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DEA Index Models for Advancing United Nations' Sustainable Development Goals

The latest research of Prof Ali Emrouznejad explores how Data Envelopment Analysis (DEA) can support the United Nations' Sustainable Development Goals (SDGs). By creating DEA-based index systems, the aim is to measure and enhance progress toward critical global targets such as clean energy, sustainable cities, and responsible consumption. These models provide a robust, data-driven approach to evaluate efficiency and identify areas for

improvement, empowering policymakers and organizations to make informed decisions.

This innovative method bridges the gap between operational efficiency and sustainable development, offering a practical tool to address complex challenges. Together, we can drive meaningful action toward achieving the SDGs.

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About the author

Ali Emrouznejad is a Professor and Chair in Business Analytics at the University of Surrey, UK, where he leads the Centre for Business Analytics in Practice (CBAP). He is a globally renowned academic, celebrated for his ground-breaking contributions to Data Envelopment Analysis (DEA), performance measurement, and business analytics. He has been recognized as one of the top 2% of the world's most influential scientists by Stanford University and has authored more than 250 high-impact articles.

DEA INDEX MODELS FOR ADVANCING UNITED NATIONS' SUSTAINABLE DEVELOPMENT GOALS

Vincent Charles and Ali Emrouznejad

This work explores how Data Envelopment Analysis (DEA) can advance progress toward achieving the Sustainable Development Goals (SDGs). DEA is a quantitative, non-parametric technique for efficiency assessment that evaluates the performance of decision-making units (DMUs) relative to a frontier of best practices. Its ability to handle multiple inputs and outputs simultaneously makes it uniquely suited to tackling the multi-dimensional challenges of sustainability. The study focuses on three key themes: *resource management, environmental and energy efficiency, and governance and policy.* Applications discussed include water management, waste reduction, public transport, and energy use, providing a holistic perspective on SDG implementation. DEA's flexibility allows it to incorporate diverse indicators, making it an ideal tool for examining the interconnected dimensions of sustainability.

This paper highlights how DEA-based composite indices can measure and benchmark performance, uncover inefficiencies, and provide actionable insights for improvement by integrating economic, social, and environmental dimensions.

Key findings emphasize the importance of expanding DEA applications to underrepresented regions and sectors, addressing data limitations, and incorporating dynamic and behavioural factors into existing models.

Future research directions include developing cross-sectoral DEA models, adapting methodologies for incomplete and noisy datasets, and leveraging machine learning techniques to enhance analysis and interpretability.

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