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Renewable energy policies in promoting financing and investment among the East Asia Summit countries: Quantitative assessment and policy implications

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HIGHLIGHTS

- This paper evaluate renewable energy policies in 16 East Asia Summit countries.
- Five criteria are used to build the quantitative index.
- They are market, profitability, legislation, technology, and financial resources.
- Policy implications are drawn based on the index.

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ABSTRACT

Many countries have implemented various policies for renewable energy development ranging from setting power purchase agreements and the legislation of renewable energy requirements to providing incentives and imposing carbon taxes. The evaluation of the effectiveness of such policies, however, is fragmented, which raises a need for a comprehensive analysis. This paper aims to assess whether and how policies promoting renewable energy investment have achieved the intended goals. It employs five broadly defined criteria - market, uncertainty, profitability, technology, and financial resources - to build an index to assess respectively if such policies have helped create a market for renewable energy, maximize potential profits, reduce risks relating to the investment, develop and adopt new technologies, and improve the access to financial resources. Each criterion is reflected by three indicators. Values of each indicator are converted into ordinal values for analysis. The index not only scans comprehensively all relevant renewable energy investment policies in the East Asia Summit countries, but also provides systematic and quantitative measures to compare the effectiveness of policies in these countries with respect to the creation of market, the degree of uncertainty, the potential of profitability, the development and adoption of technology and the accessibility of financial resources.

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1. Introduction

Many countries have implemented various policies for renewable energy development ranging from setting power purchase agreements (PPA) and the legislation of renewable energy requirements to providing incentives and imposing carbon taxes on fossil energy sources. Review of renewable energy policy in various countries have been conducted, including (Shen and Luo, 2015) for China, (Mekhilef et al., 2014) for Malaysia, (Chen et al.,

2014) for Japan, South Korea and Taiwan, (Lidula et al., 2007) for ASEAN, (Sarraf et al., 2013) for Cambodia, (Schmid, 2012) for India, (Blok, 2006) and (Klessmann et al., 2011) for the European Union. However, as shown in Fig. 1, the share of renewable energy in the total primary energy consumption in 2013 averages 2.2% across the world, and it is even smaller at 1.5% for the Asia Pacific region. Within the Asia Pacific region, New Zealand tops at 10.3%, followed by the Philippines (7.4%) and Australia (3%). For the rest of the countries, the renewable energy share is no more than 2%. Looking from the supply perspective, only 14% of global total primary energy supply is from renewable energy, among which biofuels and renewable waste account for more than 10% and other renewable sources such as solar, geothermal, wind and tide account for only

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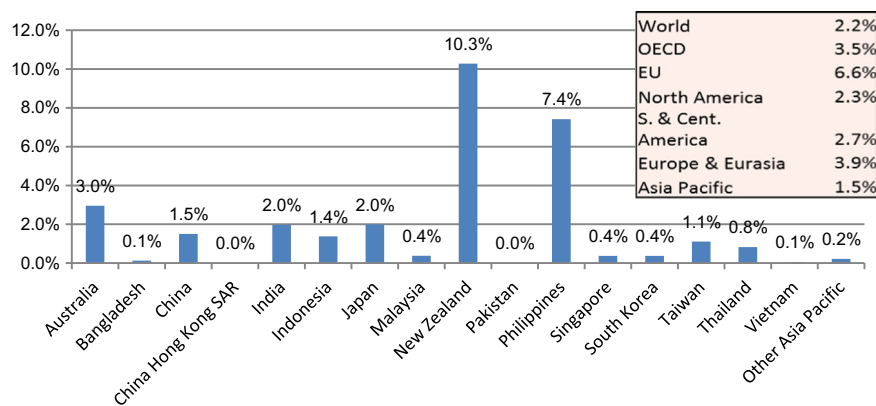


Fig. 1. Share of renewable energy in the total primary energy consumption in 2013. Source: BP statistical review of world energy June 2014.

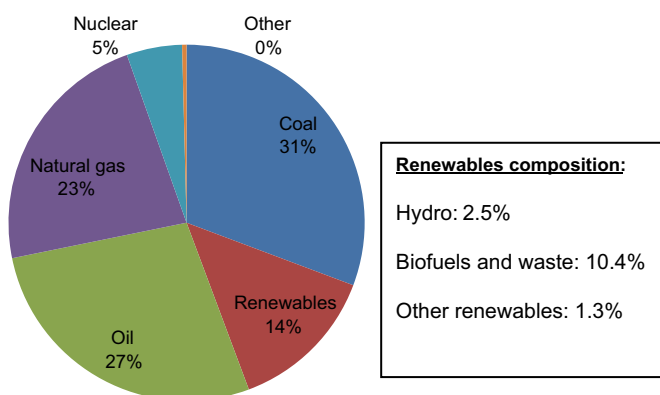


Fig. 2. 2013 fuel shares in world total primary energy supply. Source: International Energy Agency: Renewables Information 2015.

1.3%, as shown in Fig. 2.

Many countries invest heavily in renewable energy capacity. According to International Energy Agency, since 2005 the global annual investment on renewable energy-based electricity generation has almost tripled, and in 2013, renewable energy accounted for about 60% of \$400 billion investment in new power generation. As shown in Fig. 3, Asia (including China) almost contributes to half of the world investment in new renewable power capacity. The Fig. 4 further shows that the growth of non-hydro renewable energy capacity in Asia in 2014 is mainly driven by big economies such as China, India and Japan.¹ All developing countries in this region, except for China, have a growth rate lower than the Asia average. In the meantime, it is noted that although some countries in Southeast Asia, such as Cambodia, Malaysia, the Philippines, and Vietnam, had more than 10% growth rate, the accumulated capacities in these countries are still very small. Thailand is the leading country in Southeast Asia when measured by both growth rate and accumulated capacity. However, the growth rate in Thailand is still far behind the Asia average.

It is thus interesting to ask what the countries in East Asia has done right and what policy gaps are remaining in incentivizing investment and financing of renewable energy projects. Specially, the evaluation of the effectiveness of such policies is so far mostly fragmented in the literature to our knowledge. This also raises a need for a comprehensive analytical framework for policy evaluation.

This paper aims to assess whether and how policies, which are supposed to promote renewable energy investment, have achieved the intended goals. It employs five broadly defined criteria -

¹ The total capacity is not zero but very small compare to the numbers in China, Japan, and India.

market, profitability, legislative and regulatory uncertainty, technology and financial resources - to build an index of policies to assess if such policies have helped create a market for renewable energy, maximize potential profits, reduce risks relating to the investment, and develop and adopt new technologies, as well as provide more financing channels. These criteria are selected because of its high relevance to concerns - risks and return - of potential investors in the renewable energy sector and feasibility of policies. To our knowledge, there are no previous academic studies that have attempted to build an index to quantitatively evaluate the renewable energy policies, especially from the investors and financiers' point of view. The most relevant to this study might be the IRENA reports and the Renewable Energy Country Attractiveness Index released by Ernst & Young (IRENA, 2012; Ernst and Young, 2014). We critically review these related reports in the subsequent section.

Each of the five aspects - market, profitability, legislative uncertainty, technology, and financial resources has a few indicators. The market aspect examines whether policies helped create and extend a market for renewable energy. The profitability aspect presents whether policies provided the environment in which potential profits from renewable energy investment can be improved. The uncertainty aspect examines whether there are mechanisms, legislations and regulations that reduce policy risks relating to the investment in renewable energy. The technology aspect shows whether and how policies helped develop and adopt renewable energy technologies. The financial resources aspect presents policies that could improve the availability of funds by addressing issues on the supply side, including public financing, financial institutions, financial markets, financial tools and business models. Values of each indicator are collated and the cardinal values are converted into ordinal values for analysis. As the outcome, this research not only comprehensively scans all relevant renewable energy investment policies in the East Asia Summit countries, but also provides systematic and quantitative measure to compare the effectiveness of policies in these countries with respect to the creation of market, the degree of uncertainty, the potential of profitability, the development and adoption of technology and the accessibility of financial resources.

The index in this study is built using the policy measures in the year 2014. To capture the temporal characteristics of renewable energy development and dynamics of renewable energy policies, we will need to perform a consecutive yearly evaluation and comparative analysis, which is the ultimate goal of this suggested index but beyond the scope of this study. The merit of this study we believe is to propose a simple index comprising of five dimensions which could give a snap-shot on what policies are missing in promoting and securing renewable energy investment. This index can be easily understood and communicated between policy makers across the

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