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# Modeling Water Resources Carrying Capacity, Optimizing Water Treatment, Smart Water Management, and Conceptualizing a Watershed Management Approach

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**Abstract :** Sustainable water use is important for the existence of the human race. Water resources carrying capacity (WRCC) measures the sustainability of water use; however, the calculation and optimization of WRCC remain challenging. This study used a mathematical model (the Logistics Growth of Water Resources -LGWR) and a linear objective function to model water sustainability. We tested the validity of the models using data from Ghana. Total freshwater resources, water withdrawal, and population data were used in MATLAB. The results show that the WRCC remains sustainable until the year 2132 ±18, when half of the total annual water resources will be used. The optimized water treatment cost suggests that Ghana currently wastes GH₵ 1115.782± 50 cedis (~$182.21± 50) per water treatment plant per month or ~ 0.67 million gallons of water in an avoidable loss. Adopting an optimized water treatment scheme and a watershed management approach will help sustain the WRCC.

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