

CHAPTER I

INTRODUCTION

1.1 OVERVIEW OF THE STUDY

“sustainable development must ensure that it meet the needs of the present without compromising the ability of future generations to meet their need.....sustainable development requires meeting the basic need of all and extending to all the opportunity to fulfill their aspiration”

(The World Commission on Environment and Development [WCED], 1987)

Since the first descriptive definition of sustainable development was first introduced during “The Brundtland Report” in 1987, there has been widespread recognition of the importance of sustainable development. There are many consequences of development affecting to ecosystems for example air pollution, water pollution and over exploitation of natural resources. Moreover, the exponential growth of human population in the present day results in increase in demand of resources. Thus the challenge for scientists and policy makers is “How to manage our resources?” to meet the goal of sustainable development.

A wetland is a complex ecosystem, which comprise of many sub communities for many living organisms. Generally a wetland can store a rainfall, regulate ground water level, prevent a seawater intrusion and provide nursing ground for aquatic life as well as produce food supply for human. With specific characteristics and importance of wetland, Ramsar Convention was established in 1971 for wetland conservation at international level. Nowadays, 1,328 wetlands are registered as a Ramsar site, 10 Ramsar sites are located in Thailand especially connected to coastal zone. Many wetlands in Thailand have been degraded by the effect of unsustainable development.

Don Hoi Lord was registered as an international wetland or Ramsar site in 2001 that also has an effect from development. Razor clam or *Solen regularis* is well known as Hoi Lord. The wetland derives its name from razor clam and high abundance of razor clam population. Moreover, razor clam has been a source of income for local fishermen income who harvest razor clam on the sand dune during the low tide.

Presently, the number of razor clam is decreasing due to harvesting pressure by local fishermen, who respond to high market demand. Many studies have been conducted on razor clam, such as life history, environmental condition of Don Hoi Lord and social awareness for Razor clam. The objectives of all studies emphasized conservation but most of the studies were conducted with reductionistic approaches, without considering the integration for better problem solving or management.

Modelling has become an important tool in the study of ecological system as well as natural resource management. Models provide an opportunity to explore ideas regarding ecological systems that it may not be possible to field-test for logistical, political, or financial reason. Numerous scientists now believe that the study of ecosystem requires a multi-disciplinary approach or holistic approach in order not to neglect the social interaction from natural resource management. (Jackson et al., 2000).

Multi-Agent Systems (MAS), also called agent-based modeling has been used by researchers in ecology or economics, as well as tools for ecosystem management (Bousquet and Le page, 2004). Moreover, MAS can integrate socio-economic, ecological and spatial dynamics into a single model. It provides a better understanding of how the properties of human-construct landscape at a macroscopic level can arise from the interaction of system components at a microscopic level (Ferber, 1995).

In this study, Multi-agent simulation was created to investigate interaction between a razor clam population and local fisherman harvesting behavior. Components of the model were comprised of razor clam population data from field collection, local fisherman behavior data, and other stakeholder data (trader and tourist) from interview. Different scenarios were tested in the simulation to assess situation of razor clam population and local fisherman behavior, and determine appropriate management strategy from the simulation. After simulation session, the Role-Playing Game (RPG) session was organized by inviting some local fishermen at Don Hoi Lord who normally harvest razor clam as well as other stakeholders to participate. The RPG would be able to conduct opportunity of discussion among local fisherman as well as the modeler can extract information to cooperate with simulation model. Finally, the perception among fishermen could propose for suitable razor clam management strategy.

1.2 OBJECTIVES OF THIS STUDY

To achieve goal of sustainable management, holistic approach study should be used in a study of ecosystem management. As Jackson et al. (2000) suggested not neglect the behavior of the social group which involve in natural resource management, the purpose of this study was to build an ecological model for razor clam conservation and facilitated conservation ideas to stakeholders who involved at Don Hoi Lord.

Thus, the objectives of this study were:

- To assess existing condition of population dynamics of razor clam at Don Hoi Lord.
- To identify behavior and interactions of local fishermen who harvest razor clam.
- To construct a multi-agent simulation model to explore the interaction between human activities and razor clam population.
- To propose and discuss collectively a strategy for razor clam conservation.

1.3 HYPOTHESIS OF THE STUDY

As a purpose of this study, an ecological model will be built and explored razor clam populations under different scenarios. In addition, exploring razor clam population through the model should reflect behaviors of fisherman, which would be discussed later with local fishermen for razor clam management and conservation purposes. Therefore, hypothesis of this study was:

“The population of razor clam will respond to different patterns of human activities.”

1.4 SCOPE OF STUDY

Based on MAS as a tool for ecosystem management, the razor clam population at Don Hoi Lord, Samut Songkhram province, Central of Thailand was studied (Figure. 1). Razor clam is well-known a common property, such that everybody can harvest it. To date, the population of razor clam is decreased therefore, an appropriate management is needed for conservation.

There are five sand dunes at Don Hoi Lord, the largest one was selected as a study site. This sand dune is closed to local communities and there are high harvesting rate from fisherman and indirect effect of tourism. This study was designed for monthly data collection for one year including ecological data of razor clam population and socio-economic data from interview. Cormas (common-pool resources and multi-agent systems) platform was used in this study to build an ecological model to explore razor clam population. Finally, RPG was used in a discussion session to share experience on razor clam conservation and model calibration with local fisherman at Don Hoi Lord.



Source: http://www.gisthai.org/map-gallery/thai_atlas/images/forest43/forest43.html

Figure 1.1 Samut Songkhram province, Central of Thailand (in the red circle)

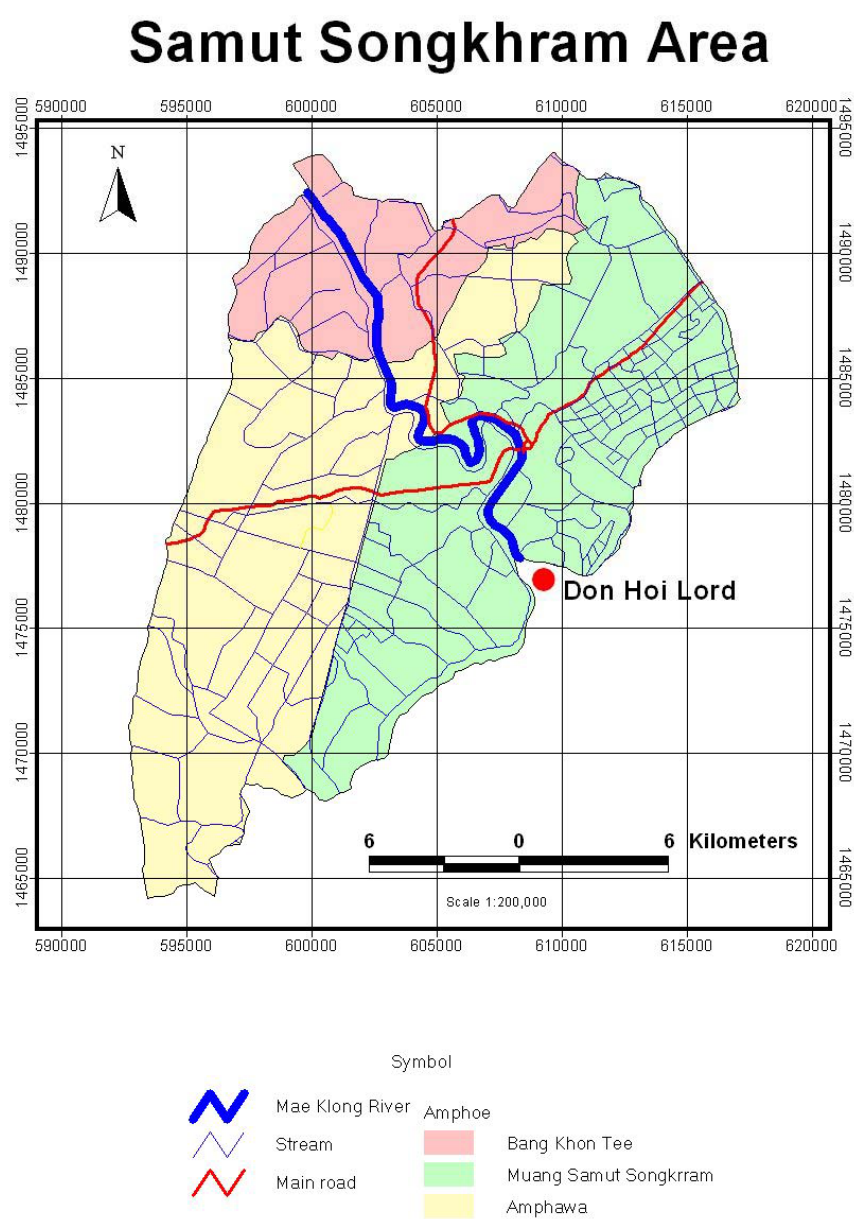


Figure 1.2 Location of Don Hoi Lord (red spot) in Samut Songkhram province

1.5 CONCEPTUAL FRAMEWORK OF THE STUDY

The conceptual framework of this study was divided into 3 parts. Part 1 was field data collections including ecological data and socio-economic data. Part 2 was ecological model construction under Cormas platform. Finally, Part 3 was RPG session for discussing on razor clam conservation and for model calibration. The overall framework of this study was illustrated step by step as figure 1.3:

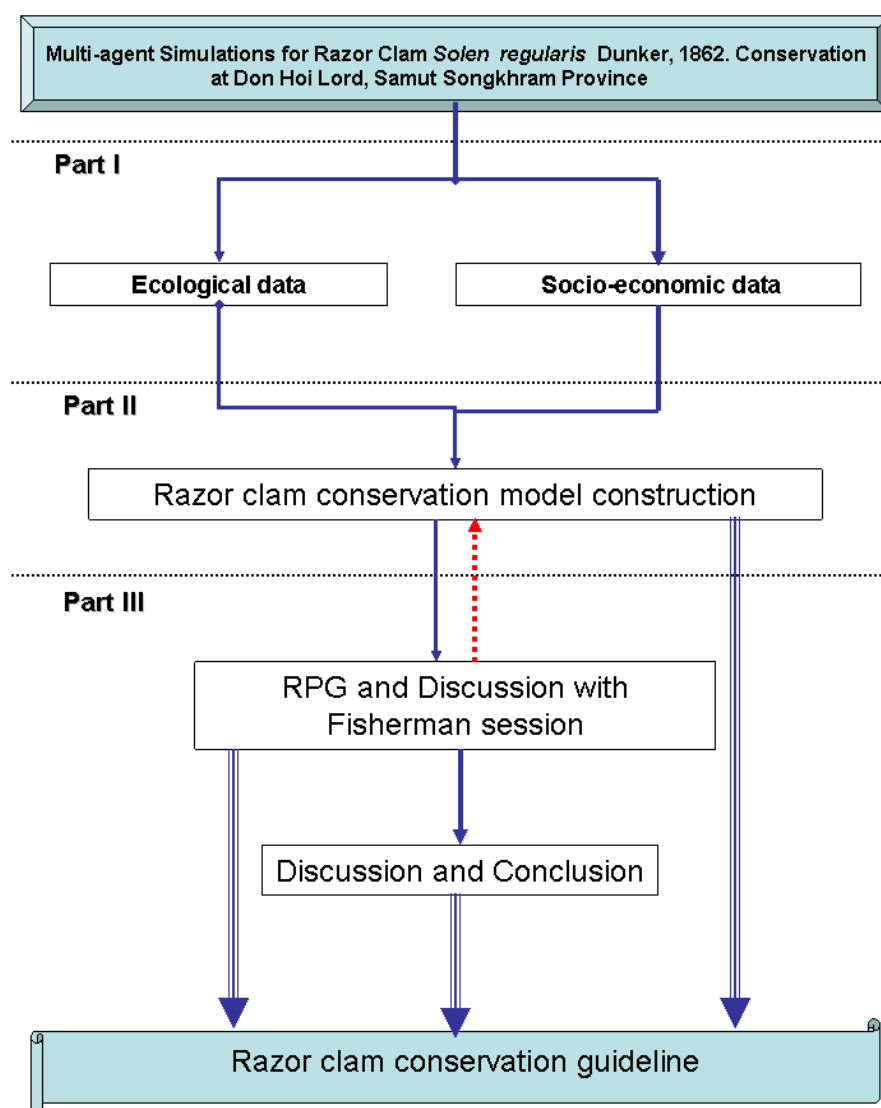


Figure 1.3 Conceptual frame work of this study

1.6 THESIS OUTLINE

In this thesis is composed of five chapters as follows:

Chapter I, overview of this study, objectives, hypothesis and conceptual framework of the study are presented.

Chapter II, the literature review of razor clam, Don Hoi Lord, Ecological modelling approach and especially Companion Modelling approach (ComMod) are presented.

Chapter III, The methodology of this study is presented step by step including study site, field data collection both of ecological data and socio-economic data, Multi-agent simulation model construction and Role-Playing Game (RPG) session.

Chapter IV, the results from the study and discussion are presented together. The characteristics of study site is presented first and follows by razor clam ecological data, socio-economic of fisherman and tourist, Multi-agent simulation model construction and RPG among local fisherman at Don Hoi Lord. After that, the results from Multi-agent simulation model combined with RPG result are represented. Finally, discussion on companion modelling which consist of Multi-agent simulation and RPG are lastly.

Chapter V, covers conclusions and recommendations of this study, as well as future study for razor clam management and conservation.