Introduction

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Biographical notes: Peng Zhou is a Professor at College of Economics and Management, Nanjing University of Aeronautics and Astronautics (NUAA), PR China. He was also with the Energy Studies Institute, National University of Singapore (NUS) as a fellow till August 2009. He holds a PhD in Industrial and Systems Engineering from NUS. His main research interest is energy and environmental systems analysis, with particular emphasis on the application of operations research/management science and statistical analysis techniques. He has published over 20 peer-reviewed journal articles. He is an editorial board member of the *International Journal of Performability Engineering*.

There has been a growing concern about energy consumption growth, climate change and sustainable development. As a result, concepts like energy efficiency, environmental performance and sustainable development have been widely cited by researchers and practitioners. Improving energy efficiency helps to reduce energy consumption and improve environmental performance, which is an important step towards sustainable development. In this regard, an important research question arises: how to measure energy efficiency, environmental performance and sustainability?

The papers appeared in this special issue attempt to advance the knowledge of using modern Operations Research/Management Science (OR/MS), econometrics, and other tools to assess energy efficiency, environmental performance and sustainability. The first, Boyd (2009), uses stochastic frontier regression analysis to assess the energy efficiency of two climate sensitive manufacturing sectors, namely auto assembly and pharmaceuticals. The resulting models have been adopted by the US EPA Energy Star to benchmark energy performance for plants in the two sectors. In Mallah and Bansal (2009), a linear econometric model is developed to assess energy efficiency potentials on future electricity requirements in India. In order to separate efficiency effect from non-efficiency effect, He et al. (2009) apply the logarithmic mean Divisia index decomposition analysis method to decompose China's aggregate electricity intensity into structure and intensity effects at a relatively refined level. They found that energy efficiency improvement is the main drive force of the decline in China's aggregate electricity intensity during 1995–1999. Yu and Tao (2009) introduce a fuzzy logic based life cycle assessment approach to assessing the energy efficiency of

biomass-based ethanol. Compared to the traditional life cycle assessment, the fuzzy logic based approach has advantages of simplicity and lower data requirements among others.

As a popular nonparametric frontier technique for performance measurement, Data Envelopment Analysis (DEA) has recently received much attention in energy and environmental studies (Zhou et al., 2008). This special issue also includes two DEA related papers. Within a nonparametric DEA framework, Zha and Zhou (2009) apply the directional distance function approach to constructing an environmental performance index. The index has been applied to model the environmental performance of Chinese industry at provincial level over time. In Halog (2009), DEA is used to construct performance metrics for evaluating energy, environmental and sustainability performance of biofuel supply chains. The metrics are helpful to design a sustainable value chain of biofuels.

The use of renewable energy helps to reduce carbon dioxide emissions and promote sustainable development. It is therefore important to assess the contribution of renewable energy to sustainable development. To deal with the imprecision and uncertainty of the information available, Doukas et al. (2009) propose a linguistic multicriteria TOPSIS method to assess alternative renewable energy sources. In Lin et al. (2009), the computable general equilibrium approach is adopted to assess the potential of renewable energy and energy efficiency improvement in reducing CO_2 emissions in Taiwan. Eason et al. (2009) develop a population based model for assessing sustainability implications and apply it to evaluate various scenarios of US energy sector in response to the renewable energy standard under the American Renewable Energy Act (H.R. 890). By using decomposition analysis and Environmental Kuznets Curve, Borghesi and Vercelli (2009) provide an in-depth discussion on whether the current energy consumption and productions trends are consistent with sustainable development.

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