Environmental Engineering and Management Journal *April 2015, Vol.14, No. 4, 719-730*
http://omicron.ch.tuiasi.ro/EEMJ/

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A FUZZY NON-RADIAL DATA ENVELOPMENT ANALYSIS (DEA) APPROACH TO MEASURE REGIONAL ENVIRONMENTAL PERFORMANCE OF CHINA

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Abstract

Data envelopment analysis (DEA) has been recently utilized as a multiple criteria tool for environmental performance evaluation by incorporating undesirable outputs. Most DEA models to measure environmental performance follows the assumptions of crisp data and radial measures. In this paper, we present a fuzzy non-radial DEA approach with Russell measure for environmental performance evaluation. A pair of bi-level mathematical programs is formulated to calculate the lower and upper bounds of the fuzzy efficiency score of the environmental efficiency at specific levels. We transform this pair of bi-level mathematical programs into a pair of conventional linear programs. A case study of 29 provinces, municipalities and autonomous regions of China using the proposed fuzzy non-radial DEA approach is also presented.

Key words: environmental efficiency, fuzzy DEA, Russell measure, undesirable output

Received: October, 2011; Revised final: July, 2012; Accepted: August, 2012

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