UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

A DEA APPROACH IN MEASURING EFFICIENCY OF WASTEWATER TREATMENT IN MALAYSIA

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ABSTRACT

Wastewater treatment process (WWTPs) services can be considered as important indicators of the development of a country as water is the vital supporting resource for sustainable development. In Malaysia, The National Water Services Commission (SPAN) is introduced to oversee the performance of wastewater operators as the demand of the wastewater treatment is increasing over the years. The pollutants discharged from the process of WWTPs would affect the environment and if the pollutants were not being in a good controlled, it will give a negative impact to the environment. Therefore, the purpose of this study is to measure the efficiency of wastewater treatment in Malaysia and to choose the state that provide the best treatment of wastewater services which also could prevent wasting resources and unreasonable increase of costs. Previous researchers conducted extensive research on the efficiency of wastewater treatment, primarily using Data Envelopment Analysis (DEA), in which only desirable inputs and desirable outputs were included. The first measurement of the WWTPS efficiency of the 11 states in Malaysia for the year of 2017 will be conducted by using Charles, Cooper and Rhodes (CCR) model. There are two states that efficient which are Labuan and Terengganu. However, the model with the absence of undesirable outputs will have an unfair and unreliable results, thus the Distance Directional Function (DDF) approach will be used in the second step to measure the efficiency for the WWTPs that involves desirable inputs, desirable output as well as the undesirable output. This model indicates how far the desirable output will expand and the undesirable output will reduce. The desirable outputs in this study are suspended solid (SS) and chemical oxygen demand (COD), while the undesirable output in this study is ammoniacal nitrogen (AMN). The efficiency score obtained from the DDF approach will be compared with another DEA approach that also incorporates undesirable output which is the SBM-UO model. The comparison of the two models identifies four similar efficient states: Johor, Labuan, Pulau Pinang, and Selangor. Furthermore, the inefficient WWTPs operators is able to conduct benchmarking process with the efficient states so that future improvements could be done. Labuan appears to be efficient through the result from the three models which means Labuan can be served as the main state to be benchmarked by other state.