Modeling the Impact of Climatic Change on Water Resources in the Eastern Seaboard Area, Thailand

Manfred Koch
Chulalongkorn University
October 20, 2006

Introduction

The Eastern Seaboard Area, located in the eastern region of Thailand, is composed of many important industrial units with adjacent communities. The major water supply in the area comes from 5 large reservoirs and each reservoir is linked by a pipe network that can transfer water among each other.

During the serious drought of 2005, many factories were affected by a lack of water, resulting in a slowdown of the industrial production. The high expenses to resolve this problem were covered by the government sector as well as private sectors. On the other hand, potential floods may also cause damages and significant social and economic losses that might even be higher than those generated by droughts.

Figure 1: Eastern Seaboard Area, Thailand

For solving water management problems under a hydrological risk, a risk based optimization modeling approach for water management will be developed in order to serve the present and future needs of water users in the region and to mitigate floods and droughts.
Objectives of the research
1) To share ideas and corporate in water resources research.
2) To find out about possible approaches to be taken to solve the water management problem in the Eastern Seaboard Area, Thailand, taking into consideration experiences and results from similar studies in Europe and Germany, in particular.

Research approach

Based on the water problem in the Eastern Seaboard area, it is recommended that an integrated water resources management system should be developed to cope with the issue both in space and time. The system should comprise an analysis of precipitation, runoff, water allocation, allocation impact and, optimization tools to manage the scarce resources of the region under various risk scenarios.

There are many approaches and models to solve a particular water management problem. A comprehensive model must be able to provide the climatic and hydrological input for routing and distribution of water resources through the hydrological cycle within the study area and, last but not least, to evaluate the economic side of various water resource management scenarios. As this cannot be achieved by a single model alone, we propose a combination and melding of at least 3 models, namely, GCM, SWAT, and WEAP.

- The General Circulations Model (GCM) and more precisely a Regional Climate Model (RCM), which basically is a downscaled version of the former. The GCM or RCM model is used to evaluate the impact of climate change on various hydrological parameters, such as precipitation and evapotranspiration in the long-term future within the study region.

- Soil & Water Assessment Tool (SWAT) This model can predict the effect of management decisions on water with reasonable accuracy on large, ungaged river basins using observed or simulated (output from the GCM) precipitation pattern.

- Water Evaluation And Planning System (WEAP) This model can calculate by an integrated approach, the various stakeholder processes, water balance, simulation based policy scenarios and evaluate their economic benefits, using output from SWAT.

The research should proceed to integrate these models (see Figure 2 for the assembly of RCM and SWAT and the various modeling approaches using past, present and future data) and to calibrate them on available field data and/or to provide further information on which data should be gathered to achieve the research objectives stated.

References

**Figure 2. Schematic diagram of RCM/SWAT simulation runs**

(after Jha et al., 2004)