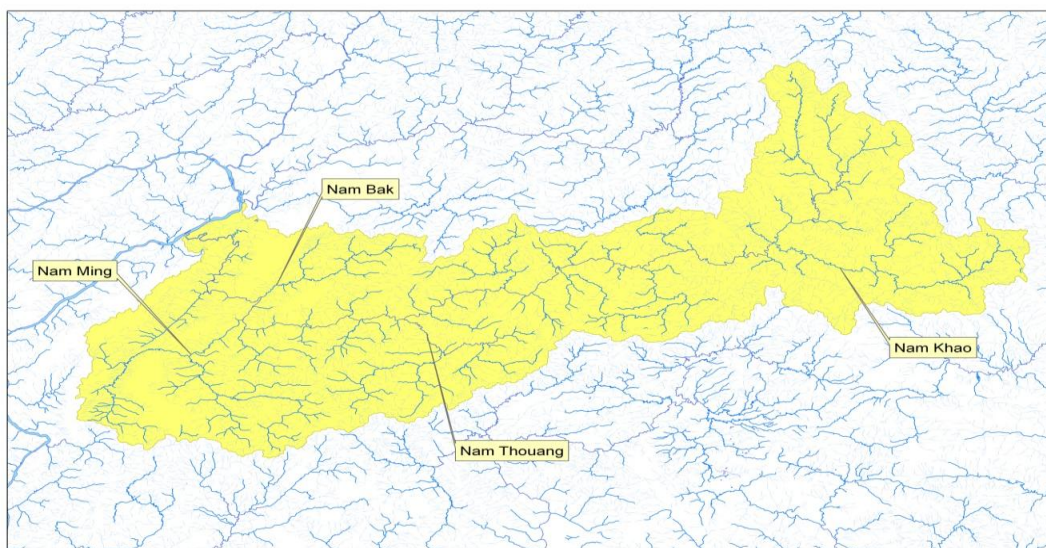


Figure 1-4 Main tributaries of NamKhan basin

More detail of small stream, if a data processing in GIS river map, they are interest other names of Nam Khan sub-tributaries (samml name of rivers) are show see Figure 1-5 .

