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Integrated Water Resources Simulation Model for Rural Community

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The purpose of this study is to develop several water resources simulation models for residence houses, constructed wetlands and farms and then integrate these models for a rural community. Domestic and irrigation water uses are the major water demand in rural community. To build up a model estimating domestic water demand for residence houses, the average water use per person per day should be accounted first, including water uses of kitchen, bathroom, toilet and laundry. On the other hand, rice is the major crop in the study region, and its productive efficiency sometimes depends on the quantity of irrigation water. The water demand can be estimated by crop water use, field leakage and water distribution loss. Irrigation water comes from rainfall, water supply system and reclaimed water which treated by constructed wetland. In recent years, constructed wetlands play an important role in water resources recycle. They can purify domestic wastewater for water recycling and reuse. After treating from constructed wetlands, the reclaimed water can be reused in washing toilets, watering gardens and irrigating farms. Constructed wetland is one of highly economic benefits for treating wastewater through imitating the processing mechanism of natural wetlands. In general, the treatment efficiency of constructed wetlands is determined by evapotranspiration, inflow, and water temperature. This study uses system dynamics modeling to develop models for different water resource components in a rural community. Furthermore, these models are integrated into a whole system. The model not only is utilized to simulate how water moves through different components, including residence houses, constructed wetlands and farms, but also evaluates the efficiency of water use. By analyzing the flow of water, the water resource simulation model can optimizes water resource distribution under different scenarios, and the result can provide suggestions for designing water resource system of a rural community.

Keywords: Water Resources, Simulation Model, Domestic Water, Irrigation, Constructed Wetland, Rural Community