

CHAPTER I

INTRODUCTION

1.1 Subject and Relevance

Geology and the human environment provide a comprehensive introduction to the subject of environmental geology and the interaction of human with the geological environment. As a subject, environmental geology has recently grown in popularity with the rise of interest in environmental issues. Despite this, the environmental geology is not a new subject but is a linkage of three related earth science disciplines, including economic geology, engineering geology and applied geomorphology, each of which has been given a new focus through the need for greater environmental management.

By the year 2000, over 3.5 billion people, over 50 percent of the world's population, will live in urban areas. Urban growth demands the fuels, mineral resources and water resources. This growth will, certainly, produce vast volumes of waste and increases human vulnerability to natural hazards. This, environmental geology is a practical subject, which environmental geologists have the crucial role in managing our interaction with the geological environment. This subject demonstrates how environmental geologists can make a practical contribution to manage this interaction allowing both sustained development and environmental conservation.

Generally, the discipline of environmental geology involves studies, investigations and review that often include an analysis of: a) environmental hazards,

such as growth faults in urban areas, water well failures, hillside slumping, landslides, subsidence, b) soil contamination, as a result of leaks from service stations, and other industrial sources of leaks, spills, and accidents, c) associated groundwater contamination requiring remediation, and d) other subsurface condition, requiring sampling and geological interpretation, and assessment of hydrogeological data and hydrochemical analyses.

Subsequent evaluation in environmental geology requires a definition and interpretation of correlative subsurface lithology and stratigraphy, an evaluation of local hydrogeological conditions for dewatering of open-cut and underground mines, an assessment of the potential development of drinking water supplies and associated impact of contaminants on the groundwater resources, an assessment of risk exposure from any potential contaminant on health and the environment, and a cost benefit analyses of all applicable remedial approaches to clean-up. Discipline may also be involved in aiming to determine potential environmental impact of mining operations, or to evaluate subsurface condition, for example; groundwater quality and hydrological parameters such as groundwater flow direction and rate, dewatering, and water supplies.

Environmental geology uses many specialties of geology such as stratigraphy, structure, hydrology, and related area of chemistry, physics, biology, and mining method. All of these disciplines assist in one-way or another to solve a problem or provide a solution to a situation in environmental geology. It then becomes the job of environmental geologist to synthesise and piece together the critical information in a format for the homeowner, government agency, or a public group to comprehend.

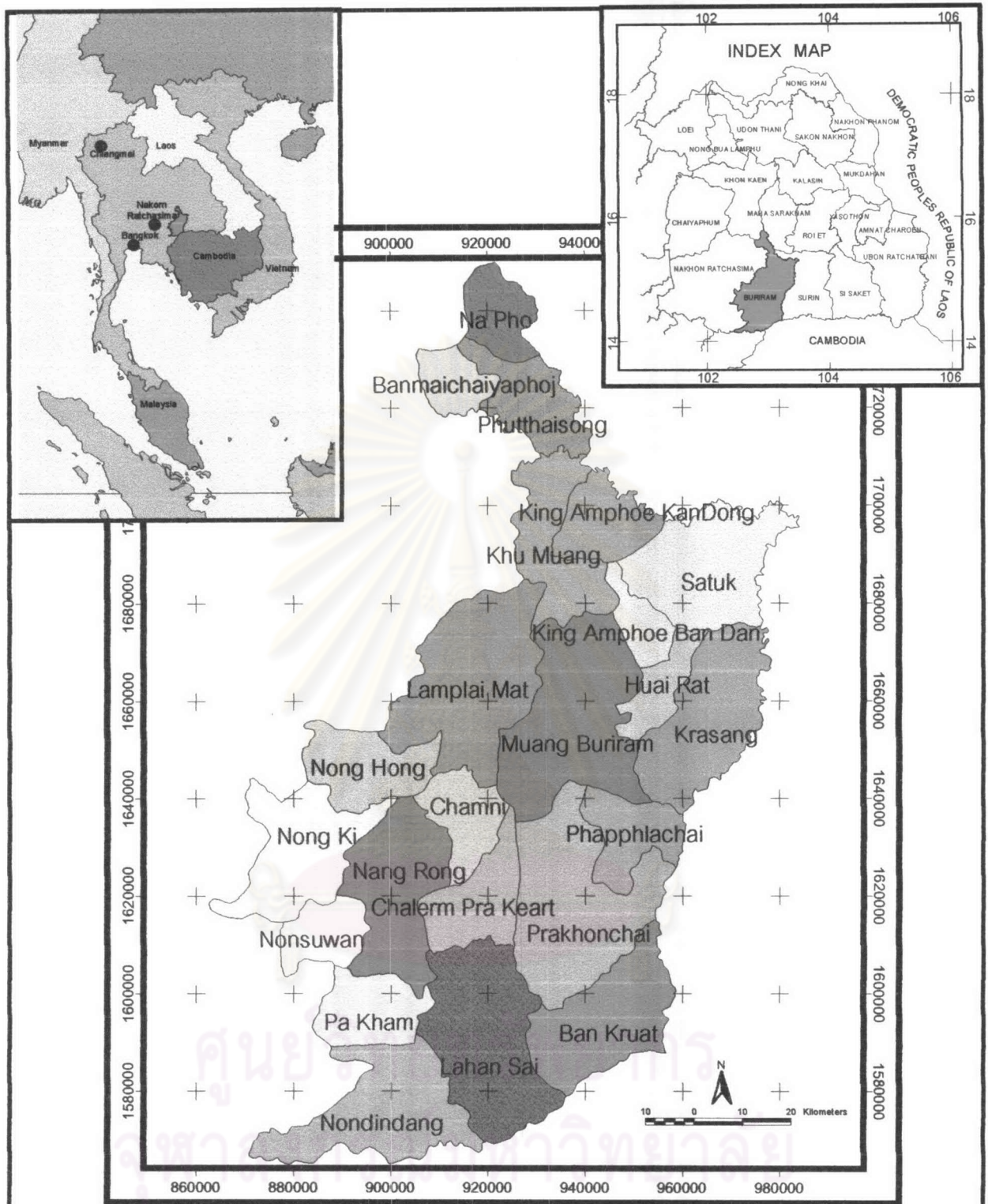
1.2 History and Background of Changwat Buriram

About 80-90 years ago, most of the people who settled in the Changwat Buriram, where the studied area is located, came from northeast province and Chiang Mai province. They speak central language, northeast language and Khmer language named “suai”. During that time people came to settle in the forest area, where they could freely cultivate the land for livelihood, which later resulted in increasing population. This fertile forest, with the Lampatia River, which flows through the area, attracted the people to migrate and settle in this area.

The southern part of the Changwat Buriram, the Phanom Dong Rak Mountain, marks the Thai and Cambodian territory. The people who migrated to the tambon encroached on to this forested hills, reached the border and settled there in a scattered manner.

1.2.1 General Description of the Study Area

Changwat Buriram is located in the southern part of northeast Thailand. It is situated between latitude $14^{\circ} 15'$ - $15^{\circ} 45'$ north and longitude $102^{\circ} 30'$ - $103^{\circ} 45'$ east. The total area is $10,321.885 \text{ km}^2$ (Figure 1.1). Average aerial elevation is about 163 m. above the present Mean Sea Level (MSL). It is about 376 km from Bangkok by train and about 400 km by bus. The population of Changwat Buriram was 1,520,419 in 1999 (Buriram Provincial Statistical Office, 2000).



ENVIRONMENTAL GEOLOGY OF CHANGWAT BURIRAM

Figure 1.1 The Study area

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1.2.2 Geography and Physiography

The study area is located within a well-defined boundary of a small sub-basin of the Chi River basin, a tributary of the Mekong River. It is having the Mun River and the Chi River as the two main water courses. The river gradient is about 1:700 in the northern half (15 km) and about 1:1,000 in its lower half. Basic natural resources for the development of agriculture are water and soil.

The climate in this watershed is distinguished by a relatively low rainfall of about 1,176 mm/year the maximum over the same period being 1,476 mm/year and the minimum 778 mm/year. The average evaporation reaches 2,020 mm/year. The region has a rather high temperature of about 26.8 °C on the average, with its peak 36.8 °C and the lowest at 15.7 °C. The average relative humidity is 70% over the year having its minimum value of 38 % in the dry season.

The soils of the basin are predominantly sandy contents, especially in the higher lands, which form the watershed. They are low in organic matter with a relatively high degree of erosion. In the vicinity of the low land near the river, the soil is characterised by loam and clay deposits with poor drainage. It exhibits good water holding capacity; however, due to high evaporation in the dry season, no water can be stored within that soil. In addition, saline soil has been reported in the area.

1.2.3 Problems Related to Physical Conditions of the Study Area

According to Buriram Governor's Office Plans for the year 1994-2004 and 2002-2006, the problems related to physical conditions, particularly the infrastructure, in Changwat Buriram can be listed as follow.

- a. Inadequate infrastructure, i.e. service road, electricity, water supply in dry season.
- b. Inadequate access road to the border area of Thailand and Cambodia.
- c. Telecommunication is not well established.
- d. There is no standard transportation centre, i.e. airport and bus terminal.
- e. Soil is high in salinity and high in sandy contents.
- f. Drinking water and water supply are shortage and low quality.
- g. There is no sanitary waste disposal area.

1.3 Objectives

The present study aims at acquiring, evaluating the physical environment conditions and analyse them together with the socio-economic conditions. This study is also aimed to answer primarily the environmental problems in terms of spatial area evaluation for example, where is the suitable area of the water resources, the waste disposal site.

1.4 Scope of Works

According to the problems of Changwat Buriram mentioned earlier, the literature review has been carried out by collecting the secondary data, regarding topographic maps, geological maps, groundwater maps, groundwater quality, soil types, climate, rainfall, surface drainage, population profiles, agriculture, land use/land cover, infrastructures, archaeological and historical heritages. Then data is subdivided into 2 groups, natural resources and human resources. Natural resources are water resources, soil and agriculture, and waste disposal site, whereas, the human resources include human settlement, population, education, and sanitation and public health. Consequently, the information has to be analysed and evaluated in terms of its spatial distribution in the area using GIS tools. Finally, the conclusion, discussion, and recommendation will be prepared.

1.5 Expected Outcomes

This research is expected to be able to recognise the environmental geology of Changwat Buriram in terms of the potential environmental implication. Geological data will be analysed together with socio-economic background of the area. Then, various diagrams and maps will be presented in all chapters, so that they will be easily provided essential database for the user and planner.

1.6 Previous Works

The study of environmental geology in Changwat Buriram has not yet been previously carried out. However, there are some areas that environmental geology have been carried out and will benefit this research in providing the framework, concepts and the scientific way of thinking. Hereinafter is a summary of what the environmental geology concerned that has been done in Thailand.

Sarapirome (1992) studied the environmental geology of an area along the Eastern Coast, the Upper Gulf of Thailand using the physical parametres. They are physiographical and geological setting, mineral resources, surficial deposits, water resources, marine geological conditions, and tourist and recreational resources, and considered with the socio-economic background of Chon Buri and Rayong Provinces. As a result, the development potential, in particular, residence, heavy industry, and agricultural area had been purposed.

Chalermarp (1996) created the systemization of geological information for land management of Changwat Prachuap Khiri Khan' and purposed the Primary Geological Information (PIU) system to apply the Geological Information for Land Management (GILM) in the regional scale that could be developed into local scale in the future. The PIU system classified the information into 3 stages by map processing and degree of inference; 1st stage of PGI includes landform and process, geological material, geological structure, geohydrology, and miscellaneous in geological information, 2nd stage of IGI (Intermediate Geological Information) includes geological hazard and deterioration, geological resources, and geotechnical properties,

3rd stage of UGI (Ultimate Geological Information) that consists all of information demonstrating suitability of geological characteristics of the particular area related to objectives of applications. This work provides the guideline for structuring the methodology in this research.

Pokaew (1999) studied the 'Environmental Geology of Changwat Krabi for Land Use Planning by Using GIS' recollected the environmental geological setting including of topographic limitations, geological setting and geomorphological, geological resources, marine geological conditions, coastal erosion, and tourist and recreational resources. In addition, review the socio-economic background of the area. Finally, conservation area, carbonate rock for construction, residential area, agricultural area, and industrial development area were purposed.

Wanthachaisaeng (2000) reported the Quaternary geology and hydrogeology of Amphoe Khu Muang, Changwat Buriram using the data of cuttings, E-logs, and groundwater quality to explain the subsurface geology, groundwater modeling, and environment of deposition of sediments underlying the study area. This work provides very good database for this research.

Boonruang (2001) studied the environmental geology appraisal using GIS for sanitary landfill site selection in Changwat Chachoengsao. The aim was to prevent and minimise the environmental geology problems, such as, air pollution, water pollution that affects human health particularly caused by increased solid waste. This case study used physical environmental geology parameters which include slope, surface water, groundwater, geology, geomorphology, flood-prone area, soil

characteristics, forest, land use, urban, heritage, and land requirement. Afterthat, socio-economic parameters have been additionally integrated using the Weight Rating System.

Charoenmit (2001) studied the environmental geology of Changwat Nakhon Phanom, Northeastern Thailand and identified the problems under the economic cooperation development project of the Great Mekong Sub-region (GMS) of Burma, Cambodia, Lao PDR, Thailand, Vietnam, and Yunnan. As a result, agricultural development plan was presented as a major plan using the physical environment, socio-economic conditions, and existing plans under the methodology of the weight rating system.

The Buriram Governor's Office Plans (1994-2004) stated the connection of the Khamere Ruins Route from Prasat Hin Phimai and Prasat Phanom Rung in Thailand to Nakorn Wat - Nakorn Thom in Cambodia. The other plans are to make Buriram as the industrial agriculture centre and the centre of transportation from Eastern Sea Board to Indo-China.

The Buriram Governor's Office Plans (2002-2006) also stated that Buriram has the potential to be a tourist centre and also proposed many plans for improving human's health and sanitary, agriculture, infrastructures, and industrial development.

1.7 Thesis Structure

The report includes five Chapters. The first chapter provides the subject and relevance in the study of environmental geology and also identifies environmental problems in the area in order to acquire the aims of the research. Chapter II is aimed to provide the background of the study area, including the physical environments and socio-economic conditions. Chapter III provides the methodology used and the way to work throughout this research. Consequently, the result of analysis of geological data, particular emphasis on groundwater analysis and the waste disposal potential area are shown in Chapter IV. The final Chapter, Chapter V, provides the conclusion and recommendation in terms of what can and cannot be done in the area based solely on the research outcomes.



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