

CHAPTER 1

INTRODUCTION

1.1 Background and Rationale

Almost three-quarters of the Songkhla Lake Catchment (SLC) in Southern Thailand has been used for agriculture, requiring fertilizer, compost, animal feeds and other substances needed for crop growth and animal farming (Figure 1-1). These products often contain significant amounts of phosphorus (P). Although P occurs naturally in the form of rock phosphates, it is the prime substance causing eutrophication problems in tropical lakes. Excessive aquatic plant growth can markedly reduce the clarity of water in a lake, which leads to death of fish and increased cost of treating water for public supply. P may be released into surface water via various hydrological events or human activities, such as atmospheric fallout, sewage treatment plant effluent, industrial wastes, domestic wastes, and runoff from cultivated soil, especially where excess amounts of phosphate fertilizer have been applied. A more serious problem is contamination with cadmium (Cd), which is commonly associated with rock phosphates. Cd is a highly toxic bioaccumulative heavy metal. If ingested, it can cause kidney disease and prostate cancer. Prolonged use of Cd contaminated products can lead to an unacceptably high concentration of Cd in agricultural soil, which can consequently be accumulate to high levels in food crops such as rice and root vegetables. Cd is subject to health standards in most importing nations and a high concentration of Cd, if found in crops, could lead to their rejection for human consumption or even for animal feed. Contaminated soils over large areas are difficult or impossible to remedy, and eventually result in severe public health and ecological problems. Such problems, if occurring in the SLC, could be devastating for the health and local economy of some 1.5 million people living in the region (NSO, 2002). This research study therefore seeks to understand the connection between the regional economy and the environment of the SLC with respect to nutrient and heavy metal contamination, and to predict how severe such problems will

become, based on the current and possible future economic situation. P and Cd fluxes into the SLC are key causative agents and are the indicator elements chosen for this study.

Environmental monitoring and subsequent remediation and controls of ongoing pollution are well established but inefficient means of environmental protection. It would be better to prevent environmental contamination *a priori*. In this study an accounting tool for understanding the flow of materials through a regional economy, a Substance Flux Analysis (SFA), was used to investigate the flow of selected substances in goods through processes in the SLC (Baccini and Brunner, 1991). The method provided information on amounts of selected substances entering into the region, their buildup in stocks of goods in various identified processes, and the leakage from these processes to environmental compartments each year.

The aim of this study was to make a “conceptual model” of possible future eutrophication problems caused by P in the SLC and Cd contamination in the catchment’s soil. The study thus provides an insight which enables policy makers to identify important point sources, regulate the products, and control the processes that cause the release of these substances to the environment. Programmes for monitoring the actual derivation of the substances can subsequently be established.

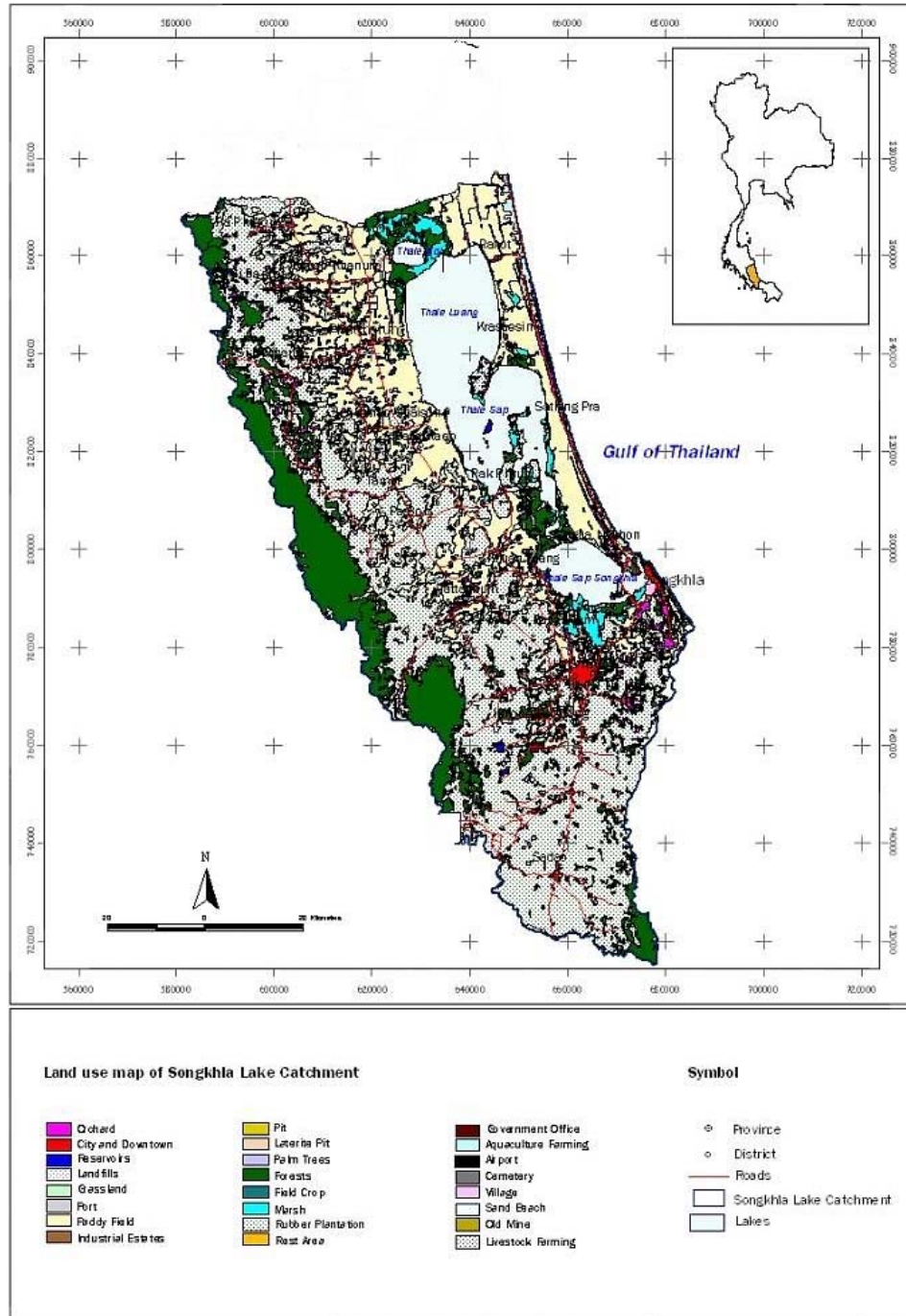


Figure 1-1 : Land use Map of the Songkhla Lake Catchment (ICSLB, 2002).

1.2 Research Objectives

The objectives of this study were as follows:

1. To assess the amount of P and Cd entering into, stored in, and emitted from the agricultural soil of the SLC.
2. To determine significant factors influencing P and Cd balances in the context of environmental management of the SLC.

1.3 Anticipated Outcome

1. A database on P and Cd balances showing inputs, stocks, and outputs in the SLC agricultural soil.
2. Knowledge on the main sources and flow pathways of P and Cd in the region, which would enable environmental policy makers and other stakeholders to set up monitoring programs.