Energy and water are consumed or contaminated during both the production and disposal of wasted food. To this point, evaluations of water and energy resources associated with food waste have considered only resources used in food production. To allow full characterization of food waste within a Food Energy Water (FEW) nexus framework, this study addresses a fundamental knowledge gap related to the energy and water impacts of food waste after disposal. This research characterizes fluxes of water and energy related to disposal of wasted food in landfills within the state of Florida. Also, it is estimated that each metric ton (Mg) of landfilled food waste produces 69 kWh of energy, while the energy needed for collection, leachate transport, and treatment totals 466 kWh/Mg. Hence, a net energy cost of 397 kWh/Mg is estimated, which is 3.9 x 10^8 (0.39 billion) kWh annually in Florida. This research finds that the water footprint of landfilled food waste is related to assimilation of contaminated effluent, and ranges from 134 to 2670 m^3 per metric ton of landfilled food waste, depending on the constituent. Up to 2.6 x 10^9 (2.6 billion) m^3 of water may be required annually to assimilate contamination related to landfilled food waste in Florida. This study assesses the sensitivity of 21 variables used to estimate energy and water impacts and find that impacts are sensitive to the proportion of landfills collecting and utilizing landfill gas and concentration of constituents in leachate and effluent. Future research should be focused to improving the characterization of these influential parameters, and to similar FEW analysis of other food waste management technologies, such as composting or anaerobic digestion. Better understanding of water and energy impacts of food waste could inform societal decision making regarding investment in FEW-efficient waste management technologies.

Keywords: food, energy, water nexus, food waste, water footprint, landfill, waste management

Major: Civil Engineering

Educational Career:
Bachelor’s of Water Resources Engineering, BS, 2009, Bangladesh University of Engineering and Technology
Master's of Water Science and Engineering, MS, 2015, UNESCO-IHE Institute of Water Education

Committee in Charge:
Kelly Kibler, Chair, Civl, Environmental, & Construction Engineering
Debra Reinhart, Civl, Environmental, & Construction Engineering
Omer Tatari, Civl, Environmental, & Construction Engineering

Approved for distribution by Kelly Kibler, Committee Chair, on March 3, 2017.

The public is welcome to attend.