

## CHAPTER IV

### CONCLUSIONS



#### 4.1 General.

The Northeastern region is a block like structural and geomorphological unit which covers about one-third of the total area of the country. The general topography is gently dipping eastwards and mainly covered with surficial deposits. Geological investigations had not been carried out in a satisfactory scale due to low economic mineral potential in comparison with other parts of the country. Limitation of rock exposures in the region gives rise to geological ground survey problems. However, remote sensing data can provide significant geological information for mapping purposes of the area. Based on these data, base-line informations on geology of the area are collected together with photogeological mapping techniques as well as modified and developed appropriate mapping scheme.

Khon Kaen and its vicinity areas are the selected area for sample site of this study programme due to their appropriate physiographic and geological conditions. According to literature reviews, the geology and geological structures of the area are quite simple and could represent the distinctive features of the Khorat

Plateau. Therefore, the methodology approached and the results of the study area should be base-line informations for further studies in this region.

One of the primary information for this study is aerial photographs (WWS. Series) of approximately 1:40,000 scale together with field investigations of the selected areas. Besides, the photo index and the relevant information are collaborated by studies as listed in Table 1.4. The methodology approach in this study is summarized in three categories, planning and preparation, preliminary and detailed study stages, as flow charts in Figure 2.1. The selected appropriated sites, methodology and tools, as the results from the planning and preparation stages are designed to use for the study. After preliminary stages, the preliminary geological units and major structural features are delineated. Based on the representativeness and the presence of all mappable units, 13 localities are selected for detailed study by means of visual interpretation and spotted field observations. The results are, then, concluded and established the keys of interpretation in terms of photo characteristics, morphological expressions and rock properties. These are used as fundamental key data for mapping of the study area.

The using of World Wide Survey Series, scaled 1:40,000 recorded in 1954-1955 AD., for a geological mapping in the northeast region is quite satisfactory.

That is the aerial photographs can give a detail in rock unit patterns and its distribution clearly. The continuity and the boundary of each unit can well be delineated as well as attitude of bedding, fractures and other structural features. The keys of photo-interpretation are needed at the first step and followed by development of photo analysis chart as previously mentioned.

The other primary information is the various types of Landsat Imageries of which the scale and time of recording are essential. It is discovered that the most suitable time of recording is just after the rainy season since in the low relief and rolling area, moisture is accumulated in the lower topographic features. In this case Band 7 is the most suitable in delinating. Moreover, the best imageries are those recorded particularly on October 7, 1979 which show no cloud cover and give good graytone contrast.

In the scale of the Landsat Imageries, the scale of 1:250,000 is the most suitable because it fits with the base map prepared for the preliminary study and this gives a better detail.

#### 4.2 Mapping Units.

For the mapping unit, the results of study can be concluded as follows :

##### 4.2.1 The Tracing of the Mesozoic Rocks.

Generally, it can be significantly carried out and this well corresponds with the most previous works. Except for some units, particularly the Phu Phan Formation, the features obtained from the aerial photographs clearly divides it into two parts, eg. lower (D1) and upper (D2) Phu Phan Formation of which the latter shows more resistant character and widespread in the area.

#### 4.2.2 The Khok Kruat Formation (Unit E).

The data obtained from aerial photographs at Ban Nong Pan area clearly indicates its position under the Unit M3 of the study area. This can also be traced in field observation particularly in the western part of the study area. In addition, this rock unit is concealed in some lower parts such as those from the paddy fields but can be well traced in the aerial photograph such as those observed at Ban Non Muang area (see Figures A-6-1, A-6-2 and A-6-3).

#### 4.2.3 The Maha Sarakham Formation.

It is normally shown in the preexisting maps only one formation although the drilling data and other publication clearly divided it into Maha Sarakham and the Upper Clastic / Claystone or Borabu Formation. The result of this study clearly shows the exposures of the Upper Claystone (M1). The Maha Sarakham Formation or Salt bearing unit is probably overlaid by other surficial deposits such as M2.

#### 4.2.4 The Surficial Deposits.

M2 and M3 Units, at present, the relationships between them are not clearly seen but the transitional to gradational might possibly be the suggestion. However, the distribution of M3 seems to continuously extend throughout the area except in the part which was eroded by Lam Nam P+ong.

The M2 Unit is confined only in the east and western part of the area, such as Amphoe Chiang Yun, Ban Fang and Phra Yun. Each part shows different attitudes of trending probably may caused by the minor folding of the substratum rocks such as salt bearing unit.

#### 4.2.5 Structures.

In the study area, bedding planes normally incline with angles of 5-20 degree which give rise to the large shallow syncline trough. In addition, the large - second order folds are appropriately associated. Then all axes of foldings above are carefully interpreted and analyzed to be an attitude of the north-south trending. The principal stress of tectonism ( $\sigma_1$ ) is adequately the east - west direction. The structures associating to this area is diagonal- , cross - and longitudinal- fractures which indicate to shear and extension forces. The Indosinian orogeny and Himalayan epeirogeny are tectonic events of foldings and fracturing.