Kritsanat Surakit 2007: Integrated Water Resource Management for Bung Boraphet. Doctor of Engineering (Water Resources Engineering), Major Field: Water Resources Engineering, Department of Water Resources Engineering. Thesis Advisor: Associate Professor Nutchanart Sriwongsitanon, Ph.D. 182 pages.

Bung Boraphet is considered as the largest fresh water lake and wetland system in Thailand. However, natural resources of the lake are deteriorated dramatically by an increasing human exploitation of water resource and unsuitable managing practices. The daily water budget model of Bung Boraphet was considered as one of the most useful tools for an understanding of hydrological parameters of the lake and can be used for water resource management of the lake. The daily water budget analysis between December 2002 and May 2006 was therefore conducted and calibrated using primary and secondary data. The daily water budget calculation showed promising results with very high values of statistical measures gained from the comparisons between the observed and calculated water levels and water storages. The water budget was then used to analyze six different water use scenarios. Two highlighted proposals suggested by different stakeholders to raise the weir crest and to divert extra flows from the Nan River during the dry seasons - that are used to set some of the scenarios - are not really practical which is proved by the water budget analysis. In this dissertation, changes and trends of water quality parameters are also examined. The results reveal that suspended sediment concentration is the most critical parameter affecting the sustainability of the lake. Profound investigations of suspended sediment concentration were therefore carried out using the two dimensional depth averaged hydrodynamic and water quality models. Model calibrations have shown satisfying results with high values of statistical measures. The model was then used to identify the operation and management of sedimentation to reduce its effects on water storages and biodiversity of the lake. Remote sensing technique was applied in this dissertation to analyze the land use changes over time within and around the lake using the Landsat5 images between 1993 and 2003. Results showed that the area of irrigated rice surrounding the lake rose 100%, whilst the area of aquatic plants and wetland vegetation declined by 50%. These evidences correspond to the results gained from the water balance and water quality studies. It can be finally concluded that the scientific tools and models investigated in this study were proved to be useful to identify the suitable operation and management of the lake.

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