CHAPTER VI

DISCUSSION AND CONCLUSION

The purposes of this study are aimed at to map any of geomorphologic units all over the study area, to identify any kinds and characters of sediments and to look at the relationship among the sediments, their processes and their depositional environment. In Chapter IV, the descriptions of landforms as its forms and the deposits have been mentioned, whereas the sedimentary petrography of each particular landform was described in the previous chapter. This chapter will provide an outline of large-scale basin development. In addition, the benefit of this study is also recommend for further land use.

Evolution of the Basin

The Sam Ngao and Ban Tak area is situated in the northern basin of the Central Plain (Takaya, 1968). It is bounded by western and eastern mountain ranges in the north of Changwat Tak. Geologically, according to Piyasin (1974) and Boripatkosol *et al.* (1989), Precambrian (?) gneiss represent the oldest rock unit in the area. Silurian-Devonian rocks, which mainly consist of quartzite and schist, are reportedly exposed in the west. Intrusive igneous rocks known as Tak Triassic Batholith crops out in the east. Volcanic igneous rocks occur in the north of Triassic granite. They consist of andesitic and rhyolitic rocks. All the rocks present around the margins of the basin are thought to be main sources of the Cenozoic deposits. The Quaternary deposits are the youngest and can generally be divided into unconsolidated terrace deposits and alluvial filled.

Landforms in the study area have initially caused by the difference of deposition, natural weathering, erosion and mass-movement processes since Tertiary. The occurrence of laterite in the high terrace and middle terrace could be able to estimate the age of the deposits based upon the degree of compaction comparing with the same aspect of neighbor areas of the country. For example, the relative age of high terrace has been estimated to have formed during Late Tertiary to Early Pleistocene by comparison with some of terrace evidences in the Central Plain.

The variety of landforms presented in the study area can be grouped mainly into 3 categories. Firstly, units of denudational origin consist of mountain and hill areas of

Precambrian (?) gneiss, Silurian-Devonian quartzite and schist, Triassic granite and Triassic volcanic rocks. Secondly, unit of colluvial origin represented mostly colluvial deposit. And thirdly, units of fluvial origin are Tertiary landform unit, terraces, floodplain, natural levee, point bar and sand bar.

The idea regarding the formation of terraces are varies and still open to discussion. Tectonic or climatic change are the principle factors usually regarded as being responsible for alternating episodes of deposition and down cutting (Thiramongkol, 1975). Most tectonic subsidence being affected areas have caused the deposition of up to several hundred meters thick of complex sediments (Kukal, 1971). Thiramongkol (1983) also suggested the terraces found at various levels reflected the effect of both former climatic changes and tectonism. In this regard, tectonic movements and rapid denudation seem to have influenced the mode of geomorphologic evolution. Since rapid erosion of the weak rocks under the prevailing humid conditions has led to the variations of local base level, terraces are the ample clue to indicate that the present topographic relief probably originated as a result of tectonism during Tertiary and Pleistocene.

Landforms in the study area are at four different levels, including the highest level of Tertiary landform unit, high terrace, middle terrace, and low terrace. They can be distinguished by their altitude. As mention above, these terraces are probably influenced by their structure controlled underneath. The north-south fault across in the west of the basin can be traced as one of surface evidences of small tectonic adjustment.

The global Pleistocene climatic changes seemed to influence geomorphologic evolution of the area. Outcrops of Tertiary landform unit at Ban Mae Bon shows sharp contact of younger sediments overly the older pebbly sandstone and conglomerate. It is believed that the deposition of older sediments and the formation of pebbly sandstone and conglomerate occurred during a humid tropical interglacial. The younger sediment on the top was deposited under sub-aerial erosion which was most pronounced the alternate period of drier and cooler climatic fluctuations. Younger sediment deposited by a result of subsidence is probably accompanied covering the older pebbly sandstone and conglomerate bed beneath. Similarly, there is a sharp lithological discontinuity between the younger sediments in the upper part and the lateritic gravel beds in the lower part of high terrace. This is probably due to the lower deposit accumulated during the postglacial, follow by the erosion during dryer period, and the phenomena in tern continued as above. Therefore, it can be concluded that

the geomorphological evolution of the area is influenced by Tertiary and Quaternary tectonism in association with Pleistocene climatic changes.

The assumption concerning the evolution of this basin related to its geomorphological landforms and sedimentary deposits are describe as follow and is concluded in Table 6.1.

Phase I: Landforms have been developed since Tertiary. After tectonic subsidence is expected to have occurred, the accumulation of alluvium has deposited consequently. Then the uplifting of alluvium has later on led to sub-aerial erosion. After that, system of braided river has been developed on the deposit. The river developed river terrace into four different levels. These landforms are Tertiary landform unit, high terrace, middle terrace, and low terrace. They range relatively in age from Tertiary, late Pleistocene, middle Pleistocene and late Pleistocene, respectively.

Phase II: From Late Pleistocene to recent, the present alluvial plain has been developed. The Ping River became braided; whereas the meandering of the Wang river was dominant. Floodplain, natural levee, point bar and sand bar have developed by the result of braiding and meandering.

Table 6.1 Evolution of the Ping and the Wang River Basin related to their geomorphological landforms

Phase	Events	Relative age
I	Tertiary landform unit developed after uplifting, followed by high terrace, middle terrace, and low terrace	 - Tertiary - Pliocene to Early Pleistocene - Middle Pleistocene - Late Pleistocene
II	The Ping became braided and the Wang became meandered leading to the formation of alluvial plain.	- Holocene

Conclusion

- The geomorphological unit in Amphoe Sam Ngao and Ban Tak area can be divided into 3 units of denudational origins, 1 unit of colluvial origin and 8 units of fluvial origins. Firstly, the units of denudational origins are of metamorphic rocks, sedimentary rocks, and igneous rocks. Secondly, colluvium represents the units of colluvial origin. Thirdly, the units of fluvial origins are classified as Tertiary landform unit, high terrace, middle terrace, low terrace, floodplain, natural levee, point bar and sand bar.

- Due to the results from laboratory analyses, the roundness of pebble from Tertiary landform unit and terraces indicate fluvial environment. The gravel deposits are transported from upstream sources, which shown by the difference of pebble composition. Since the Wang River drained throughout the volcanic rock in northeastern part of the area, it should probably have flowed at the time of the formation of the lower Mae Salid high terrace. It is due to ample demonstration in the pebble associations.

- The features of each terrace are similar in their roundness of pebble and differ slightly in pebble association. However, They are different in the degree of dissection, degree of diagenesis, relief and lateritic features.

- The bad sorting of fine particle leads to great variations in stream velocity during the deposition, whereas the coarseness of the pebbles and the large area where the sediment has been spread out are able to confirm that they formed in braided river conditions. In short, this region has been covered with sediment by a system of braided rivers, switching and wandering laterally over great distances.

- From the thickness of the sediment, the broad area of terraces and the petrology of sediments, it can be concluded that the material from Tertiary landform unit and terraces was deposited by system of braided rivers. These rivers flowed through zone of intramontain plains. Moreover, tectonic subsidence of an area causes the deposition of up to a hundred-meter thick complex of sediments.

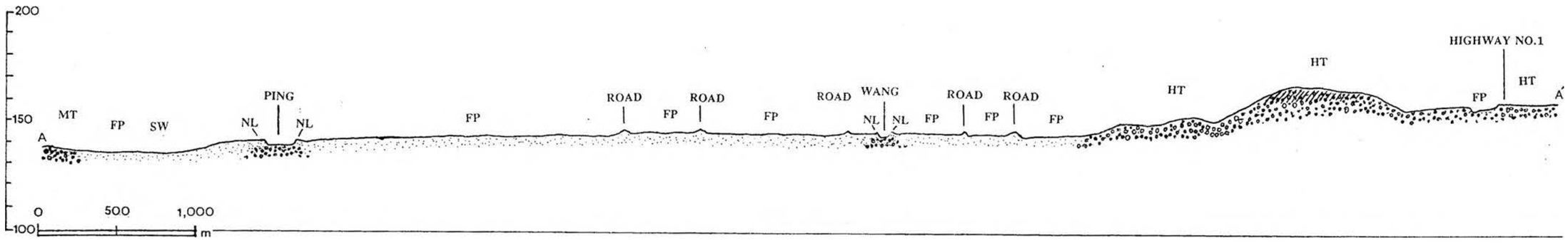
- During the rest of the Pleistocene and the Holocene, the climatic changes might have played the significant role to the change in a local base level. In addition, small tectonic adjustment is expected to have occurred making the basin more stables. Deep and

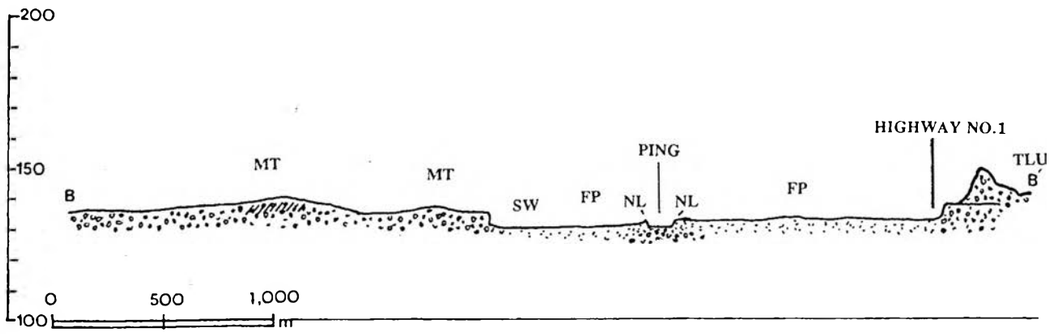
very thick sediments and surface east-west sets of faults cutting through the deposit will also be able to conclude that tectonism is also responsible for the formation of thick deposit in particular Tertiary and late Quaternary landforms.

Idealizes cross sections through the study area is shown in Figure 6.1. Geomorphological units, their characteristic, and possible age of each landform in the Ping and the Wang River Basin are summarized and present in Table 6.2.

Table 6.2 Relative age of the landforms in the study area.

Geomorphological units	**Lithological Characteristics**	**Possible age**
Tertiary landform unit	Several cycles of unconsolidated to consolidated gravel, pebbly sand, and sand. High degree of diagenesis. High degree of erosion. Fault cross- cut the deposit. Relief about 100 m.	Tertiary
High terrace Middle terrace Low terrace	Gravel bed with laterite 0.7-2.1 m thick. Gravel bed with laterite 25 cm thick. Gravel bed covered by sand layer with heavy concentration of iron oxide concretion up to 20 cm.	Plio-Pleistocene Middle Pleistocene Late Pleistocene
Floodplain	Sand, silt, and clay.	Holocene
Natural levee	Sand, and silt.	Holocene
Point bar	Pebbly sand, sand, looses.	Holocene
Sand bar	Pebbly sand, sand, looses.	Holocene
Colluvium	Rock fragment of quartzite, wide range of degree of diagenesis of surficial material and high degree of erosion shown as cliff.	Middle - Late Pleistocene to Holocene





LEGEND

TLU = Tertiary landform unit

HT = High terrace

MT = Middle terrace

NL = Natural levee

FP = Floodplain

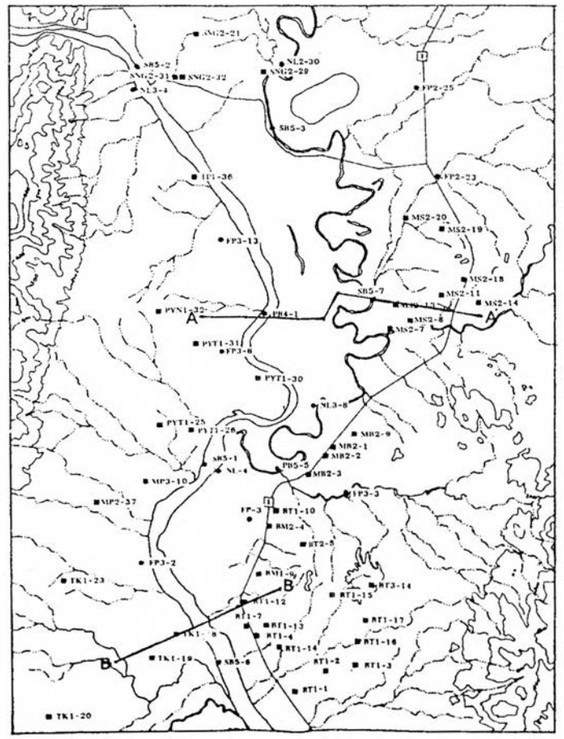


Figure 6.1 Idealizes cross sections through the study area.

Application

Besides the scientific value of detailed geomorphological maps in this study, it may serve amongst others purposes as follow.

Planning data, important for regional planning, which can be obtained from data on the distribution of plains, valleys, depressions, slope inclination, slope movements, erosion processes, areas liable to flooding, etc.

Geomorphological boundaries are also often soil boundaries. It means that this map can be used in soil surveys and mappings. The slope angle affects the conditions for agricultural work and the possibility of mechanization. It also supply the engineers with a lot of data important for designing of settlement, industrial plants, flood protection works, etc.

The Tertiary landform unit and terrace units, the gravels were commonly deposited. A large quantity of gravel deposit in these units is essential and can be used as construction materials purpose. The floodplain unit, the deposits are composed mainly of sand, silt and clay and because of their gentle gradients, relatively good water supply, and fertile soils, these plains are of great agricultural. Moreover, in the point bar and sand bar deposit, the great sand deposit can be served as the construction material.