



CHAPTER I

INTRODUCTION

Geomorphology is one of geological disciplines concerning precisely with the study of the size, shape, and origin of landforms. Its application will be related to many works, for example, engineering, other physical sciences, land planning, and even archaeology. In general, geomorphological data is the useful basic data for any physical planning and management of any area development including further other physical science studies. It could be good of the geomorphology of Thailand is talked about in general. Then, concentrate to the lacking of this type of study in the study area.

Along the northern and western regions of Thailand, which is well known as the area of north-south mountain ranges and basins, the study of geomorphology has not been paid enough attention. Generally, the area is composed of several large and small intermontane basins. These basins have been reported to be filled by the greatly thick lacustrine and fluvial Cenozoic sediments, particularly from Miocene to Quaternary (Piyasin, 1985).

The area between Amphoe Sam Ngao and Amphoe Ban Tak, Changwat Tak, is one of river basins, which seems to have been filled by fluvial sediment. This basin is bounded by the western and eastern mountain ranges. According to Boripatkosol *et al.* (1989), the western range built up by Precambrian (?) and Silurian-Devonian rocks and called the Doi Mun Luang Mountain Range; whereas, the eastern Triassic igneous range is defined as the Khao Luang Mountain Range. These ranges run parallel to N-S direction.

There are two main rivers, the Ping and the Wang Rivers. The Ping River currently flows southward from northwest of the area and then joining with the Wang River, which drains southward from the north of the area, in the middle part of the basin. The Ping River is one of the main old rivers in the north of Thailand showing dominantly various landforms caused by fluvial processes. In particular, in the area that the Ping joins the Wang, many spectacular fluvial landforms, paired and unpaired river terraces, for example, are the legacy of such processes. Therefore, it is very impressive that this area is of interest and seems to have complete fluvial geomorphology for studying in details. In addition, it is fortunate that lots of quarries and sedimentary exposures are well available for detail stratigraphical study, which can be used as one of standard fluvial area in the country. The other benefit is

expected to represent the basic concept of fluvial geomorphology in relation to the genesis and also further applications as well.

Objectives and outputs

To conduct the detailed study of geomorphology of the Ping and the Wang River Basin at Sam Ngao–Ban Tak area, Changwat Tak, the purpose of the study is: 1. to separate and delineate boundary of each different geomorphological unit. 2. to characterize kinds of surficial material from different geomorphological units. 3. to work out on the relationship between sediments and their depositional environment.

The outputs of this research will provide information on: geomorphic data of the area as final geomorphological map, relation between stratigraphic units classified based on geomorphology, and the evolution of fluvial landforms. The other benefit expected is to recommend the appropriate application for planning and using of the land, further agricultural activities and also geological construction material resources.

The study area

The study area is sandwiched by high mountainous zones, which are parallel in the east and the west of the Ping and the Wang Rivers. These mountain ranges control the meandering belt of these two rivers. Thus, the varieties of fluvial landforms are strictly controlled to form only within the area.

Sam Ngao–Ban Tak area locates about 20 km to the north of the center of Amphoe Muang Tak. The northern part of this area adjoins Amphoe Mae Phrig and contacts to the east by Amphoe Muang Tak. The study area is bounded by Doi Mun Luang Mountain in the west and Khao Luang Mountain in the east and covering from the upper boundaries are approximately at latitude $17^{\circ}02'$ to $17^{\circ}15'$ north and longitude $99^{\circ}00'$ to $99^{\circ}10'$ east. The total area is approximately 400 square-kilometers.

Physiography

The study area represents physiographically by an alluvial plain and undulating plain. The Ping River flows from southwest part through the middle part of the area; whereas, the

Wang River flows downward from the north and joining together with the Ping River in the middle part of the area. In general, the area can be broadly divided into three main physiographic regions as mountainous terrain in the west, hilly terrain in the east and undulating and low alluvial plains in the middle part of the area. The western Doi Mun Luang mountain range is partly of Thanon Thong Chai mountainous zones, which shapely elongate as mountainous terrain with slope a bit rather greater than 35 degrees. The undulating terrain occurs as wide gentle slope region and lies parallel to the Ping River and mountain range in the west. This terrain locates in the middle part of the area along both sides of the highway number 1. The last region, along the both sides of the Ping and The Wang River, is an alluvial plain with slope 0-2 degrees and lies between 100-300 meters above mean sea level. Agricultural activities are observed at the moment in this region.

Climate

According to Koppen's classification, Changwat Tak is classified into Tropical Savannah: Aw with 3 seasonal changes (Thongplaew, 1988). Rainy season is present normally from May to October. Consequently, cold season begins from November to February; whereas, summer period commences annually from March to April. The study area is also classified as rain shadow region. The average rainfall in the area is about 943.7 mm/year. Rainfall usually begins from May, reaches its maximum in September and then declines gradually in October. The mean monthly maximum temperature ranges from 23-40.6 °c in the summer and the maximum usually reaches their peak in April. The mean monthly minimum temperature may fall to 12.1-25 °c in December and January.

Accessibility

The study area covering Sam Ngao and Ban Tak districts, north of Changwat Tak, is about 500 kilometers away to the north from Bangkok Metropolis. The accessibility to the study area is illustrating in Figure 1.3. It can be accessed comfortably, firstly follows the highway number 1 from Bangkok to Changwat Ayutthaya, then changes to the highway number 32 to Changwat Singburi and once again joins the highway number 1 and continues throughout Tak township. Amphoe Ban Tak locates approximately 20 kilometres to the north of Changwat Tak. It is expected to take about 6 hours travelling by car from Bangkok Metropolis to the study area.

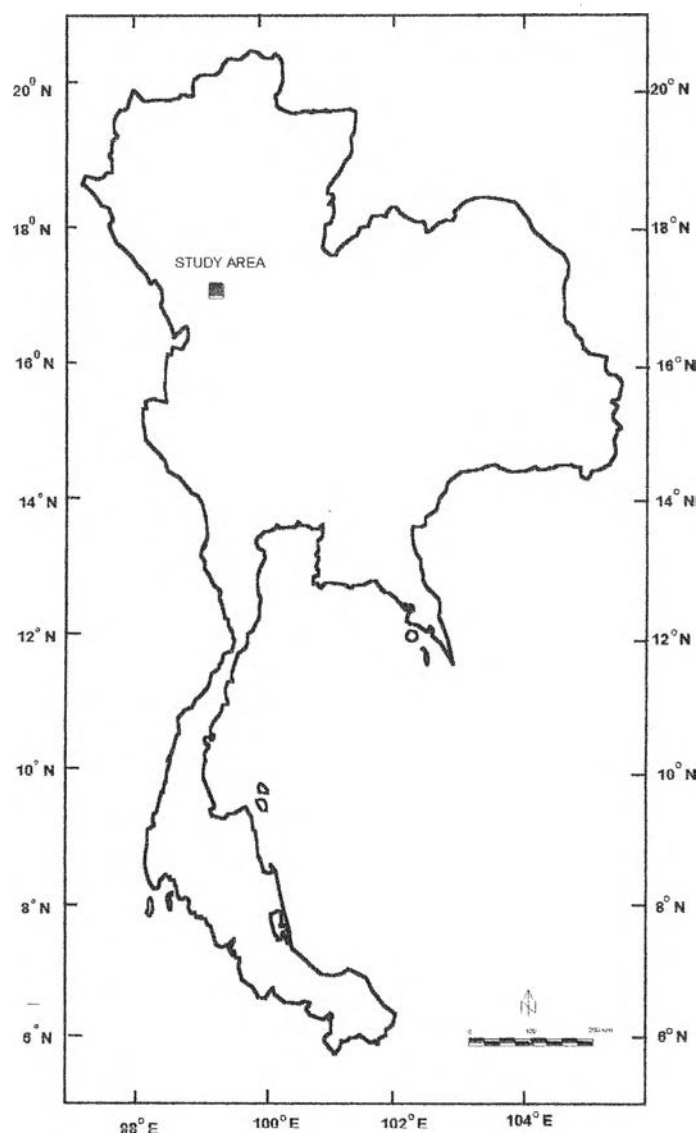


Figure 1.1 Index map of Thailand showing the location of the study area.

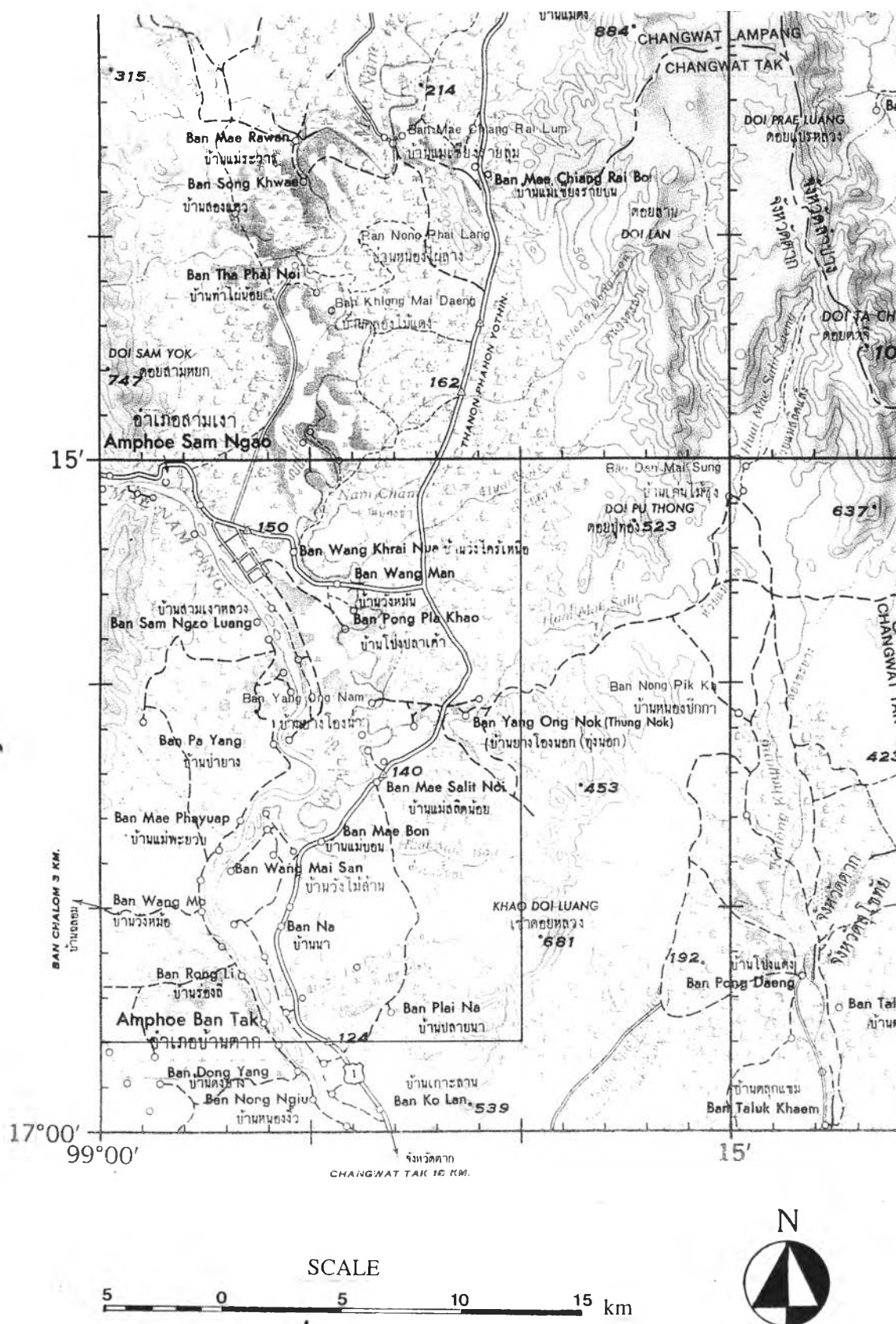


Figure 1.2 Topographic features of the study area, Sam Ngao and Ban Tak area.

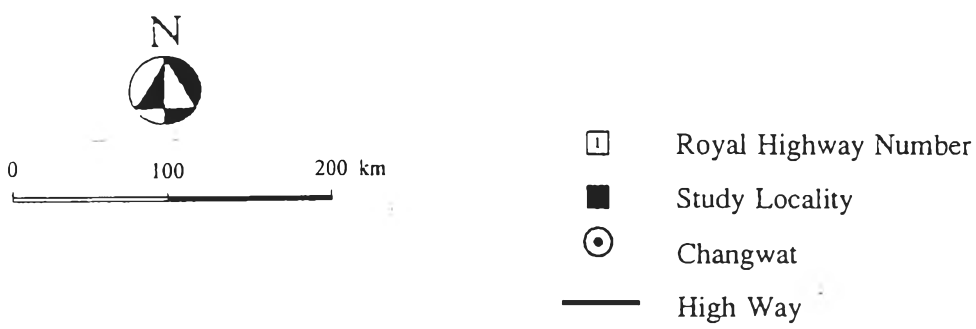
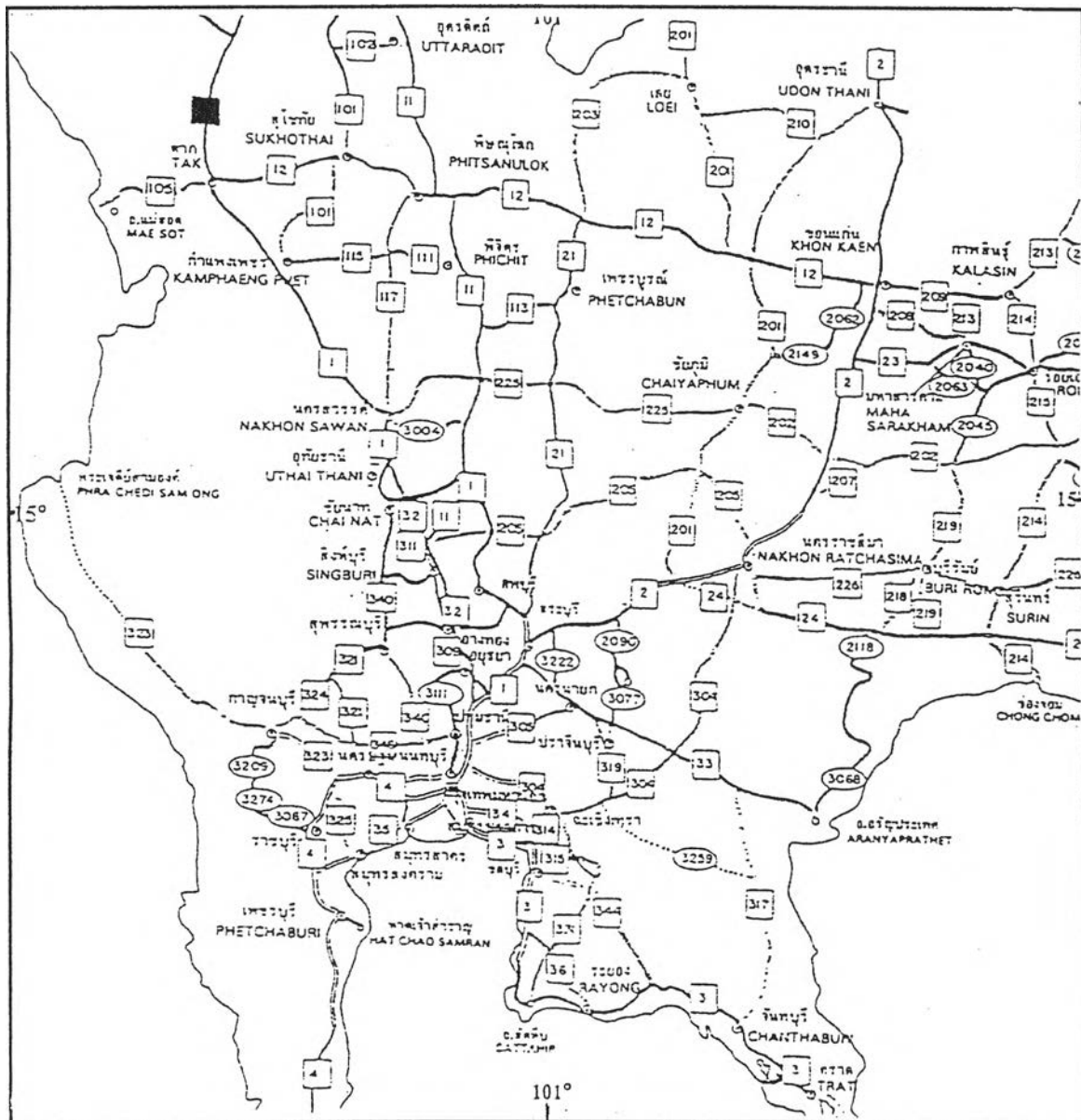


Figure 1.3 The accessibility of the study area.

Previous works

Eventhough, there are some of geological studies and soil survey reports in this region. No geomorphologic study has been specifically carried out in this area before. Hereinafter is the list of relevant publications, which benefit to this work.

Takaya (1968) published one of the important works on entitled “Quaternary Outcrops in the Central Plain of Thailand”. The main purpose is to describe 140 representative Quaternary outcrops that were located in the plain. A tentative stratigraphic classification of the Central Plain separated to be parts is also proposed in the paper as shown in Table 1.1. The stratigraphic classification has been done based mainly upon the field observation.

Eiumnoh (1983) studied geomorphological units and development of high river terraces in a graben of Changwat Petchabun. He suggested that the geomorphological units of the area are composed of denudational landforms, for example, fluvial landforms consisting of river bed of perennial stream cut in solid rock, river-built plains, river terraces, alluvial fans, karst landforms, water body and man-made landforms. It was concluded that the high river terraces were developed from dissected old alluvial fans that derived from transportation and re-deposition after the graben faults taken place during the Pleistocene epoch.

Thiramongkol (1983) investigated two small intermontane basins in the north of Thailand and revealed that the basins were composed of Pleistocene terraces and Holocene floodplain and infilled valley bottoms. He concluded that these landforms were influenced of Tertiary and Quaternary tectonisms in association with climatic changes in this area.

Kaewyana (1985) investigated the surficial deposits in Mae Tang Basin, about 40 kilometers north of Changwat Chiangmai. He suggested that the intermontane Mae Tang Basin is a fault-block, the depressions of which follow the NE and NW structures. It has been a site for deposition of lacustrine and fluvialtile sediments. The basin fill consists of elevated former alluvium, present floodplain alluvium, channel and bank deposits and alluvial fan deposits. However, the surficial deposits underlying the sedimentary plains in Mae Tang Basin can be divided into 6 mappable units. They are meander belt sand and silt, natural levee sand and silt, floodplain silt and clay, alluvial fan sand and silt, low terrace

sand, and high terrace silt and sand. Tectonic uplift of the area caused rejuvenations of these former rivers, leaving floodplain remnants as terraces above the present river level.

Sarapirome and others (1986) studied area covers Lampang urban area and the vicinity, a part of Lampang Tertiary Basin. The study reveals that the Cenozoic sediments are composed of 2 types of deposits in the Tertiary period, which are undifferentiated deposits and lacustrine deposits, and 3 types of deposits in the Quaternary period, namely, coarse alluvium deposits, sandy braided-fluvial deposits, and meandering deposits. Furthermore, the Quaternary sediments can be separated into alluvial-fan and braided-channel deposits, braidplain and valley-fill deposits, sandy bar deposits, floodplain deposits, natural levee deposits, meander-belt deposits, and channel-lag deposits. The sedimentary characteristics, general stratigraphy, age identification evidence, and the possible reconstruction of depositional environments of the deposits are described.

Bishop (1989) studied Late Holocene alluvial stratigraphy and history in the Sisatchanalai area, North Central Thailand and suggested that the fluvial system in this area has been extremely active over the last two millennia. He concluded that the landforms in this area comprise terraces, upper-floodplain, and lower-floodplain. The present upper and lower floodplains adjacent to the Yom must post-date channel avulsion about 1800 years BP. The terrace surface is as yet undated but the incision necessary to leave it, as "terrace" must also post-date the channel change. He showed clearly on recent Holocene deposit of floodplain in close relation to archaeological sites.

Choowong (1996) studied the Quaternary Geology Related to Gemstone Deposit in Bo Phloi Basin, Amphoe Bo Phloi, Changwat Kanchanaburi. He distinguished the units into three categories based on geomorphological integrity as denudational origin, fluvial-colluvial origin and fluvial origin. The dominant features of fluvial origin consist of high terraces, middle terraces, low terraces and floodplain that occur extensively on both sides of the Lam Ta Phoen perennial channel. The benefit of this work is that the genesis phase of gemstone related to its geomorphology and the evolution of the Quaternary sediment.

Piyasin (1974) published geological study in this region; when he was in Geological Survey Division, Department of Mineral Resources. His geological map with a scale of 1:250,000 Changwat Uttaradit was published. It covers the study area as well. The rocks in this area comprise Precambrian (?) hard rocks to soft Quaternary sediments.

Triassic granite and unconsolidated sediments can be seen in the eastern mountain range and the central part of the basin. The western mountain range represents the Precambrian (?) rocks. In 1989, Boripatkosol and his colleague have been carried out a detail geological survey for geological map scale 1:50,000 Amphoe Mae Phrig and Amphoe Ban Tak. They found that the western mountain range of the area of Amphoe Ban Tak represents the Silurian-Devonian rocks of Don Chai Group. It contacts eastward with the Precambrian (?) rocks. There are the groups of Triassic volcanic rocks in the north of this area. Furthermore, they divided the unconsolidated sediments into terrace, floodplain deposits and meandering belt deposited during Quaternary period. In the same year, Thongpleaw *et al.* surveyed the suitable of soil and published soil map of Changwat Tak. They concluded that the landforms of the area were divided into floodplain, semi-recent terrace or surface, old alluvial terrace, and erosion surface and mountainous area.

There are a few geomorphological publications outside this region. This chapter mentions only the most important of them.

Table 1.1 Tentative stratigraphy of the Central Plain (Takaya, 1968)

Area		Northern basin	Nakhon Sawan area	Southern basin	Calcareous deposits
Stratigraphical unit					
Holocene		Floodplain (sandy)	Floodplain (sandy)	Deltaic plain (clayey)	Floodplain (sandy)
		Terrace I	Terrace I	Deltaic plain	Terrace I
		Formation I (loamy)	Formation I (clayey)	Formation I (clayey)	Formation I (clayey)
Pleistocene	Last glaciation	Terrace II	Terrace II	Terrace II	Terrace II
	Penultimate glaciation	Formation II (clayey)	Formation II (clayey)	Formation II (clayey)	Formation II (clayey)
		Terrace III	Terrace III		
	Antepenultimate glaciation	Formation III (sandy)	Formation III (sandy)	?	
		Terrace IV (?)	Terrace IV (?)		
		Formation IV (sandy)	Formation IV (sandy)		Calcareous deposits
		Low-level peneplain	Low-level peneplain		
Pliocene	High-level peneplain	High-level peneplain			