

CHAPTER II

REGIONAL GEOLOGY

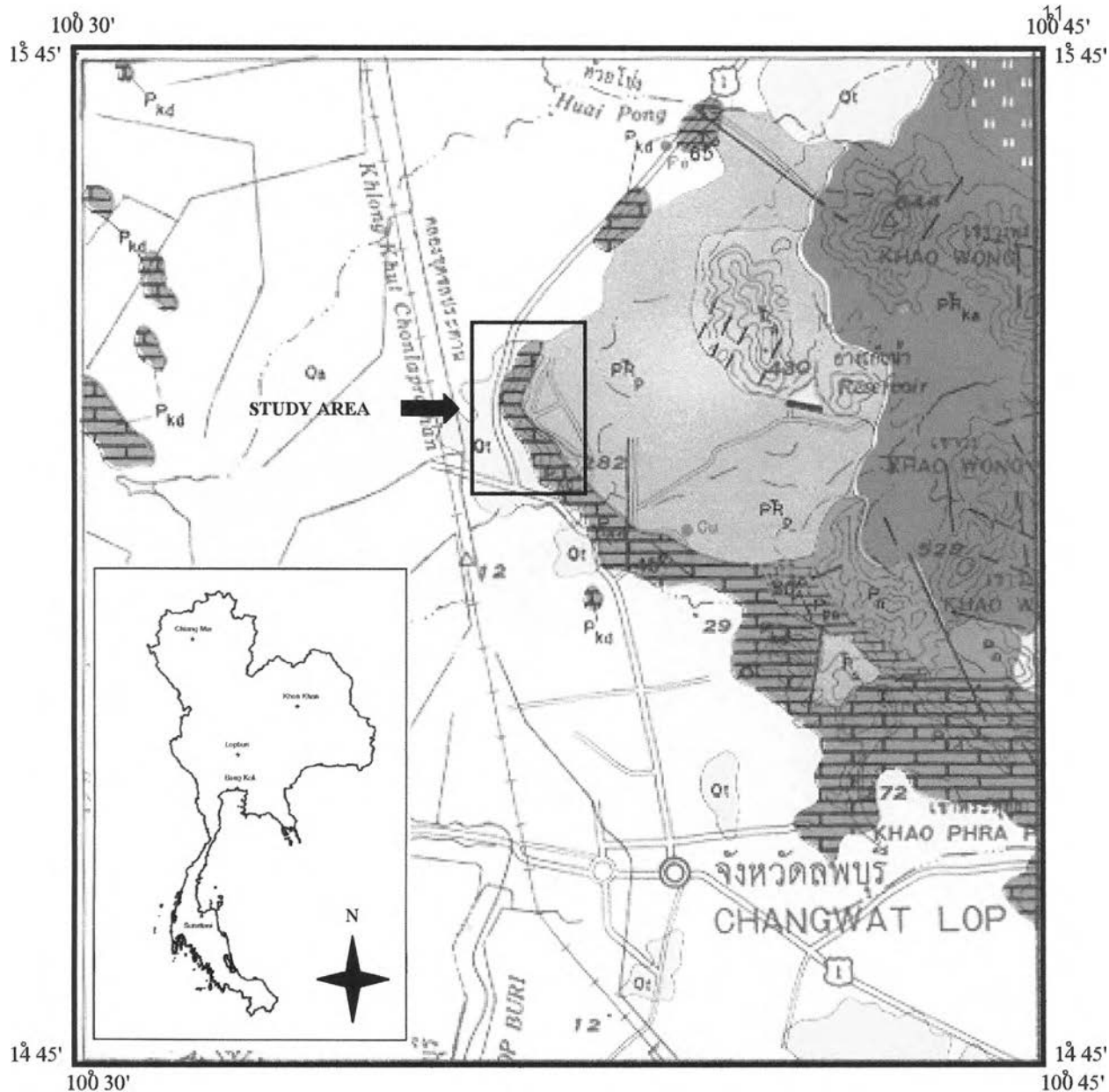
The regional geology surrounding the study area is outlined in the following paragraphs in order to serve as a background for further detailed study under the present investigation. The target area lies approximately between the latitudes of 14° 45' N to 15° 00' N and longitudes of 100° 30' E to 100° 45' E and covers approximately 625 sq kms.

The most up-to-date geological map and report related to the study area was that compiled by Hintong et al. (1981). A modified regional geological map covering the study area on the scale 1:250,000 is illustrated in Figure 2.1 Generally, rocks distributed in the area comprise the sequences of sedimentary rocks ranging in age from Lower to Middle Permian, and the igneous rocks of Permo-Triassic age. The Quaternary terraces and alluviums develop in low lying terrain covering approximately 70 % of the area.

The Permian rocks are distributed predominantly in southeastern part of the area. They belong to Saraburi Group which can be subdivided into six formations (Hintong et al., 1981). In the study area and its vicinity, however, they are found only three formations, namely, Nong Pong Formation, Pang Asok Formation, and Khao Khad Formation, respectively, in ascending order. The detailed description of each formation is outlined as follows:

2.1 Nong Pong Formation

Rock sequences are trending NW-SE and dipping moderately to SW. The formation is well exposed at Khao Sung Nam. The lithology of this formation is



Symbol	Formation	Age
Qa	Allovia deposits	Quaternary
Qt	Terrace deposits	
TRs	Undifferentiated, granodiorite, hornblende granite, quartz monzonite, quartz diorite	Upper Triassic
PTRhs	Undifferentiated rhyritic and andesite porphyries	Permo-Triassic
PTRka	Andesite	
PTRp	Diorite and hornblende diorite	
Pkd	Recrystalline limestone and chert nodule	Middle-Lower Permian
Ppa	Shale, slaty shale and slate	
Pn	Banded to laminated limestone	

Figure 2.1 Regional geological map covering the Khao Phra Ngam area (After Hintong et al., 1981).

characterised by interbedded shale and limestone. Occasionally limestones are intercalated as lenses or lenticular beds especially in the upper part. Shales are mostly brownish-gray, grayish-brown to light gray, and bluish-gray, occasionally silty and sandy. Limestones are medium gray to dark gray; bedded, banded to well-laminated and argillaceous in some beds. Bedded cherts are generally intercalated in the upper part. Crinoids, fusulinids and corals are common. The age of Nong Pong Formation was reported as Lower Permian.

2.2 Pang Asok Formation

Pang Asok Formation overlies conformably on the Nong Pong Formation. The lithology of this formation consists mostly of gray, bluish-gray, light brown to pale reddish-brown shales, slaty shales and some slates with lenticular beds of greenish-gray arkosic sandstones and light gray limestone. Locally the hornfelses are associated. Their ages were mapped as Middle – Lower Permian.

2.3 Khao Khad Formation

Khao Khad Formation overlies conformably on the Pang Asok Formation. Rocks are well exposed in the study area and form the NW-SE trending at Khao Phra Ngam, Khao Sam Yot, Khao Khwang and Khao Phra Put and the NE-SW trending at Khao Sa Phan Nak and Khao Thab Kwai. The rocks are composed predominantly of thick bedded to massive, medium to dark gray, and occasionally recrystallized limestones and dolomitic limestones. Generally, gray to brownish-gray bedded and nodular cherts are usually intercalated. Less abundance, however, are the interbedded light brown to yellow-brown cherts, sandy shales, siltstones and sandstones. Locally the rocks are marbles, calc-silicates and hornfelses. Fusulinids are abundant in limestone, but corals, brachiopods, gastropods and crinoids are also found. Their age was reported as Middle Permian.

2.4 Quaternary Deposits

The upper most lithostratigraphic units of Changwat Lopburi and neighboring area are Quaternary clastic sediments consisting of terrace and alluvial deposits. They cover most of the low lying areas of the map.

2.4.1 Terrace Deposits

The terrace deposits cover locally along the foothills slightly higher in the elevation than the alluvial plains. The terrace deposits are mainly composed of semiconsolidated gravel, sands, silts and clays. However, in some areas the sediments are consolidated by calcareous or ferruginous cements forming laterites, lateritic soils, calcareous tufa or travertine.

2.4.2 Alluvial Deposits

The alluvial deposits cover nearly 70 % of the map on the western and southern parts. They comprise unconsolidated gravel, sands, silts and clays underlying the recent flood plains.

2.5 Igneous rocks

The igneous rocks exposed in Changwat Lopburi and neighboring area were mapped as both intrusive and extrusive in origin (Hintong et al., 1981). The intrusive rocks were grouped into two units, namely, Phra Ngam diorite and Soi Woi intrusives, whereas the extrusive units were grouped into two units, namely, Khao Yai Volcanics and Huai Som Volcanics. They are a part of the Loei-Petchabun volcanic belt and probably belong

to the “Loei Fold Belt” (Intasopa et al. 1995). The detailed description of each rock unit is outlined as follows:

2.5.1 Phra Ngam diorite

Phra Ngam Diorite occurs as stock and dike in central portion of the map. This unit is characterized by greenish gray, green to black, fine to medium grained, granular texture. The essential minerals are plagioclase, hornblende, diopside and augite. The composition of plagioclase varies from andesine to labradorite, mostly altered to sericite. Hornblende shows poikilitic texture with feldspar inclusion. The accessory minerals are sphene, apatite, biotite, muscovite, calcite and magnetite. Its relative age has been assigned as Late Permian to Early Triassic.

2.5.2 Soi Woi intrusives

The Soi Woi intrusives are exposed as stock in the northern part of the map. They can be divided into five types, namely, granodiorite, granite, quartz monzonite, quartz diorite and syenodiorite. The relative age is Late Triassic (Norian). Detailed lithology of these intrusives are as follows:

- **Granodiorite**

The granodiorite is a gray, greenish gray, dark green, medium to coarse-grained rock with granular hypidiomorphic and allotriomorphic texture. The essential minerals are quartz, orthoclase, microcline, microperthite, plagioclase (oligoclase to andesine), hornblende and biotite. The accessory minerals are apatite, calcite, chlorite, sericite, epidote, sphene, magnetite, hematite and muscovite. Quartz and plagioclase occasionally

show myrmekitic texture. Plagioclase altered to sericite and clay mineral, and hornblende altered to epidote and chlorite.

- **Granites**

Two varieties of granitic rocks have been recognized; hornblende-granite and biotite-granite. Both varieties are whitish gray and pinkish, fine to medium-grained rocks with granular texture and locally porphyritic texture. The essential minerals are quartz, hornblende, biotite, orthoclase, and microcline. The accessory minerals are apatite, zircon, rutile, and magnetite.

- **Quartz monzonite**

The quartz monzonite occurs mostly as a gray and greenish gray, medium-grained rock with hypidiomorphic granular texture. The essential minerals are quartz, orthoclase, microcline, perthite, oligoclase, pyroxene, and biotite. The accessory minerals are epidote, chlorite, sericite, clay minerals, magnetite and zircon. Quartz and plagioclase show myrmekitic texture.

- **Quartz diorite**

The Quartz diorite is a gray to dark green, medium-grained rock with allotriomorphic granular texture. The essential minerals are quartz, orthoclase, microcline, and oligoclase to andesine. The accessory minerals are apatite, chlorite, epidote, sericite, and sphene.

- **Syenodiorite**

The syenodiorite is a gray to greenish gray, fine to coarse-grained rock with hypidiomorphic granular to porphyritic texture. The essential minerals are quartz, orthoclase, microcline, andesine, biotite, hornblende and pyroxene. The accessory minerals are apatite, calcite, sericite, epidote, sphene, and magnetite.

2.5.3 Khao Yai Volcanics

The Khao Yai Volcanics are volcanic complexes consisting of rhyolite, andesite, and andesite porphyry, volcanic breccia, agglomerate and tuff. They occur as dikes, flows and sills, cover the eastern part of the map, especially, Khao Wong Phra Chan and Khao Wong. The relative age was Permo-Triassic. Detailed descriptions are as follows:

- **Rhyolite**

The rhyolite is a yellowish brown to light brown and reddish brown, fine-grained rocks locally with porphyritic texture. In some areas, flow structures can be observed.

- **Andesite**

The andesite is usually associated with rhyolite and commonly occurs as dike in carbonate rocks. It is a greenish, violetish brown, fine-grained rock with locally porphyritic texture.

- **Volcanic breccia**

The volcanic breccia is brown and consists of mostly rhyolitic volcanic fragments of various sized and shapes. Thick layer volcanic breccia can be observed and the orientation of pebbles may be recognized as layers.

- **Agglomerate**

The agglomerate is white and light brown and consists of rounded fragments of igneous rocks and volcanic bombs settled in fine-grained matrix.

2.5.4 Huai Som Volcanics

The Huai Som Volcanics are volcanic complex similar to the Khao Yai Volcanics. Its consists mostly of undifferentiated rhyolite and andesite porphyries, rhyolitic and andesitic vitric tuff and less abundant andesitic basalt. They are pinkish brown, green to dark green, fine-grained rock showing porphyritic texture with phenocrysts of white and pinkish feldspar. The Huai Som Volcanics cover the northeastern edge of the area and overly the Khao Yai Volcanics. The relative age was Permo-Triassic.