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Renewable electricity policy in Asia: A qualitative comparative analysis of factors affecting sustainability transitions

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ABSTRACT

A qualitative comparative analysis was undertaken of 18 Asian countries to determine factors that influence the pace of their sustainability transitions toward increased renewable energy for electricity. We develop a policy index based on renewable electricity targets, feed-in tariffs, and emissions trading schemes in these countries. Countries with a relatively low level of current renewable electricity generation but with relatively high scores on the policy index are wealthier and more democratic. Likewise, countries with a relatively high level of renewable electricity generation and with lagging renewable electricity policy tend to be poorer, more authoritarian, and endowed with higher levels of fossil-fuel resources. Thus, our analysis points to factors other than GDP per capita that could explain the relative stasis or progress of a country toward a sustainable energy transition. Implications for the literature on the political and societal (or "landscape") dimensions of sustainability transitions are discussed.

1. Introduction

Although many countries have developed policies to support sustainability transitions (STs) in a range of industries, the reforms have often fallen far short of the full mitigation of environmental

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problems. The issue of the slow pace of STs is particularly pressing for greenhouse-gas emissions, which have continued to climb at a global level, and for developing countries in Asia. Although some countries and world regions have achieved stability or even reductions in both per capita and total emissions, the developing countries of Asia have emerged as major contributors to global greenhouse-gas emissions and as rapidly growing contributors. For example, between 1990 and 2010, the carbon-dioxide emissions of China increased by 257%, of Indonesia by 194%, of India by 180%, of Thailand by 160%, and of Taiwan by 118% (Olivier et al., 2011). Because electricity generation is now the leading source of emissions, ST policies with respect to electricity in this world region deserve special attention.

This study will examine the comparative strength of ST policies for renewable electricity (defined below) in a data set of 18 East, Southeast, and South Asian countries. It is assumed that growth in renewable electricity generation in general can help to reduce greenhouse-gas emissions. However, the relationship between growth in renewable electricity generation and reduction of fossil-fuel generation is not one-to-one (York, 2010, 2011). Especially in Asia, rapid economic growth and, in some countries, ongoing electrification are causing enormous increases in electricity demand. As we studied the electricity planning documents for this group of countries, it became clear that many countries are responding to projections of increased demand by increasing not only their goals for renewable electricity but also their goals for fossil-fuel sources.

This study contributes generally to research on STs by developing the analysis of the broad socio-economic conditions that lead to delayed, blocked, or slowed transitions. Although lack of industrial policy and failure to produce electricity at market-competitive prices are often significant barriers for firms and technologies located in niche positions with respect to an existing sociotechnical regime, it is also the case that political and societal barriers can affect the underlying political support for STs. Through comparative analysis, this research project will contribute to the literature on such broader "landscape" factors that enhance or retard policies favorable to renewable electricity generation. The term "landscape" is used in the sense of the multi-level perspective (Geels, 2011) and will refer specifically here to geographic, natural resource, demographic, economic, and political factors that affect the policy field for renewable electricity.

Our central research question is to understand the joint effects of societal and political variables on a country's degree of ST toward renewable electricity. Our research question specifically asks: how do the variables act in conjunction to predict Asian countries' varying performances for sustainable electricity policies? In the process of addressing the research question, we also show which Asian countries have the highest and lowest current levels of renewable electricity generation, and which have the most and least advanced renewable electricity policies.

2. Background literature

The problem of how to achieve more rapid innovation and more successful STs is receiving increasing attention in the literature on STs (Markard et al., 2012). Although some industrial transitions occur with little or no government intervention and are driven by marketplace innovation, the transition of electricity and related large sociotechnical systems generally requires government policy to spur demand and to correct for environmental externalities that are not captured in conventional pricing arrangements for energy from fossil fuels. Strategic niches where innovation occurs, such as solar energy, require government protection and support, at least until they are able to scale up and to achieve pricing parity or until policy internalizes externalities of competing technologies through instruments such as carbon pricing (Smith et al., 2005; Smith and Raven, 2012). In heavily regulated industries such as electricity generation and distribution, government policy support is especially important. Thus, the issue of STs for electricity is a good site to develop general knowledge about the role of broad societal and political factors that shape the pace of STs.

Increasingly the literature on STs recognizes the importance of such factors (e.g., Elzen et al., 2011; Flor and Rotmans, 2009; Geels, 2011; Grin, 2010; Meadowcroft, 2009, 2011). Of particular relevance to this study is the role of domestic stakeholders, specifically the level of cooperation or resistance from the incumbent industry that is undergoing sunsetting or a transition. Sometimes STs are embedded in broad social conflicts over the future direction of society, such as occurred in the conflict between nuclear and wind energy in Denmark (Jørgensen, 2012). In the United States and to some extent