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South Korea's urban green energy strategies: Policy framework and local responses under the green growth

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ABSTRACT

Environmental and energy problems confronting South Korea brought a paradigm shift in the urban development toward "low-carbon green city" since the declaration of "Green Growth Strategy" in 2008. The South Korean governments set the goal to increase urban energy self-sufficiency through renewable energy generation and implemented various urban energy projects. However, the outcome of those urban green energy projects showed a varying degree of success. While the top-down approach led by the government facilitated the spread of urban green energy strategies in a short period of time, it also showed some drawbacks, such as the gap of willingness between the central government and the local governments and low level of community involvement. Although the importance of citizen participation in the transition to urban energy self-sufficiency has been emphasized in a rhetoric, energy projects that residents played a key role were rare in Korea. The urban energy transition in the low carbon green city projects needs to be supplemented by reinforced bottom-up approaches with the momentum from local governments as well as active citizen participation during the planning and implementation process.

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1. Introduction

Cities are major consumers of energy and resources, which cause a series of issues such as energy depletion, greenhouse gas (GHG) emission, contamination of air and water and destruction of urban forests and ecosystems (Beatley, 2007; Campbell, 1996; Dekay & O'Brien, 2001; Fook & Gang, 2010; Low et al., 2005; Rees, 1997). Environmental degradation and the consequent decrease in quality of life caused by growth-oriented urban development brought a necessity to pursue a more sustainable urban energy strategy that combines energy, environment, economy and society (Beatley & Manning, 1997; Kline, 2000). Furthermore, carbon control began to be incorporated in urban management as concern over climate change grew (Bulkeley, 2010; Jonas et al., 2011; While et al., 2010). The concept of 'green city' has received more attention and it includes not only ecologically sound and clean environment but also energy transition from fossil fuels to renewable energies.

South Korea is the 8th biggest energy consumers in the world as of 2012 (IEA, 2014a), and energy issues have been one of policy priorities as it has long been dependent on imported fossil fuels to sustain its economy. Overseas dependence of primary energy was 95.7% in 2013 (MOTIE & KEEI, 2014a; 2014b). The share of fossil fuels in South Korea's primary energy supply and electricity generation reached respectively 85.7% and 66.8%, and the electricity was mostly consumed by industry (54.1%) and residential and commercial sector (39.4%) (Fig. 1). At the same time, South Korea is facing an increasing demand for carbon reduction as the 7th biggest CO_2 emitter in the world (IEA, 2014b).

Uneven energy and electricity self-sufficiency[1] among cities is also cited as a challenge to South Korea. While energy consumption in capital area (Seoul metropolitan area) accounted for approximately 36.6% of total electricity consumption, most of the power plants are located in southern regions. Electricity self-sufficiency of seven metropolitan cities in South Korea ranged from 1.7% to 337.2% (Hyundai Research Institute, 2013). As low-carbon society has emerged as an important concept, the energy issues began to have an inextricable linkage with urban development (Bulkeley, 2010; Jonas et al., 2011; While et al., 2010). The declaration of "Green Growth Strategy" in 2008 was a turning point for South Korea to accelerate the urban energy transition with comprehensive policy measures of sustainable development (Lim, 2011; Park & Kim, 2013).

In this context, this paper explores the evolution of South Korea's green city strategy with a specific focus on urban green energy policies and discusses its major characteristics. The South Korean governments adopted the green city strategies to increase urban environmental quality while reducing carbon emission and energy dependency on imported fossil fuels. Based on the review of the first five years of green growth, this paper also assesses the policy outcome of low-carbon green city and related urban energy transition. Another focus

[1] Electricity self-sufficiency = total electricity production/total electricity consumption.

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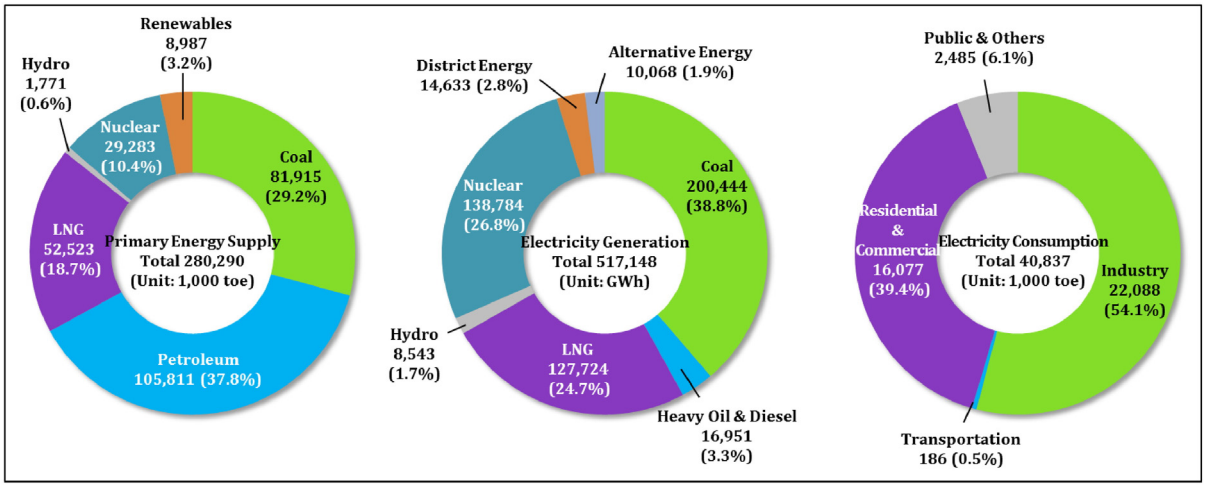

Source: MOTIE & KEEI (2014a): 174-175; MOTIE & KEEI (2014b): 31, 44

Fig. 1. Energy mix and electricity generation and consumption in South Korea (2013).
Source: MOTIE & KEEI (2014a): 174–175; MOTIE & KEEI (2014b): 31, 44

Table 1
Financing plan for green growth (2009–2013)
(Unit: trillion KRW).

Strategy	2009	2010–2011	2012–2013	Growth rate
Climate change adaptation and energy independence	8.6	29.2	19.2	14.0%
Creation of new engines for economic growth	4.8	10.7	13.1	9.4%
Improvement of the quality of life and enhancement of international standing	5.2	10.5	12.2	3.6%
Total	17.5	48.3	41.5	10.2%

Source: Presidential Committee on Green Growth (2009b).

of this study will be given to the central–local government relations in pursuing low-carbon green city as it will reveal the characteristics and consequences of top-down approach of green growth strategies. The green growth strategies could spread nationally within a short period with an attractive fiscal incentive but also accompanied the gap of willingness between the central and local governments as well as lack of community involvement.

This paper consists of the following sections: the next section surveys the literatures dealing with the conditions and elements of urban energy transition. The third section discusses the introduction of low-carbon green cities in terms of South Korea's green growth strategy. The fourth section reviews the quantitative outcome of low-carbon green cities under the green growth framework and evaluates the nature of central-local government relations in pursuing these projects. The cases of seven metropolitan cities will be analysed in this part. The conclusion summarizes the key finding of this research and suggests future tasks for urban green energy projects in South Korea.

2. Elements of urban energy transition

The fossil fuel era enabled modern cities to expand and prosper, but consequently made them witness the "brink of a dual calamity": one posed by finite fuel supplies and the other by its combustion (Droege, 2008: 10). Inevitable depletion of fossil fuel reserves and increasing concern about climate change caused by fossil fuels have created a demand for more sustainable, cleaner and efficient energy sources (Rae & Bradley, 2012). Many cities have tried to step on the path of energy transition from conventional energy supply and consumption patterns to a new sustainable energy system of renewable energy, distributed generation and citizen-participatory energy governance (Choi, 2013: 654). In this regard, energy transition projects to achieve energy self-sufficiency and to cope with climate change have been the main elements of green city, which enable a less energy-intensive way of life (Rae & Bradley, 2012; Lehmann, 2008). The transition to more sustainable energy systems requires a wide scope of engineering disciplines and technology has been regarded as a key to successful urban energy transition (Rae & Bradley, 2012).

A group of scholars emphasized that active community involvement is also a prerequisite for the success of urban energy transition (Allen et al., 2012; Bomberg & McEwen, 2012; Leem, 2011; Musall & Kuik, 2011; Park, 2013; Walker et al., 2007; Warren & McFadyen, 2010). Although central governments play a leading role in national energy governance to manage energy supply plan, power grid and pricing schemes, local governments also have crucial roles in setting regional agenda (Schreurs, 2008) and implementing the projects reflecting local context (Musall & Kuik, 2011). Especially, energy transition to renewable energies involves decentralized, distributed generation and necessitates close cooperation with the local governments. Thus, the task of local governments in energy transition is "to facilitate compliance with regulations and to take adequate account of local specificities, problems and endogenous innovation potentials as well as to combine solutions to environmental problems with economic benefits (Monstadt, 2007: 336)".

Local governments are interested in urban energy transition projects for many reasons. First, many urban energy transition projects aim at efficiency improvement and the proliferation of renewable energy supply systems, which have been emphasized as counter-measures to deal with climate change and energy insecurity over the past few years (Allen et al., 2012; Droege, 2008; Schreurs, 2008). Second, some local governments begin urban energy transition projects to seek economic incentives for their investment in renewable energies. The economic benefits include job creation and attraction of manufacturers, lower energy costs, revenue generation and potential advantages in the climate or energy market that pioneers may enjoy (Byrne et al., 2007; Walker, 2008; Walker et al., 2007). Furthermore, the importance of leadership and policy diffusion is stated as factors to lead the involvement of local governments (Schreurs, 2008). Earlier studies also showed

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