

A Stochastic Mathematical Program with Equilibrium Constraints for Sustainable Wastewater Management

Steven A. Gabriel ¹, Chalida U-tapao ¹, Christopher Peot ², Mark Ramirez ²

1. University of Maryland, College Park, Maryland 20742 USA, email: cutapao@umd.edu
2. District of Columbia and Sewer Authority, 5000 Overlook Avenue, SW, Washington, DC 20032

Operations research (OR) is one of many mathematical models that can support sustainable development of world energy consumption. We present a stochastic mathematical program with equilibrium constraints for sustainable wastewater management. This two-level problem is a stochastic model for wastewater-derived energy with a strategic wastewater treatment plant as the upper-level player. The lower-level players make up the fertilizer, CNG transportation, natural gas for residential usage and electricity markets. All players are price-takers. The strategic player's decisions involve converting uncertain amounts of solids into, high-end fertilizer, biogas and/or electricity for internal or external purposes. This research uses OR to optimize a decision maker's objectives within the limits of available energy resources and also provide results for sustainable development. The results base on economics and environmental purposes.