

An analysis of Seoul's energy transition from an integrated multilevel governance perspective*

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A growing body of literature has analyzed urban energy transition. However, the existing analytical frameworks are limited in fully capturing energy transition in cities. This study develops an integrated multilevel governance framework by adding indicators. Using this framework, this study analyzed Seoul's energy transition and found that the energy transition has enhanced by embracing important values beyond the achievement of quantitative targets. From the vertical perspective, parts of national policies downloaded to shape the OLNPP. This study also discovered that the current energy system deteriorated the effectiveness of Seoul's energy transition. From a modified horizontal perspective, institutional preparations for Seoul's energy transition were initially inspired by best practices in other cities. However, this situation has reversed. In addition, this study found that a variety of actors have participated in shaping and implementing Seoul's energy transition.

Keywords: Urban energy transition, Multilevel governance perspective, Vertical dimension, Horizontal dimension, Desirability for energy transition

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1. Introduction

As Bulkeley, Broto and Maassan (2011) clearly delineate, challenges and opportunities in relation to energy transition are salient in cities because of population concentration and the fact that cities are central hubs of social, economic, and technological activities. Specifically, as of 2014, more than half of the world's population (54%) lives in urban areas (UN, 2014). Due to the concentration of economic and social activities in cities, the emissions of urban areas account for 40~70% of world emissions (Walraven, 2009). If these estimates take into account indirect energy consumption for the production of intermediate inputs, the comprehensive emission footprints of cities are even more significant. Urbanized societies are also heavily dependent on other regions. This trend is on the rise. In the future, with the constant growth of both population and economic and social activities expected to continue to be centered in cities, both the extent to which cities contribute to climate change and the demand for them to develop more effective responses to it will increase significantly (Walraven, 2009).

A growing body of literature recognizes that cities are important sites of energy transition considering where competent responses to climate change can be expected (Bulkeley et al., 2011; Rutherford and Jaglin, 2015; UN-Habitat, 2011). First, with abundant human capital and finance, novel technologies and policy measures are tested and approved in cities by local authorities and citizens. A strong degree of technological and political innovation occurs in cities. Drawing on this feature, Evans and Karvonen (2011) describe cities as living laboratories. Second, cities have greater autonomy for incorporating energy transition issues into policy measures and a greater capacity to apply new policies in practice (Francesch-Huidobro, 2016). Third, to stabilize climate change, energy transitions, particularly in cities, are required. An energy tran-

sition can be understood as a fundamental and long-term structural change in an energy system. To support significant energy transitions, the involvement of various actors and institutions with the capacity to address multiple issues is necessary so that local authorities can “coordinate and influence workable local level responses to the problem of developing more effective policies around energy and environmental issues” (Fudge et al., 2015: 2).¹⁾

The important role of cities in implementing change at this level is identifiably increasing. In many cases, local authorities have developed and implemented significantly more comprehensive and intensive energy and climate change policies than central governments (Rutherford and Jaglin, 2015). An indicator of this was the noteworthy and active participation of local governments in the COP 21, which revealed the critical potential of local constituencies to both implement practical solutions and to strongly influence international negotiations based on public opinion (UCLG, 2015).

In South Korea, the One Less Nuclear Power Plant program of Seoul has become known as an important example of best practices of energy transition policy. The success of Seoul’s initiative has inspired and stimulated other local governments to develop sustainable energy policies. On February 4, 2016, for example, heeding lessons learned from Seoul, the city of Ansan announced a major plan for transition into an energy independent city (Kang, 2016). Taiwan has also accepted the ideas behind the OLNPP (Yun, 2016).

As the involvement of local authorities in climate change and energy issues swells significantly, scholars have increasingly focused on the innovative the efforts of local governments (Fudge et al., 2015; Haastard, 2015; Lee, 2015a; Lee and Painter, 2015; Lee et al., 2014). In part, studies have probed which forces are behind the initiation of transitions (Lee et al., 2014). Other studies have

1) It needs to be noted that the page number of Fudge et al.’s article(2015) is given according to the page order since it is currently in press.

focused more on the dynamics and the interactions between multiple actors involved in energy governance (Francesch-Huidobro, 2016; Hasstard, 2015). Overall, however, the literature has evaluated energy transition from a relatively restricted perspective, and this has analytical limitations. Studies have examined whether or not the movement of energy transition is vigorous and which drivers or actors motivate it, but few have been able to determine whether the orientation of the transition is positive or negative. Rutherford and Jaglin (2015) also pointed out that a broader range of values needs to be considered and reflected in studies even though existing studies of energy transitions using ‘the lens of the urban (p. 177)’ have meaningful implications.

To overcome the limitations of these restricted analytical frameworks, this study aims to develop a more integrated analytical framework, which can be applied to assess the quality and dynamics of energy transitions in cities. This more integrated framework is built drawing on a multilevel governance perspective model, and it also includes more indicators. Combined, these factors allow researchers to analyze the orientation of energy transition. Using this integrated framework, this study evaluates energy transition in Seoul.

To reach this goal, this study unfolds as follows. The theoretical framework section reviews multilevel governance perspectives and suggests an integrated multilevel governance perspective, bringing in other analytical frameworks to complement the limitations of each framework. Section 3 documents Seoul's energy transition, and national-level policies related to climate mitigation and energy are briefly investigated. In Section 4, the OLNPP is analyzed using the integrated framework. Finally, the findings of this paper are discussed, and the limitations of this study are noted in the conclusion.

2. Theoretical Framework

1) Multilevel Governance Perspective

Governance is a process of decision-making in which multiple actors are involved. The actors who influence energy governance are local authorities, citizens, businesses, and experts. Also, the actors beyond urban boundaries such as state governments or other cities also impact the energy governance of a city. Therefore, an energy transition needs to be analyzed through a framework that can take into account the interface between activities that might cross “traditional jurisdictional boundaries (Francesch-Huidobro, 2016: 47).”

The multilevel governance perspective (MLG) is a strong framework for analysis of urban energy transition because it focuses on governance from multifaceted dimensions. This section explores what the MLG perspective is, focusing on its strengths and weaknesses.

The MLG perspective consists of horizontal and vertical perspectives. The vertical perspective (Type I MLG) looks into governance processes between different levels of government. Different levels influence each other. Usually, national policies or goals are delivered to local governments, and energy and environmental activities of local authorities are confined within a nationally determined policy or legal framework. However, best practices of local authorities are sometimes adopted by national or higher level government. In this sense, the vertical process shaping energy governance “combines top-down and bottom-up action between interdependence levels of government (Francesch-Huidobro, 2016: 47).” Francesch-Huidobro (2016) used the process of policy convergence in the EU as an example: each member state transposes EU directives to national laws, but pioneering practices also influence and shape the EU level policies. According to Voet (2014), Germany,

one of the most influential EU member states, has successfully uploaded domestic policy measures to the EU level.

The horizontal perspective (Type II MLG) discloses how cities influence other cities. Best practices regarding energy and climate change issues can be shared or circulated in networks to which cities are linked. Examples showing horizontal governance processes are ample. For example, C40 has built a website to share best practices of member cities related to energy and climate change, and this website has inspired many policymakers.²⁾ Seoul's energy transition has received widespread media attention and received numerous awards; it has become a model of best practices that cities in other countries as well as local governments in Korea imitate.

The MLG is a highly effective tool that allows researchers to investigate energy governance from a wider scope. However, it has some limitations. First, since it analyzes energy governance, placing local governments at the center of energy or climate governance, the roles or efforts of other actors like businesses, academia, NGOs and citizens are often neglected. Second, this framework does not provide any assessment of whether energy governance is desirable or legitimate.

To overcome these limitations of the MLG perspective, this study builds an integrated analytical framework by bringing in additional indicators and another framework to expand the generalized MLG perspective.

2) Integrated Multilevel Governance Perspective

Filho et al. (2016) used three indicators to assess sustainability governance: 1) existence of socially just and ethically accepted values; 2) equal emphasis

2) <http://www.c40.org/>

on economic and ecological value of natural resources; 3) degree of acceptance of stakeholders (p. 756). These indicators permit an analysis of the desirability of energy transition by checking whether critical values are included and whether various stakeholders' opinions are accepted. However, this approach cannot track the dynamics regarding who initiates energy transition and where and how energy transition develops. Therefore, including these indicators can enhance the MLG perspective; in turn, the MLG perspective can complement an indicator-based analysis.

Another limitation of the MLG perspective is that it cannot capture the interactions and activities of other actors except local authorities even though it can significantly capture interface around local governments from a comprehensive perspective. Therefore, additional dimensions are required to grasp how non-governmental actors participate in the process of energy governance. Lee and Painter (2015) identified primary actors and their roles in relation to climate change governance (see <Table 1>). The authors evaluated climate change policies of four cities including Seoul based on the identified roles of each actor.

<Table 1> Primary actors and their roles in urban climate change governance

Primary actors	Roles in urban climate change governance
Mayor or vice mayor	<ul style="list-style-type: none"> - Chairing an urban governance governing body - Providing vision on climate change policies - Allocating financial and human resources - Coordinating municipal departments
City departments (directors and staff)	<ul style="list-style-type: none"> - Providing technical expertise - Planning and implementing policies
NGOs and business	<ul style="list-style-type: none"> - Facilitating citizen participation on climate policies - Raising citizens' climate awareness
Research communities	<ul style="list-style-type: none"> - Providing scientific research on climate mitigation and adaptation - Consulting governance members for decision-making

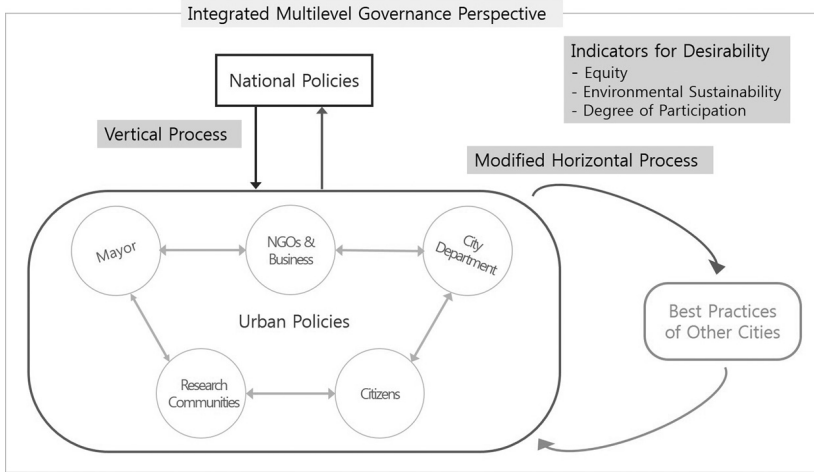
Source: Lee and Painter, 2015: 569.

The framework of Lee and Painter (2015) greatly analyzes the contributions of multiple actors and sheds lights on the strengths and weakness of climate change governance by different actors. However, as the authors themselves articulated, it has limitations: the analytical framework is only applicable for a comparison of energy policies in different cities with similar state-level policies. Also, this study cannot assess the effect of national policies on the development of local government policies, or vice versa. However, the vertical perspective might be critical for evaluation of energy policies of local governments in a socialist state such as the People's Republic of China. In this case, the autonomy of local authorities in the process of energy transition is significantly limited. Even in a democratic country, a local government with a weak fiscal self-reliance ratio might have limited autonomy over energy or climate governance. The MLG can complement these limitations of Lee and Painter (2015)'s framework, permitting an analysis of the vertical dimension of energy transition.

Integrating additional indicators to evaluate the legitimacy of energy transition and the degree of participation of each actor to the existing MLG framework, this study overcomes the limitations of an indicator-based analysis. Furthermore, this study builds a more comprehensive analytical framework for energy transition of cities. More specifically, a modified horizontal process of the MLG perspective can capture a wider variety of situations by integrating the efforts of various actors into the horizontal network. <Figure 1> illustrates the integrated MLG framework.

In the following sections, the practical applicability of this analytical framework is revealed through an analysis of energy transition in Seoul using the integrated MLG perspective. First, the example of Seoul's energy transition is documented.

<Figure 1> Integrated Multilevel Governance Perspective



3. Seoul's Transition

Based on a critical review of government documents, statistics, academic papers, and media reports regarding climate change and energy issues, this study seeks to apply the integrated MLG framework to the case of Seoul. The findings of two public meetings and one in-depth interview are also used in the analysis. In order to understand the vertical interface of energy transition in Seoul, an overview of national climate change and energy policies is necessary.

1) National context

(1) Climate Mitigation Policies

Since former Korean President Myung-bak Lee announced low-carbon green growth as a new economic growth vision for the next sixty years in

2008, the GHG emission reduction target to reduce CO₂ emissions by 30% by 2020 compared to the business as usual (BAU) levels has been subsequently set into law (The Framework Act on Low Carbon, Green Growth).

To reach this target, the government began implementing GHG and Energy Target Management System (TMS) in 2012.³⁾ This program requires large GHG emitters or large energy consumers to submit regular inventories and comply with their emission reduction targets, which are determined through negotiations with the government. The criteria for businesses to join this program have been strengthened,⁴⁾ and relatively small emitters are currently controlled under the TMS (IEA, 2012; Ministry of Environment, n.d.). The implementation of a cap and trade system began in January 2015. 525 large emitters are required to participate in this system;⁵⁾ they account for about 67% of national greenhouse gas emissions. For the first phase from 2015 to 2017, allowances are distributed free to companies. The proportion of free allowances will be slowly decreased.⁶⁾ However, vulnerable industries such as carbon-intensive and trade-dependent industries will be protected by distributing the allowances free regardless of the phases (Ministry of Environment, n.d.). The Korean government has strengthened the emission standard for new vehicles from 140g/km in 2015 to 97g/km in 2020. According to this regulation, new cars need to meet this standard starting in 2015 (Ministry of

3) The program was established in 2010 and commenced in 2012.

4) The TMS requires businesses emitting more than 125ktCO₂e in 2011, those emitting more than 87.5ktCO₂e in 2012 and those emitting more than 50ktCO₂e in 2014 to reduce their emissions according to the negotiated reduction targets. There are separate criteria for facilities, which is lower than the criteria for businesses.

5) Industries emitting more than 125ktCO₂e or their facilities that emit more than 25kt of CO₂e are required to join this system.

6) The second phase is from 2018 to 2020, and the third phase and subsequent phases are expected to cover five-year terms.

Environment, n.d.).

In addition to the aforementioned policies for industrial sectors, South Korea uses various other policy measures to encourage the mitigation efforts of non-industrial sectors. First, a Carbon Point System has encouraged local governments and private individuals and entities to join mitigation activities by providing incentives. People voluntarily join this system and receive incentives such as cash or gift cards for savings of electricity, gas, and water. As of 2014, about 3.5 million households joined this system and reduced GHG emissions by 1.06MtCO₂e. The Green Credit Card similarly encourages public involvement in mitigation efforts by providing card points when card members purchase eco-friendly products and use public transportation. The Green Credit Card was estimated to have obtained a reduction to about 1.05 MtCO₂ as of 2014 (Ministry of Environment, n.d.).

The Korean government also submitted its Intended Nationally Determined Contribution (INDC) to the UNFCCC, which aims to reduce total emissions by 37% by 2030 from the BAU levels (850.6Mt CO₂e in 2030). The reduction target for the INDC has been criticized since it does not guarantee a meaningful reduction in South Korea. The government aims to meet the target by using a significant proportion of international credits rather than reducing national emissions (The Government of the Republic of Korea, n.d.).⁷⁾

(2) Energy Policies

Recent discussions of energy policies have been focused on creating businesses in new energy sectors as an engine for economic growth rather than on stabilizing climate change. Creating new engines for economic growth

7) Originally, the four reduction targets for the INDC, which backslid compared to the current target, were discussed but were severely criticized by civil society and academia (Tak, 2015).

through promoting new energy business development is one of the seven major agendas of the second National Energy Basic Plan (NEBP).⁸⁾ The government subsequently set up an Implementation Plan of New Energy Industry Activation and Core Technology Development Strategy in 2015. In order to boost new energy industries, institutional coordination is undergoing changes. Previously, Korea Electric Power Corporation(KEPCO) only sells the electricity to customers in the electricity market.⁹⁾ However, the number of electricity sellers is expected to increase. The negawatt energy conservation market opened in 2015 to allow demand resource/saved electricity to be exchanged like electricity generated. Also, the entry of owners of energy storage systems (ESS) and electric vehicles into the electricity market is being actively discussed. These discussions and modifications of existing policies and rules are aimed to promote new energy business development.

The 4th New and Renewable Energy (NRE) Basic Plan set the NRE deployment target at 11% of total primary energy supply (TPES) for 2035. Compared to the previous plan for the period from 2009 to 2030, which aimed to increase NRE to 11% of TPES by 2030, the government actually lowered the deployment target. This decision of the Korean government clearly contradicts the goals of the Implementation Plan of New Energy Industry Activation and Core Technology Development Strategy, which aim to promote new energy business development, including NRE. The lowered target is expected to severely slow the momentum, discouraging the anticipated business expansion.

8) The primary business development model includes the following: 1) Negawatt market, 2) ESS integrated services, 3) energy-Independent Islands, 4) solar light rent, 5) electric vehicles, 6) thermal effluent/waste heat, 7) eco-energy towns, and 8) zero energy buildings.

9) Exceptionally, community energy service companies can sell electricity directly to customers.

One of the major goals of the 2nd NEBP is to establish a distributed power system, which contradicts the energy mix planned for 2035. According to the planned energy mix for the target scenario, nuclear power, the representative central power system, will account for 29% of the total generating capacity in 2035. Although the share of nuclear power decreased from 41% in the 1st NEBP to 29% in the 2nd NEBP, nuclear plants with a capacity of 7GW need to be newly constructed in addition to the 11 nuclear plants currently under construction. The 7th Long-term Electricity Demand and Supply Plan announced the building of two additional nuclear power plants in South Korea. Samcheok-si and Yeongdeok-gun have been selected as potential sites for the new nuclear power plants; but social protest and resistance to the sites chosen for new nuclear power plants are on the rise (Lee, 2015). Also, this plan is incompatible with the status of the current electricity market. As of 2015, the average reserve margin, which indicates how many power plants are idle, was 27.3%. Following the large-scale blackout in 2011, the government increased generating capacity from 83.2 GW in 2011 to 97.6 GW in 2015. Due to the economic slowdown, electricity demand has not increased as much as was anticipated. As a result, the private generators who installed the LNG power plants have suffered from deterioration of profits (Choi, 2016).

2) Energy Policies in Seoul

The One Less Nuclear Power Plant Policy (OLNPP) became known as a prime example of best practices in terms of city-level energy governance, drawing interest not only from energy policy experts and decision makers but also from civil society. As of 2011, the electricity consumption of Seoul accounted for 10.3% of the national total while the city generated only 2.9%. This means that Seoul is significantly indebted to other power generating cit-

ies; it also must deal with environmental damages and social conflicts related to power supply systems in those regions. Before the commencement of the OLNPP, Seoul's electricity consumption had been on the rise, increasing by 12% from 2006 (41,826GWh) to 2011 (46,903GWh) (Seoul Metropolitan Government, 2014a).

In 2012, the Seoul Metropolitan Government (SMG) initiated the OLNPP to relieve the environmental and social burden that Seoul's energy consumption puts on other regions, to increase the city's power self-sufficiency, and to respond to global warming. The policy aims to reduce energy consumption by 2 Mtoe by 2014, which is equivalent to the amount of energy generated from one nuclear power plant. In addition, the SMG also aims to increase power self-sufficiency to 8% by 2014 and to 20% by 2020 (Seoul Metropolitan Government, 2014a). Various projects¹⁰⁾ helped the SMG achieve its targets six months earlier than planned. Electricity, city gas, and petroleum consumptions have been reduced by 1.4%, 3.5%, and 1.7%, respectively, while national energy consumptions have increased during the same period (Seoul Metropolitan Government, 2014a). The SMG began implementing the second phase of the OLNPP in January 2014. The newly established targets for the second phase include reducing energy consumption by 4 Mtoe, increasing the electricity self-sufficiency ratio to 20%, and reducing GHG emissions by 20% by 2020, compared to 2011 levels. While the vision in the initial period of the OLNPP was to establish the foundations for energy self-sufficiency, the vision for the second phase includes integrating

10) The OLNPP implementation plan consists of six policy agendas including 78 projects. The six agendas are as follows: 1) increase NRE installments; 2) enhance building energy efficiency; 3) establish environmentally friendly and energy-efficient transportation systems; 4) create energy-related jobs; 5) shift to a low-energy consuming city, and 6) build a citizen-driven low energy consuming culture.

principal values like sharing and participation.¹¹⁾ In other words, the goals of the OLNPP have been expanded from achieving quantitative targets alone to considering important qualitative variables (Seoul Metropolitan Government, 2014b) (See <Table 2>).

<Table 2> The Snapshot of the OLNPP

	1st phase	2nd phase
Vision	Establish the foundations for energy independence	Energy independent Seoul (Energy values: independence, sharing, participation)
Target	Reduce energy consumption by 2 Mtoe	- Reach an electricity self-sufficiency ratio of 20% (2020) - Reduce energy consumption by 4 Mtoe and GHG by 10Mton of CO ₂ e
Strategies	New and renewable energy production, energy efficiency enhancement, energy savings	- Change the structure of society - Build a distributed energy producing city - Implement an efficient and low consuming social structure - Create decent energy jobs - Establish an energy sharing community

Source: Seoul Metropolitan Government, 2014b: 31.

Prior to the OLNPP, the SMG had established energy consumption and CO₂ emissions reduction targets. On April 2, 2007, former Mayor Se-hoon Oh announced ‘Seoul Eco-friendly Energy Declaration,’ which aimed to reduce energy consumption by 15% below the 2000 levels and GHG emissions by 25% compared to 1990 levels by 2020. Subsequently, the SMG started to survey energy consumptions by sector and region and to implement energy efficiency enhancement measures in buildings. It also implemented other measures to manage transportation demands such as installing bicycle roads and introducing car-free days, and conducted many projects to promote NRE

11) Energy sharing includes measures for the relief of energy costs for the energy poor.

deployment. These efforts led to Seoul's selection over Tokyo as the host for the 2009 C40 summit.¹²⁾ Following that announcement in 2008, the SMG created the Ordinance regarding Seoul Metropolitan Government Climate Change Response and started to fund climate change related activities, aiming to build it to 100 billion KRW (Seoul Metropolitan Government, 2009). The Ordinance has been revised several times and still provides legal foundations for climate change responses in the SMG.

Yim (2013) concluded that Mayor Park's energy and climate change policies have followed former Mayor Oh's policies, based on analysis of changes in the characteristics, organizations, laws, and budgets of energy and climate change policies in Seoul. The policy measures are now more specific and varied, and the related laws and organizational structure have been changed somewhat. Based on these findings, he argued that the previous framework remains present in the current OLNPP. Although the OLNPP has succeeded the framework of the 'Seoul Eco-friendly Energy Declaration,' the results are completely different because the previous measures were superficial and proclamatory (Lee, 2015b). For example, expansion of bicycle roads was criticized at the Seoul Metropolitan Council. Since Mayor Oh's policy to expand bicycle roads was not coordinated with the existing infrastructures and did not carry out training programs, the actual usage of the roads was much lower than expected (Park and Kim, 2012).

Also, the most notable difference between the current and the former administrations is governance.¹³⁾ As Lee and Painter (2015) and Lee et al. (2014)

12) Seoul competed with Tokyo for hosting the C40 summit, but Seoul was chosen for the third C40 summit at the second C40 summit held in New York.

13) Before Mayor Park's administration, the Green Seoul Citizens Committee (GSCC) was established and participated in climate change and environmental decision-making processes as a governance organization. The GSCC is currently valid and is involved in the OLNPP. However, as Cho (2003) found, at first,

explained, Seoul's energy transition process includes various actors in all stages from developing to implementing the plan. Citizens can also contribute to shaping and implementing urban energy agendas through various channels of participation, which include the OLNPP Citizen Committee (OLNPPCC),¹⁴⁾ the OLNPP Implementation Committee (OLNPPIC),¹⁵⁾ the Energy Independent Communities, and relevant meetings.

There are mechanisms to bring the public's opinion and knowledge to the SMG, and the policies of the SMG are conveyed to the public. These channels of participation provide mechanisms to coordinate the interests of stakeholders with the agenda of the SMG. The OLNPP has been developed, embracing input from citizens from citizens. To develop the draft of the OLNPP, 16 meetings were held, and the public's perspectives were gathered through the OLNPP Policy Hearing Workshop and Citizen's Congress. About 400 people participated in the group discussion session, making 109 suggestions for the design of energy transition in Seoul (Seoul Metropolitan Government, 2014a). The OLNPP 2 was also drafted through discussions with and input from OLNPPIC. Citizens' opinions and ideas for projects related to the OLNPP 2 have been collected through both on and off-line channels including the 'OLNPP 2 Social Fiction Discussion Session,' in which about 400 citizens participated (Seoul Metropolitan Government, 2014b).

In addition to role of the OLNPPIC and the GSCC have in governance

the GSCC could not exert a strong influence over environmental and climate issues since the administrative influence of the SMG was much stronger. Currently, the GSCC seems to be more influential, according to Lee and Painter's analysis (2015).

14) The OLNPPCC consists of 19 representatives including the Mayor, civil society, the business sector, and religious institutions.

15) The OLNPPIC consists of 48 representatives from civil society, the business sector, religious institutions, media and cultural organizations.

and project management of the SMG, the SMG cultivates other local governance structures to foster local networks and build local competence. The most representative project of this kind is the Energy Independent Community (EIC) program (Seoul Metropolitan Government, 2014b).¹⁶⁾ At the OLNPP Policy Hearing Workshop in February 2012 and the Citizen's Congress in April 2012, the expansion of the EICs was recommended, and it was included as a part of the OLNPP. In the latter half of 2012, the SMG began the EIC projects. As of 2014, there are 15 EICs in Seoul. Seoul plans to increase the number of EICs to 200 by 2018 (Seoul Metropolitan Government, 2015).

The communities that want to be supported by the SMG as one of the EICs build implementation plans, which accurately reflect their situation; they submit the plans to the SMG. The SMG evaluates the submitted plans and selects the target communities. Communities with strong initiatives are preferentially selected and supported. The primary agents of the EICs are residents and communities. They design the implementation plans for the EIC and conduct various projects and campaigns according to the established plans. The SMG informatively, technically, and financially supports the selected communities to enable them to achieve their implementation plans and overcome various existing barriers. Energy consultants visit households, audit the energy consumption status of each household, and suggest energy saving measures.

16) The SMG initiated the Energy Independent Community (EIC) program, inspired by community movements such as Seongdaegol-maeul in Seoul. After the Fukushima disaster, Seongdaegol-maeul started to study energy issues and began energy saving campaign together with GreenKorea (NGO) in the Seongdaegol Children's Library. Dozens of households have been participating in the energy saving campaign, where they have posted their monthly electricity consumptions on the library wall. It has reduced electricity consumption significantly. Furthermore, they designed classes and held workshops to study energy issues.

Also, they introduce energy-related projects of the SMG and provide informative brochures to the communities. From 2012 to 2014, the SMG provided the EIC program with subsidies about 768 million KRW. Each community has received on average 17 million KRW (Seoul Metropolitan Government, 2015).

As Lee (2015a) pointed out, the increased budget allocated for climate and environmental governance strongly confirms the critical role of energy transition in Seoul. This reveals the importance of studying Seoul's energy transition from a governance perspective such as the integrated MLG perspective developed in this study.

Finally, the SMG organized the Seoul International Energy Advisory Council (SIEAC) to obtain advice from international energy experts. The SMG hosted the Seoul International Energy Conference (SIEC) inviting the ten SIEAC members and citizens. This conference permits the SMG to receive input and perspectives from experts and to promote major achievements. The finely but flexibly designed structure of the OLNPP has been successful, and the SMG has been awarded several prizes including the 2013 UN Public Service Award.¹⁷⁾

In the following section, the energy transition of Seoul will be analyzed from the integrated MLG perspective.

17) The United Nations gave the UN Public Service Awards to the SMG for its Eco Mileage System, which provides incentives when households or businesses reduce energy consumption.

4. Discussion

1) Vertical perspective

From the vertical perspective, parts of national policies downloaded to shape the OLNPP. The SMG (2014b) claimed that the SMG has reflected the second NEBP, which has changed the principal paradigm of NEBP from supply expansion to demand management.

However, parts of national policies conflict with Seoul's energy transition. Interestingly, for example, although the new vision of the second NEBP is demand management rather than supply expansion, the central government decided to build additional nuclear power plants. The slogan of 'One Less Nuclear Power Plant' is in opposition to the central government's planning. In contrast, it implies that the SMG has autonomy to shape the energy transition. While the SMG has implemented solar feed-in-tariff (FITs) since 2013, the national level FIT was replaced by the renewable portfolio standard to promote NRE in 2012 (Climate and Environment Headquarters, 2013). Last year, the government temporarily aggregated the levels of progressive electricity rates from six levels to four levels. Due to this shift, a leader of one EIC (interview, 2015.11.28) complained that the changed progressive electricity rates discouraged the installation of mini solar panels. Saving on utility bills by reducing one level of progressive electricity rates was one of the reasons for households to install mini solar panels. Also, the low electricity rates are one of the barriers to building retrofit projects in Seoul. As An (2015) also pointed out, the SMG is allowed to have autonomy in terms of energy policies, but its achievements can be restricted due to the current energy system, which is controlled by the central government.

Furthermore, parts of the OLNPP have not uploaded to the national level

even though it receives a number of compliments from experts and policy makers. This may be attributed to political dynamics. The political position of President Park's administration (Conservative Party) is entirely different from that of Mayor Park's administration (Liberal Party).

Although the OLNPP has not uploaded to the national level, it provides a model for energy transition. The annual solar PV installments prove the effectiveness of the OLNPP model. According to the 2014 New and Renewable Energy Deployment Statistics (Ministry of Trade, Industry & Energy, 2015b), the installed capacity of solar PV was 3,603 kW in 2010, 4,197 kW in 2011, and 2,963 kW in 2012, but the annual installed capacity dramatically increased to 11,520 kW in 2013 and 14,289 in 2014. Even though the practical potential of PV installation in Seoul is significantly lower than other regions due to densely located tall buildings, Seoul has made progress.

2) Modified horizontal perspective

Former Mayor Oh initiated energy and climate change policies in preparations for the C40 Summit in Seoul in 2009. To host that big event in Seoul, the SMG needed to survey the status of energy consumption and GHG emissions in Seoul and establish an action plan to reduce energy consumption and GHG emissions. Preparations for the Summit included studying the best practices of other cities to develop policy measures.

Currently, the OLNPP inspires other cities to design and implement policy measures. Given that the OLNPP attracts significant attention from citizens, researchers and policy makers, other local governments have initiated similar energy policies or programs. As previously mentioned, cities in S. Korea have announced their plans for energy transition, and Taiwan has adopted ideas from the OLNPP (Yun, 2016). The practices of other cities initially inspired

the SMG to move into energy transition, but currently, the situation has been completely reversed.

To prepare for the C40 Summit, former Mayor Oh established energy consumption, and CO₂ emissions reduction targets, explored Seoul's energy consumption status, legislated the relevant ordinance, and planned various measures. Since the previous responses were a mere proclamation to host the C40 Summit, and the achievement or actual implementation of the 'Seoul Eco-friendly Energy Declaration' was evaluated as smaller than planned, the Declaration did not bring about Seoul's energy transition, but rather paved the way for it: after Mayor Park's election, the energy transition finally started.¹⁸⁾

While impetus had previously come from external sources, the OLNPP has been driven by internal motivations. Mayor Park has developed the contents of the 'Seoul Eco-friendly Energy Declaration,' and he changed the rallying slogan to 'One Less Nuclear Power Plant.' As Lee et al. (2014) clearly outlines, Won-soon Park has recognized that Seoul is also responsible for the agony of other cities where nuclear power plants are located due to Seoul's energy dependence.

As pointed out earlier, the element most saliently contributing to the success is governance. That various groups of actors are actively involved in the process of energy transition is due to the vision of the Mayor Park. Before taking the office, he had been involved in a plethora of grassroots activities as a civic activist; these experiences and his belief in the power of public involvement became a driving force for Seoul's energy transition (Lee, 2015; Lee

18) Lee (2015a) deferred concluding whether energy transition is actually occurring, since the evaluation covered only a short period of time. However, as mentioned earlier, several indicators such as electricity consumptions and increased solar PV installments imply that energy transition has begun in Seoul.

et al., 2014). Mayor Park's administration emphasizes citizen-participating governance regarding energy policies as well as other important issues (design, safety, welfare, climate and environment, and gender). As stated before, various channels for participation such as OLNPPCC, OLNPPIC, EICs and a variety of other related meetings exist. Through these channels, a significant number of different actors can participate in the process of shaping and implementing energy policies.

The Climate and Environment Headquarters is in charge of the OLNPP. There are seven offices under the Headquarters, and they are in charge of various programs related to the OLNPP. Of these offices, Energy Citizen Cooperation Office (ECCC) and Green Energy Office were organized specifically under the OLNPP (Lee, 2015a). These considerable changes in organizational structures are also an important indicator of the strong emphasis on public involvement in the OLNPP. Originally, the ECCC was established as a Working Group, but it was elevated to the status of an Office. This Office is actively carrying out a variety of tasks related to the public engagement in the OLNPP. The SMG hires and trains many people as energy consultants, especially career-discontinued women. The SMG provides consultation services to residential and commercial sectors. Based on request for energy audits, these consultants evaluate the energy efficiency of households or offices using energy audit equipment to find potential energy saving measures (Seoul Metropolitan Government, 2015). While conducting the on-site visits, they discuss other energy-related problems and introduce projects of the OLNPP to citizens, encouraging people to join the efforts. In addition to these technical and administrative supports, city departments also provide financial support for participation in the OLNPP, as mentioned earlier.

NGOs and businesses are actively involved in Seoul's energy transition. In addition to the roles of NGOs and businesses articulated in Table 1, NGOs

also participate as members of civil society in shaping and implementing the OLNPP. The OLNPPCC and the OLNPPIC include representatives from these sectors as well. Also, NGOs have provided important insights that have shaped the OLNPP. For example, the EIC was inspired by the movement in Seongdaegol, where an NGO facilitated people's participation in electricity saving campaigns.

Seoul Institute (SI) is a think tank that conducts various studies of the agendas of Seoul's energy transition. The SI has carried out various research projects related to the OLNPP. For example, the SI conducted a case study of Aachen's Energy 2020 plan to obtain insights on the EIC program. The SI also analyzed the comprehensive effects of the OLNPP using a regional Input-Output model. In addition to the SI, the SMG taps the experience of international experts for consultation on current issues related to the OLNPP. As mentioned earlier, the SMG consults the SIEAC members about its energy issues. In addition to the SIEAC members, other experts' knowledge has been shared in the SIEC. For example, Jorgen Rangers and Teruyuki Ohno were invited to discuss urban energy issues at the 2015 SIEC. Representatives from research communities participate in the OLNPPCC and the OLNPPIC, and they consult with other individuals involved in governance and decision-making processes, providing their expertise on energy and climate issues. Finally, the OLNPP has attracted the interest of a variety of researchers who provide analysis of and recommendations regarding current policies (Lee, 2015a; Lee and Painter, 2015; Lee et al., 2014) (<Table 3> summarizes results of the assessment from the modified horizontal perspective).

<Table 3> Assessment of Energy Transition in Seoul from the modified horizontal dimension

		Assessment
Inter-cities		<ul style="list-style-type: none"> - Initially, the best practices of other cities greatly influenced the preparations for energy transition in Seoul. - Currently, the OLNPP inspires other cities to design and implement energy policies. - Still, the SMG refers to best practices in other cities.
Intra-city	Mayor	<ul style="list-style-type: none"> - Mayor Park chairs the OLNPP Citizen Committee - Mayor Park establishes new offices for the OLNPP. - Mayor Park came up with the vision for the OLNPP. - Mayor Park's administration has increased the budget for climate and energy related governance.
	City department	<ul style="list-style-type: none"> - City departments provide administrative, technical, and financial supports.
	NGOs & businesses	<ul style="list-style-type: none"> - NGOs and businesses are participating in the governance process and contribute to shaping and implementing policies
	Research communities	<ul style="list-style-type: none"> - The SMG-owned-think tank, SI, conducts related studies. - Representatives from academia participate in the Committees and provide expertise. - The SMG consults international experts of SIEAC.

3) Desirability of Energy Transition

The second phase of the OLNPP has incorporated values beyond the quantitative targets that were the focus of the first stage of the OLNPP. Equity is included in the stated values of the OLNPP 2. Legislation for Energy Welfare Bill has been proposed repeatedly in the national assembly, but it has continuously failed to pass. To institutionalize support measures for the energy-vulnerable populations, the SMG is preparing a draft for Energy Welfare Ordinance, which will be legislated in 2016 (Seoul Metropolitan Government, 2014b). Beyond these measures aimed at establishing interpersonal equity, interregional energy and environmental equity is also part of the man-

date of the OLNPP. The OLNPP was initiated, recognizing that Seoul is heavily dependent on electricity generated by other regions. In addition to equity related to energy or environmental issues, the EIC program, a significant part of the OLNPP, has the goal of restoring communities. Rapid urbanization has resulted in the collapse of communities (Kim et al., 2012); the SMG aims to rebuild communities through the EIC program. Therefore, values of ethics and social justice are reflected through the OLNPP 2.

Regarding environmental sustainability, while the SMG takes the initiative to respond to climate change, it also recognizes the adverse impacts of the central government's goals to build nuclear plants and has named Seoul's energy transition in opposition to this policy. The SMG also aims to promote green industries. Since the first stage of the OLNPP focused on meeting the quantitative target, NRE facilities, which were manufactured in other regions, have been put into operation, but the number of jobs created was much smaller than expected. The SMG has steered the second OLNPP towards policies will create decent jobs in the energy sector by promoting green energy businesses in Seoul. In sum, the OLNPP has equally emphasized economic values and ecological values.

Finally, the degree of participation in the process of energy transition has been described in the previous section. The vitalized governance of the OLNPP allows various stakeholders to become involved in the process of designing and implementing policies. Furthermore, the changes from the OLNPP 1 to the OLNPP 2 are quite positive (<Table 4> summarizes the results of the assessment of energy transition in Seoul using indicators for desirability).

<Table 4> Assessment of Desirability of Energy Transition in Seoul

	Assessment
Existence of socially just and ethically accepted values	<ul style="list-style-type: none"> - In terms of environmental and energy issues, interpersonal and interregional equity has been reflected on the OLNPP. - The value of communities has been included in the OLNPP. - The OLNPP enhances, and embraces socially just and ethically accepted values.
Equal emphasis to economic and ecological value of natural resources	<ul style="list-style-type: none"> - The OLNPP has emphasized economic value as well as ecological values.
Degree of acceptance of stakeholders	<ul style="list-style-type: none"> - The OLNPP has been shaped and implemented as a result of input from a variety of actors - The active participation of these actors has made a significant difference.

5. Conclusion

This paper has developed an integrated multilevel governance perspective, to address the limitations of a multilevel governance perspective and other frameworks used to analyze energy transition processes in cities. Applying the integrated multilevel governance perspective to Seoul's energy transition, this study reveals that Seoul's energy transition was stimulated by horizontal processes. In preparation for the C40 Summit in Seoul, best practices in other cities inspired the SMG to draft energy and climate change policies. These preparations have paved the way for Seoul's energy transition. In contrast, the OLNPP currently inspires other cities to do the same. This study confirms that energy governance enabled energy transition to occur in Seoul. In addition, this study found that Seoul's energy transition has reflected important values such as equity issues and community restoration and has also made progress from the first phase to the second phase regarding the desirability of energy transition. From the perspective of the modified horizontal di-

mension, various actors have been successfully involved in the process. Regarding the vertical dimension, although some national energy policies downloaded to energy policies in the SMG, the SMG has autonomy to shape its energy transition. However, there are structural limitations to the SMG, which might deteriorate the effectiveness of the OLNPP since the national government controls the energy system. Although the story of energy transition in Seoul is successful, the evidence is lacking that national policies have been, in turn, impacted by the OLNPP.

This integrated multilevel governance perspective is a strong framework for the analysis of the dynamics between the national government and the local authorities, between cities, and between various actors within a city. Using this integrated multilevel governance perspective, this study captured and analyzed the comprehensive story of energy transition: how desirable was Seoul's energy transition, who participated in this process, and what stimulated the movements.

However, this framework has also limitations. Haastard (2015) has added an additional dimension called infrastructural process, which recognizes that energy transition is also dependent on the built environment or urban form. The framework developed in this study cannot analyze the impact of urban form on energy transitions or how the built environment is transformed or changed in the process of energy transitions. This limitation needs to be addressed in subsequent studies.

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