A Drought Early Warning System Using System Dynamics Model and Seasonal Climate Forecasts: a case study in Hsinchu, Taiwan.

Yu-Chuan Tien (1), Ching-Ping Tung (2), Tzu-Ming Liu (3), and Chia-Yu Lin (4)

(1) Taiwan National University (erictien1234@gmail.com), (2) Taiwan National University (cptung@gmail.com), (3) Taiwan National University (tedliu13@gmail.com), (4) Taiwan National University (chiayu0119@gmail.com)

Title: A Drought Early Warning System Using System Dynamics Model and Seasonal Climate Forecasts: a case study in Hsinchu, Taiwan.
Tien, Y. C., Tung, C. P., Liu, T. M., Lin, C. Y.
E-mail address: erictien1234@gmail.com

Abstract
In the last twenty years, Hsinchu, a county of Taiwan, has experienced a tremendous growth in water demand due to the development of Hsinchu Science Park. In order to fulfill the water demand, the government has built the new reservoir, Baoshan second reservoir. However, short term droughts still happen. One of the reasons is that the water level of the reservoirs in Hsinchu cannot be reasonably forecasted, which sometimes even underestimates the severity of drought. The purpose of this study is to build a drought early warning system that projects the water levels of two important reservoirs, Baoshan and Baoshan second reservoir, and also the spatial distribution of water shortagewith the lead time of three months. Furthermore, this study also attempts to assist the government to improve water resources management. Hence, a system dynamics model of Touchien River, which is the most important river for public water supply in Hsinchu, is developed. The model consists of several important subsystems, including two reservoirs, water treatment plants and agricultural irrigation districts. Using the upstream flow generated by seasonal weather forecasting data, the model is able to simulate the storage of the two reservoirs and the distribution of water shortage. Moreover, the model can also provide the information under certain emergency scenarios, such as the accident or failure of a water treatment plant. At last, the performance of the proposed method and the original water resource management method that the government used were also compared.

Keyword: Water Resource Management, Hydrology, Seasonal Climate Forecast, Reservoir, Early Warning, Drought