CHAPTER VI

CONCLUSION

Li basin is one of the Tertiary intermontane basins located in Changwat Lamphun, northern Thailand. The importance of the Li basin is basically owing to the coal deposits which has been currently exploited by private companies. The area has been chosen for detailed study on the basis of adequate subsurface geological and geophysical data and information for sedimentological analyses. It is anticipated that the records of the basin will be destroyed by the current open-pit mining operations, and the study regarding this aspect will be a non-replaceable contribution for future reference.

The study area is mainly confined within the main sub-basin of the Li basin covering on area of approximately 500 square kilometres with altogether 616 drill-holes of total depth of 47.56 kilometres. Among these, there are existing 228 boreholes with geological and geophysical logs.

It is concluded that the Li basin began to form in the Eocene time (?) by relative movement of the Mae Ping Fault Zone and the Uttaradit Fault Zone respectively to the order of the time. This is basically due to the fact that the Tertiary Period marked the resume instability of block and strike-slip faultings. The collision of the India and the Eurasia plates during the Himalayan Orogeny in Eocene to Early Miocene is regarded to be responsible for the formation of graben or tilted fault-blocks in the northern part of Thailand which

are expressed geomorphologically as intermontane basin.

The Li intermontane basin is considered to be an intracratonic basin where sedimentary sequence in this basin records initial isostatic subsidence followed by a thick sedimentary- infill history. Based on the subsurface exploration drilling data of the Li basin, there are at least 5 separate sub-basins, notably, Ban Pu, Ban Hong, Ban Mae Long, Ban Pa Kha, and Ban Na Sai-Ban Mae Wang mostly lying in the easternmost part of the Li basin from north to south, respectively. On top of this, the remaining areas are in the western, middle and eastern parts of the Li basin.

Many lines of evidences indicate that the oldest sediments in the basin is of Eocene age, and the Cenozoic sedimentary sequence in the basin is non-marine clastic with total thickness of approximately 500 metres in the deepest part of the basin. The Tertiary sequence can generally be subdivided into 5 main successions. The lowermost succession is represented by alluvial fan overlying unconformably the pre-Tertiary basement rocks. Lithologically, the succession is characterized by the association of coarse- and medium-grained clastic deposits. The second succession lies conformably on the lowermost succession with an abrupt change in lithological characteristics to mainly fine-grained clastic sediments and some medium-grained clastic sediments of meandering fluviatile facies at Ban Pa Kha sub-basin. The third succession is characterized by thick coal seam with some clay partings. The fourth succession overlies conformably the third succession with a gradational contact. Lithologically, the succession is characterized by fine-grained sediments associated with some medium-grained clastic sediments of

braided fluviatile facies. The fifth succession underlies unconformably the Quaternary alluvial deposits. The succession is characterized by the coal seam with partings and fine-grained clastic sediments associated with medium-grained sediments of meandering fluviatile facies. The uppermost succession is characterized by the fine- to coarse-grained clastic sediments of alluvial fan facies and fluviatile facies of present river. Generally, the succession also shows the westwardly thickening characteristics similar to the other two underlying successions.

It is noted that these lithologically successions are present in the 5 main sub-basins and are partially present in the external sub-basinal areas. The lithological succession of the external sub-basinal areas is mainly fine-grained clastic sediments of lacustrine facies interrupted by medium-grained sediments of fluviatile facies.

Early depositional episode in the Li basin, the lowermost succession was restricted within the tilted fault-block depression after the basin was initiated during Paleogene time. Between Late Eocene to Early Miocene time, there was the widespread paleo-lake development in the Li basin. This development is believed to be associated with the increases structural activities, especially the reactivation of existing major faults which culminated a depression of limnic condition. The deposition during this time was represented by the second succession. After that, the sedimentation in the Li basin was influenced by tectonic activities especially faults through Tertiary Period. In Late Miocene, there was the major change in tectonic setting in the Li basin which caused the abrupt disappearance of the paleo-lake followed by the basin wide

unconformity and sedimentation of the uppermost succession. Throughout the Late Miocene to presumably Holocene, numerous intrabasinal faulting have been intermittenly reactivated penecontemporaneously with the deposition of the uppermost succession.

It is important to note that the Tertiary sedimentary sequence in the Li basin, in almost all cases, shows the westward thickening of the bedding architecture. On top of this, the thick sedimentary sequence in the western part of the Li basin is the deep-water lacustrine type. This suggests that the major basinal bound faults, namely, the Mae Ping Fault Zone, and the Uttaradit Fault Zone as well as associated intrabasinal faults have been intermittenly reactivated throughout the depositional episode of the Tertiary sedimentary sequence in the Li basin.

The coal measures of the Li basin is characterized as Ban Hong Formation and Ban Mae Long-1 Member of Ban Mae Long Formation which have been economically exploited. The coal rank of the major coal seams have been determined on the moist, mineral matter-free basis using the Parr Formula. The modal value of calorific values of these major seams indicate the range of lignite-A to sub-bituminous-B coal of ASTM classification. For general name, coal of Li basin is concluded to be sub-bituminous. Lignite of Ban Na Sai-Ban Mae Wang sub-basin shows higher sulphur content than those of other sub-basins.

The coal of the Li basin is a humic coal or banded coal type. It is mainly autochthonous coal and originated largely from wood, grass reed and bark under the influence of peat swamp environment.

With respect to the coal petrographic study of the Li basin. Altogether 10 samples have been study under reflected-light microscope using point-counting method. THe findings of the study are as follows : the macerals are vitrinite, exinite or liptinite and inertinite; vitrinite is the major constituent; exinite and inertinite are minor constituents; inertinite shows pathetic relationships with degree of plant decomposition;exinite shows pathetic relationships with amount of resin and wax of plant materials. Inertinite content increases at Ban Na Sai-Ban Mae Wang coal. In respect of exinite, the content increases at Ban Pu coal.

Despite the fact that there are at least sixty Tertiary basins in Thailand, very little is known about Tertiary sediments in these basins, geologically, stratigraphically and sedimentologically. The difficulty confronting the analysis of Tertiary succession is that almost all of them are covered with Quaternary alluvium deposits or partly exposed. Li basin is among few Tertiary basins which have been intensively explored for coal development programme by drilling methods. Therefore, attention had been paid on the available subsurface data and information for geological, stratigraphical and sedimentological analyses.

It is anticipated that the full understanding of Tertiary sedimentation of Li basin will be a steping stone to the understanding of other intermontane basins particularly in northern Thailand. Besides, this study will undoubtedly throw some lights on the Tertiary stratigraphy of Thailand.

Apart from the contribution on the "pure" geological aspects of the present investigation, it is envisaged that the depositional model of the Li basin could also serve as a key for exploration and production models for various type of geological resources, namely, coal, oil shale, industrial clay, etc..