Efficiency assessment of wastewater treatment plants: A data envelopment analysis approach integrating technical, economic, and environmental issues

Castellet, L., & Molinos-Senante, M. (2016). Efficiency assessment of wastewater treatment plants: A data envelopment analysis approach integrating technical, economic, and environmental issues. Journal of environmental management, 167, 160-166. <10.1016/j.jenvman.2015.11.037> Accessed 18 Dec 2020.

Abstract

The assessment of the efficiency of wastewater treatment plants (WWTPs) is essential to compare their performance and consequently to identify the best operational practices that can contribute to the reduction of operational costs. Previous studies have evaluated the efficiency of WWTPs using conventional data envelopment analysis (DEA) models. Most of these studies have considered the operational costs of the WWTPs as inputs, while the pollutants removed from wastewater are treated as outputs. However, they have ignored the fact that each pollutant removed by a WWTP involves a different environmental impact. To overcome this limitation, this paper evaluates for the first time the efficiency of a sample of WWTPs by applying the weighted slacks-based measure model. It is a non-radial DEA model which allows assigning weights to the inputs and outputs according their importance. Thus, the assessment carried out integrates environmental issues with the traditional “techno-economic” efficiency assessment of WWTPs. Moreover, the potential economic savings for each cost item have been quantified at a plant level. It is illustrated that the WWTPs analyzed have significant room to save staff and energy costs. Several managerial implications to help WWTPs' operators make informed decisions were drawn from the methodology and empirical application carried out..

Keywords

Economic savings, Efficiency, Performance, Shadow price, Weighted slacks based measure.