Sirirat Suwanidcahroen 2011: Development of Phytoplankton and Nutrient Dispersion Models for Songkhla Lake. Doctor of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Associate Professor Winai Liengcharernsit, D.Eng. 158 pages.

In this study, the analysis of water quality was conducted at 16 stations in canals drained from the Songkhla Lake Basin and 25 stations inside the songkhla Lake. It was found that inorganic nutrient loading from various sub-basins were higher than organic nutrients. The result obtained from water sample collected at the Songkhla Lake was founded that most nutrients were at highest concentrations at the Lower Lake which received maximum waste loading from communities located in the nearby sub-basin.

The mathematical models were developed to simulate dispersion of phytoplankton and essential nutrients, including organic nitrogen, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, organic phosphorus, and inorganic phosphorus. Two-dimensional vertically averaged mass balance equations are basic governing equations for the dispersion models. The finite element method with Galerkin's weighted residual technique was used to solve these mass balance equations.

The developed models were applied to the Songkhla Lake. The results obtained from model computation showed that phytoplankton population was at higher concentration in the Upper Lake and the Middle Lake where water depth was rather shallow (about 1-2 m.), while concentrations of various forms of nitrogen and phosphorus in the Lower Lake were higher due to heavier loads from the cities located in its catchment area. These results were found to agree with data from field sampling and analyses.

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