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Construction of a responsible investment composite index for renewable energy industry

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ABSTRACT

In the past decade, environmental, social and country governance (ESG) aspects as well as economy have become key factors for decisions in the investment and future development of renewable energy industry. As a result, construction of an index for an effective measurement and benchmark of the overall sustainability and economy across countries becomes inevitable. In practice, the index should be capable to reflect a close-to-complete evaluation of existing and future conditions of renewable energy. At the same time, it should also be capable to reveal the key ESG and economic elements related to renewable energy industry. In such case, the index does not only provide an effective investment tool for investors, but also allows the index users to perform necessary comparative analyses.

A composite index, so-called Renewable Energy Responsible Investment Index (RERII), is proposed. It contains 50 countries and 17 different indicators which are classified to economic, environmental, social and country governance pillars. A trend of RERII is calculated from 2004 to 2013. In addition, 18 country profiles are created for comparative studies. The proposed RERII in this study can be used as a screening tool, decision making tool, benchmarking tool and guidance of sustainable development.

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Nomenclature

AESPI	Aggregated Energy Security Performance Indicator
BRICS	Brazil, Russian Federation, India, China and South Africa
EPI	Environmental Performance Index
ESG	environmental, social and country governance
FA	factor analysis
FFSI	fossil fuel sustainability index
GCII	The Global Cleantech Innovation Index
GDP	gross domestic product
IMF	International Monetary Fund
PCA	principle component analysis
RECAI	Renewable Energy Country Attractiveness Index
RERII	Renewable Energy Responsible Investment Index
SEI	Sustainable Energy Index
SIT	sustainability index for Taipei

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1. Introduction

Climate change and energy insecurity are among the greatest threats to the human race. The costs of failure to address the problems are extremely high. Over the past decade, renewable energy development has always been recognized as one of the solutions to combat climate change and shortage of conventional energy sources. Many countries have increasingly paid attention to the renewable energy development and market. In 2014, the total investment for renewable energy was $270 billion, which was six times that of 2004 [1]. However, the total investment fell in the past few years, partly due to policy uncertainty in many countries [2]. Concerning with government expenditure and funding constraints, renewable energy investors are important for future sustainable developments. Profit is generally seen as the main goal of investors. Yet, in the past decade, ESG investment has grown nearly tenfold [3]. Investors have started to realize that the ESG concerns can provide attractive return enhancement opportunities and are actually as equally important as profit. Recognizing that, incorporating ESG criteria into investment practices, so-called responsible investment tools, is becoming popular.

In this changing environment, one of the major forces created by responsible investment is increasing demand for effective investment tools from investors. Aggregating different indicators into a composite index is a common and practical approach. This effectively summarizes complex indicators into a single figure to benchmark country performance [4]. The index based approach has been widely applied in different aspects, such as sustainability measurement [5], energy sustainability of rural communities [6], quality of life [7] and assessment of air quality [8]. In the meantime, only few indexes are designed for renewable energy, which include: FFSI [9], SEI [10], SIT [11], AESPI [12], RECAI [13], GCII [14] and EPI [15]. FFSI is a composite index with three dimensions: depletion of resources, dependence on outside subsidies and disruption of natural cycles. Since the main objective of the index is to determine the most efficient management of fossil resources in energy sector, it does not fit responsible investors' goals. SEI is another composite index which has three main elements for sustainable energy development. The method aggregates three concepts of energy supply, energy efficient and environmental protection to construct an index. However, the index does not completely reflect the whole concepts of ESG and is also not suitable for responsible investors. SIT is a four dimensions index with 51 indicators. The indicators are classified into ESG and institutional dimensions to construct a sustainability index for Taipei city. Although the concepts of ESG are included, only few indicators concerning renewable energy are included. AESPI is formulated by 25 individual indicators. The index is to evaluate Thailand's energy security status that considers the dimensions of social, economic and environmental developments. However, the index does not contain any indicator to reveal the country governance. In addition, similar to SIT, both indexes focus on single country and hence, cannot be used as screening tool. RECAI is a well-known index and has been launched for more than ten years, covering 40 countries across six continents. It is constructed with three main drivers, including macro drivers, energy market drivers and technology-specific drivers. However, the underlying datasets and weightings are not publicly disclosed and based on subjective assessments. In addition, ESG is not under consideration. Hence, it is improper for responsible investors. Similarly, GCII is not suitable for responsible investors because of the same reason. The index focuses on the inputs and outputs innovation factors and lacks of ESG concerns. EPI is another famous index. It consists of two main streams with nine key dimensions, including health impacts, air quality, water and sanitation, water resources, agriculture, forests, fisheries, biodiversity and habitat and climate and energy. Although the nine key dimensions are extensive, it is not comprehensive enough to reflect ESG as well as investment environment.

The aim of this research is to construct a composite index that is suitable for renewable energy responsible investors to use. The intent of the composite index is not only to provide one predominant investment platform, but is also to facilitate a structured and transparent process whereby key indicators and assumptions can be included flexibly, so that the composite index can be revised and enriched to facilitate all stakeholders for renewable energy. In this paper, Section 2 presents an overview of construction of a composite index. The proposed RERII is developed and analyzed in Section 3. Finally, a conclusion is drawn in Section 4.

2. Construction of composite index

2.1. Conceptual framework

A composite index is a quantitative or qualitative indicator derived from multi-dimensional factors that can reveal the relative performance of a country, an industry or a firm in a particular aspect. Ideally, a composite index is a simple mathematical value by aggregating of a series of complex facts. Once a composite index is developed, it can be used to facilitate communication, comparison, decision making, benchmarking and ranking. In the first step, a conceptual framework should be developed to define the