Capacity Factors for

Urban Sustainability Transformations –

The Eco-capital Suwon in South Korea

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Declaration of authorship

I, Hanna Kang, declare that this thesis titled, Capacity Factors for Urban Sustainability Transformations – The Eco-capital Suwon in South Korea, and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at Technische Universität Dresden.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at Technische Universität Dresden or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- Where I have put the photographs that are not taken by myself, the source is always given. With the exception of such photographs, all other photographs and drawings are my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Hanna Kang

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Executive summary

South Korean cities have experienced remarkable economic growth starting from the 1980s, characterised by energy-dependent models coupled with a rapid, dense urbanisation process. This growth model has incrementally induced carbon-intensive urban structures that have consequently produced socio-environmental degradation and severe challenges to sustainability. A range of efforts to solve such challenges has not succeeded in breaking strong path-dependencies on existing unsustainable structures, and this concern has raised the necessity to develop a new urban approach towards sustainability.

Given that concern, a growing body of literature has endeavoured to understand the processes of 'sustainability transformations', and shares an underlying assumption that such change co-evolves with societal agency that collectively creates networks, within which decisions and strategies are developed, negotiated, and implemented. This recognition has raised the essential question about which factors are required for the agency to initiate and perform such transformations in the process of urban development. Against this background, this research aims to examine factors that critically influence the emergence of urban transformation processes by exploring interrelations that appear between them. In particular, the research focuses on the critical role of governance characteristics to influence the emergence of transformation factors.

In order to explore the factors in practice, a case study is conducted through document analysis and in-depth interviews. The real-world case selected in this research is the *Eco-capital Suwon* in South Korea, a pioneering model of sustainability-oriented urban development that employs a set of transformative experiments across action domains. Additionally, this case is critical in that its wider context—in which a more state government-led, centralised practice is dominant—would generate abundant dynamics of interactions across administrative scale levels. In order to scrutinise the factors that are employed not only in the *Eco-capital* in general but more specifically in its different projects, the research selects three projects as the sub-cases based on the different governance characteristics, as well as action domains. The three selected projects cover the domains of (rain) water management, green transportation, and renewable (solar) energy, which display multiple, unique forms of participation of (inter)national/urban/neighbourhood-scale agency from the public and private sector, academia and research institutes, civil society, and Suwon's individual citizens and residents.

The research has derived the primary findings: *1) 'Inclusive governance' encompasses collaborative actor networks and partnerships; and 2) Intermediaries working across different domains and scale levels condition the emergence and characteristics of agency-related factors for urban transformations.*

The research makes a set of contributions not only to theoretical discussions on urban transformation, but also to policy and practice in urban governance and planning. First, the selected case and its analytical design help to display: 1) a less explored phenomenon where cross-scalar interactions are often constrained by wider political systems ('why cross-scalar interactions could not occur'); and 2) a clearer understanding of the geographical unit that is advantageous for the emergence of multi-system transformations (where multi-system transformations could occur). Second, the empirical findings shed light on discussions surrounding urban transformation by verifying arguments about the significance of governance characteristics. In addition, the case analysis suggests shifting from domain-specific transformations to domain-transecting, co-evolutionary transformations, such as a water-energy nexus approach. By extension, the research provides a set of policy recommendations to accelerate urban transformations. Finally, the research suggests options for future comparative studies on how 'place' conditions reconfiguration dynamics in urban development.

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Abbreviations

AC	Advisory Committee
BAU	business-as-usual
CAS	Citizen Autonomy School
CNCR	Centre for Neighbourhood Community Renaissance
CoP	community of practice
CPG	Citizens Planning Group
CSE	Citizens Solar Energy
CSE-SC	Citizens Solar Energy-Social Cooperative
CSO	Civil Society Organisation
EAC	Eco-capital Advisory Committee
EB	Environment Bureau
ECC	EcoMobility Community Centre
ENC	EcoMobility Neighbourhood Centre
EOC	EcoMobility Organising Committee
EPC	Environmental Policy Committee
ETS	emissions trading system
FIT	Feed-In Tariffs
GGC	Good Governance Committee
GHG	greenhouse gas
GI	green infrastructure
GNT	Gwanggyo New Town
GRDP	gross regional domestic product
GTX	Great Train eXpress

HLPF	High-level Political Forum on Sustainable Development
ICLEI	International Council for Local Environmental Initiatives
IoT	Internet of Things
IWRM	integrated water resource management
KEA	South Korea Energy Agency
KEI	South Korea Environment Institute
KEPC	South Korea Electric Power Corporation
KPX	South Korea Power Exchange
KRRI	South Korea Railroad Research Institute
KTX	South Korea Train eXpress
LCGG	low carbon green growth
LID	low impact development
LSAK	Local Sustainability Alliance of South Korea
ME	Ministry of Environment
MEF	Ministry of Economy and Finance
MIS	Ministry of Interior and Safety
MLP	multi-level perspective
MLTM	Ministry of Land, Transport and Maritime Affairs
MOLIT	Ministry of Land, Infrastructure and Transport
MoU	Memorandum of Understanding
NCBN	Neighbourhood Community Building Network
NCR	Neighbourhood Community Renaissance
NCRC	Neighbourhood Community Renaissance Committee
NCSC	Neighbourhood Community Service Centre
NPG	Neighbourhood Planning Group

OECD	Organisation for Economic Co-operation and Development
RAC	Resident Autonomy Committee
REC	renewable energy certificate
RPS	renewable portfolio standard
RSE	Resident Solar Energy
RWG	Resident Working Group
SC	Social Cooperative
SCEM	Suwon Centre for Environmental Movement
SCSD	Suwon Council for Sustainable Development
SCSE-SC	Suwon Citizens Solar Energy Social Cooperative
SD	sustainable development
SDG	Sustainable Development Goal
SEC	Social Economy Centre
SES	social-ecological systems
SFEM	Suwon Federation for Environmental Movement
SG	The Suwon Government
SGTF	Suwon Green Trust Foundation
SIC	Suwon Industrial Complex
SMP	system marginal price
SNM	strategic niche management
SRI	Suwon Research Institute
SSCF	Suwon Sustainability City Foundation
SSE	Sharing Solar Energy
STS	socio-technical systems

TB   Transportation Bureau

TF   task force

TIS   technological innovation systems

TM   transition management

UEC   Urban Environment Committee

Notes on the presentation of findings

Photographs

All photographs used in the thesis were taken by the author, except where otherwise stated.

In-text references

The in-text references of research participants in the interviews are described in Appendix 1.

Transliteration of South Korean words

All South Korean words (including names) are transliterated using the Revised Romanisation of South Korean system.

1. Introduction

South Korea has experienced remarkable economic growth, which can be characterised as an energy-intensive model, primarily dependent on fossil fuel-based industries such as the steel, automotive, shipbuilding and petrochemical sectors (GGGI, 2015; Kang, Oh and Kim, 2012; Mathews, 2012). Such economic success, however, has been confronted with rapid industrialisation coupled with limited domestic energy resources (Mazzetti, 2012). This growth tradition, fuelled by excessive fossil fuel energy, has already reached its threshold to bring about further expansion (Government of South Korea, 2013, p. 68; Kim and Choi, 2013; GGGI, 2015). Furthermore, in relation to this high fossil fuel dependence, South Korea's greenhouse gas (GHG) emissions rose almost twofold between 1990 and 2005, recording the highest growth rate in the OECD area, and which consequently led to a range of environmental and socio-economic challenges such as an extreme rise in the average temperature and resultant diseases, an increasing chance of flood and drought risks, weakening resilience of coastal regions due to rising sea-levels, and the expanding socio-economic cost of risk management induced by climate uncertainty (Government of South Korea, 2013; OGPC, 2014, 2016).

Such energy-dependent growth has remarkably occurred in urban areas where labour forces and capital have been concentrated in the process of heavy industrialisation, especially in large cities of the capital region[1] (Zhang and Deng, 2017). Since the first time the urban population exceeded the rural one in 1977, the proportion of the urban population has risen to 90.7% (and 97.2% in the capital region) as of 2017 (KOSIS, 2017d). This industry-driven urbanisation has induced a carbon-intensive 'urban system' that accordingly has produced sustainability challenges of continuous increase in energy consumption and greenhouse gas emissions[2] (GRI, 2017; KEEI, 2017). Aside from the industrial section, such rising trends have particularly been contributed to by transport-related activities, in relation to an increase in car

[1] In South Korea, the term 'urban' refers to administrative areas called 'dong' (see Footnote 22). Explanation about the capital region is in Footnote 15.

[2] South Korea's final energy consumption has risen from 132,033 thousand toe in 1996 to 225,681 thousand toe in 2016 (KEEI, 2017), and GHG emission has risen from 292.9 million CO_2eq. in 1990 to 694.1 million CO_2eq. in 2016 (GRI, 2017).

use and resultant traffic congestion, a strong preference for larger cars, and the drastic spatial expansion of urban areas (dominantly occurring as urban sprawl in the capital region) (OECD, 2012). Consequently, urban sectors have incrementally become more climate-sensitive in terms of extreme surface temperature and heatwaves, and have deteriorated air quality, coupled with an increase in particulate matter (ultra-fine dust) (KMA, 2018).

In response to these challenges, South Korea adopted a new development pathway in 2009, which was expected to transform the existing fossil fuel-based system into a more 'low-carbon and green' one (Government of South Korea, 2013, p. 73; GGGI, 2015; PMO, 2010), primarily through creating new energy and clean technologies (Mathews, 2012; GGGI, 2015).[3] Particularly, in recognition of cities' significant role in achieving this restructuring—in terms of concentrated economic activity and production, infrastructure, and energy consumption (Kamal-Chaoui *et al.*, 2011; OECD, 2012) — diverse urban-level efforts were carried out by establishing local action plans in metropolitan cities and provincial governments with a focus on industry, technology, building and transportation (PMO, 2010; Kamal-Chaoui *et al.*, 2011)[4]. In addition, a variety of city models was introduced, commonly aiming to bring about a paradigm shift in urban development. Each model has a different focus such as low-carbon, green technology and building (Wang, 2010), compact urban form, and integrated land-use with transport-oriented development (OECD, 2014), ubiquitous urban services through high-tech information and technology (MLTM, 2009), and ICT-/IOT [5] -use urban system management (MOLIT, 2017a). Such endeavours had already begun when two landscape architects (Kim, 1993; Yang, 1992) introduced the concept of the 'ecopolis' in the sphere of urban planning, presenting the goal of establishing a city 'whose structures and activities are built upon ecological principles of diversity, stability, circularity and self-sufficiency' (Kim, 1993, pp. 68–71).

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[3] This model of 'low-carbon green growth' envisioned 10 objectives, including mitigation of GHG, reduction of fossil fuels use, climate change adaptation, green technologies, green industries, industrial structure and services, basis for green economy, green infrastructure, green revolution to daily lives, green growth world leader (PCGG, 2009a).

[4] The local action plans were commissioned by a set of related legal and institutional frameworks including the Framework Act on Low-Carbon Green Growth (PMO, 2010), and the National Strategy for Green Growth (2009-2050) (PCGG, 2009b) and the Five-Year Plan (2009-2013) (PCGG, 2009a).

[5] Internet of Things (IoT) refers to a network of computing devices, and in the broadest sense, connectedness of things to the internet.

The idea of embedding environmental considerations in urban development was a radical step for change (Kim, 1996; Park, 2001). This movement was triggered by nationally-raised opposition to indiscreet development patterns after undergoing the disastrous incident of the phenol spills in the Nakdong River in 1991 (M. O. Choi, 2013). Nevertheless, it was influenced by international mainstreaming of discourse on sustainable development (SD) through the 1992 Earth Summit (UNDESA, 1992). In the mid-1990s, the newly established Ministry of Environment (ME) formulated the master plan on 'ecological planning' which translated the ecological principles into planning goals of environmental impact minimisation, and ecosystem-based urban structures (especially, land use, water, energy, and green spaces) (ME, 1996). Entering the 2000s, endeavours to incorporate such a transitional paradigm into the mainstream of urban development were accelerated by many ministries which produced a range of urban pilot projects designed to create environmentally sound and socially equitable urban structures (Wang, 2013; Kim, 2014). However, the different project objectives set by different ministries hampered local government officials' understanding of the new development paradigm, and, as a result, were rarely replicated in urban-level policy (Wang, 2010). This is, in fact, considerably related to South Korea's 'governance structure', which delegates centralised power to the state-level administration, and thus little to local institutions and citizens (Kamal-Chaoui *et al.*, 2011; Seong, 2011; Han, 2015; Kalinowski, Rhyu and Croissant, 2018).

Such transitional policy, however, has failed to build an ecological city because imported fossil fuels have remained the primary means of urban growth, and energy consumption and the consequent environmental degradation have continuously increased — particularly after the global financial crisis of 2008 by 'reviving' resource-intensive industrial exports (GGGI, 2015; KEEI, 2017; OECD, 2017a). Accordingly, in 2017, the administration of President Jae-In Moon declared that South Korea was moving towards environmentally friendly sustainable development, particularly with regard to energy generation, transitioning from coal-fired/nuclear power to new and renewable energy[6]. This has been set as the primary strategy to achieve a 37% reduction of GHG emissions by 2030 compared with the business-

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[6] South Korea's Act on New and Renewable Energy retains a separate definition for the term 'new energy' as energy that is either converted from existing fossil fuels or uses electricity or heat generated through the chemical reaction of hydrogen, oxygen, etc. such as hydrogen energy, fuel cells, energy from liquefied or gasified coal, and energy from gasified heavy residual oil, and the term 'renewable energy' as energy converted from renewable energy sources including sunlight, water, geothermal, precipitation, bio-organisms, etc. such as solar power, wind power, water power, marine, geothermal, bioenergy converted from biological resources, and energy from waste materials (MOTIE, 2014, art. 2).

as-usual (BAU) scenario, especially in the realms of building, transport, waste, agro-livestock, and industry (OGPC, 2016; MOTIE, 2017b).

Achieving such transformation requires a fresh approach to deal with sustainability challenges that are 'coupled with and aggravated by the strong path-dependencies and lock-ins' of existing unsustainable systems (Markard, 2011, p. 955). In this sense, urban intervention should address the fundamental, co-evolutionary changes of socio-cultural, ecological, economic, and political structures (Rip and Kemp, 1998; Elzen, Geels and Green, 2004). Given this concern, a growing body of literature has sought to identify urban approaches that can tackle such intertwined sustainability challenges; in the early 2000s, a research area called '(sustainability) transformation'[7] emerged (Hekkert and Negro, 2009; Bai, Roberts and Chen, 2010; Geels, 2011b; Jabareen, 2013; Nevens *et al.*, 2013). Building on 'systems thinking' (see Gell-Man, 1994; Holland, 1995; Kauffman, 1995; Gunderson and Holling, 2002), numerous perspectives have appeared in terms of how to understand specific patterns and dynamics of change, directed towards achieving sustainability (as will be discussed in Chapter 2.2).

While transformation studies have been shaped by diverse schools of thought, there is one shared assumption whereby systemic change co-evolves with societal 'agency' (Geels, 2004; Kemp, Loorbach and Rotmans, 2007; Loorbach, 2010; Jorgensen, 2012). The agency of diverse sectors—not only traditional governmental actors, but also civil society, communities and citizens/residents, businesses, and intermediaries—collectively creates formal and informal networks 'within which decisions and strategies are developed, negotiated and implemented that lead to changes in societal structures' (Loorbach, 2010, p. 163). Having recognised that sustainability challenges are rooted in—and intertwined—across systems, as well as the role of agency influencing these systemic changes, it is necessary to identify the factors that are required to bring about transformations in the process of (urban) development. Against this backdrop, this research aims to examine agency-related factors that critically influence the emergence of urban transformation processes, inspired by the recent study of transformative capacity by Wolfram (2016). Unlike existing transformative capacity concepts that separately focus on individual research spheres (such as sustainability, national and urban development, community development, socio-technical and social-ecological systems, and

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[7] See Footnote 10, for differences between 'transformation' and 'transition'.

corporate businesses), this framework is developed as a transdisciplinary approach, drawing upon collective contributions from different studies.

This investigation will be conducted by exploring the interrelations linking all factors, with special consideration given to how influences of wider context shape interactions amongst stakeholders. In order to analyse how they play a role in reshaping 'real-world' urban development in South Korea, the city of Suwon will be examined as a case study. This decision was guided by Suwon's endeavours (initiated in 2010) to transform its industry-driven development pathways towards a more sustainable urban system through its transitional policy as an *Eco-capital*. This policy has embraced multiple action domains including the ecosystem, transport, building, water management, and (renewable) energy, all of which collectively contribute to multiple processes of urban reconfiguration. By extension, the city's governance approach has become known for its multi-stakeholder participatory development, situated to interact with state government-led planning practices. Such characteristics display a wide range of dynamics of urban transformations in which diverse stakeholders interact across sectors (the public and private sector, civil society, and citizens) and political-administrative levels (urban, national, and international territories). To do this, a qualitative approach is adopted, comprising document analysis and semi-structured/in-depth interviews. The rationale and details will be explained in Chapter 3.

Chapter 2 covers theoretical discussions, starting from the significance of cities in achieving sustainability, and moving towards the concept of urban sustainability transformation and capacity factors related to human agency in bringing about systemic change in urban areas. The chapter begins with the discourse on cities, which are key to sustainability, enabled by their urbanisation forces to concentrate conditions, resources, and opportunities for systemic reconfigurations (Chapter 2.1). This recognition leads to a discussion on the dynamics of such transformation, with a focus on urban contexts. A range of capacity factors required in the processes of urban transformation are described.

Chapter 3 describes the research design and methods adopted to conduct the empirical analysis. To explore capacity factors implemented within sustainability-oriented urban policies, an in-depth empirical study is designed based on the case of the *Eco-capital Suwon* and its three selected projects of rainwater management (*Rain-city*), low-carbon, ecomobile transport (*EcoMobility*), and renewable energy (*Citizens Solar Energy, [CSE]*). For this, a wide range of documents is selected for analysis—not only formal policy reports/papers, but also informal social media posts (e.g. from Facebook), as well as in-situ fieldwork in Suwon for in-

depth, semi-structured interviews with key agencies across sectors (public and non-public) and scale levels (neighbourhood/urban/national/international). A detailed justification for the case study selection and precise methodology are provided.

After introducing the case study in Chapter 4, findings from the empirical analysis are presented and scrutinised in Chapters 5–8. These chapters closely examine capacity factors that are employed in the three respective projects, in addition to the *Eco-capital* in general. The discussions further look into the interrelations amongst the capacity factors. Chapters 5–8 include overall conclusions, which describe related theoretical and/or policy implications. To conclude, Chapter 9 presents theoretical reflections, as well as contributions to the discourse on urban sustainability transformation. Thus, the research reflects on empirical findings about the critical role of 'inclusive governance' in facilitating transformation processes. Lastly, some suggestions are made regarding policy measures for independent, autonomous community activities. Options for future studies that could reveal the unique dynamics of stakeholder interactions in urban development are also mentioned.

Chapter 1 Introduction
What is required to accelerate urban systemic change (transformation) toward sustainability

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Chapter 2 Capacity factors for urban sustainability transformation
Theoretical discussions on agency-related factors for urban systemic change

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Chapter 3 Methodology
A case study with a qualitative approach (document analysis and in-depth interviews)

Chapter 4 Eco-capital Suwon
Understanding the context – a pioneering transitional policy towards sustainability

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| **Chapter 5** Agency and governance characteristics | **Chapter 6** Knowledge and social learning | **Chapter 7** Community-based innovation | **Chapter 8** Multi-dimensional Processes |

Chapter 9 Conclusions
Theoretical and empirical reflections, implications and suggestions

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Figure 1.1 Research overview
(Source: designed by the author)

2. Capacity factors for urban sustainability transformation

Responding to the recognition that urban challenges are intensively rooted in — and induced by — problematic urban systems, this chapter sheds light on a new urban approach to bring about changes towards sustainability. It begins with discussions on the widespread assertion that cities have become key to achieving a sustainable global future, directed by the urbanisation process, which has generated the potential for transforming social systems. Then, it introduces a growing research field that deals with sustainability-oriented systems change, also conceptualised as '(urban) sustainability transformation'. Relatedly, it explores different conceptual frames and their understandings of transformation dynamics, with a focus on the agency aspect. Consequently, a range of capacity factors are indicated as critical conditions for the emergence and facilitation of urban transformation processes.

2.1   Cities for sustainability

Since the United Nations' Brundtland Report (WCED, 1987), the notion of sustainable development[8] has been widely embraced as a global consensus concept (Adger and Jordan, 2009; Dobson, 2009; Cowley, 2016). Sustainable development attempts to integrate concerns for ecology and economy in its definition as meeting 'the needs of the present without compromising the ability of future generations to meet their own needs' (*ibid.*, para. 27). The following 1992 Earth Summit is widely recognised as a symbolic moment when international agreements were established by state governments to 'protect the integrity of the global environmental and developmental system' (UN, 1992, sec. Preamble). This elevation of SD to the status of an international influential theme can be seen as a politically-charged response to complex global trends such as population growth, intensifying resource consumption as well as climate change (Jordan and Huitema, 2014).

Confronted with growing urban pressure, there was the first serious attempt to embrace 'cities' within SD by the agreement of the Agenda 21 action programme at the regional and local level (UNDESA, 1992). The ensuing 2012 Earth Summit, by acknowledging

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[8] The terms 'sustainability' and 'sustainable development' are used interchangeably in the thesis.

the urbanised world (UN, 2012, para. 21), incorporated 'sustainable cities and human settlements' into thematic areas for action, in the recognition that 'cities can promote economically, socially and environmentally sustainable societies' (*ibid.*, para. 134). A few years later, the awareness of vocal status of cities was further articulated through the adoption of *2030 Agenda* (UN, 2015) as one of the standalone SD goals[9], and the New Urban Agenda (UN-Habitat, 2017) by putting urban areas at the centre of achieving SD, that together shall transform the world towards a sustainable global future.

Such embracement of cities within the global sustainability discourse is not only a result of frustrations at the slow pace of national and global action, but more significantly, the radical awareness that successes of sustainable development largely depend on pathways taken by cities in which socio-political, economic and environmental activities and resources are concentrated (Hodson and Marvin, 2010; Wolfram, 2016b; Frantzeskaki *et al.*, 2017b; Fuenfschilling, 2017). All this is set based on the widespread understanding that cities have an extraordinary potential in terms of concentration of economic activity, high levels of annual investment, rapid deployment of technology and innovation, lower resource consumption by densification, and social diversity and inclusion (SDSN, 2013).

Cities have become the pivotal spatial frame that is potentially advantageous to solve the fundamental sustainability challenges of what Rapport (2007, p. 77) calls 'how to address symbiosis between human activity and the environment'. Just a few decades ago, however, 'the idea of investing hope for the future in cities would have struck many observers as peculiar' (Cowley, 2016, p. 5), by the tendency over time in the understanding of cities as the stage in which contemporary insecurities become manifest (Caprotti, 2015). In the last 1960s and 1970s, cities were associated with political and economic crisis – protests and riots, and difficult fiscal states, and became the locus where society's ills were most visibly played out (Taylor, 2013). In the early 1990s, the previous negative view on cities began to change along with the shifted discourse of research and policy over (ex)industrial European cities, which focused on urban characteristics of density and diversity that can mobilise cities as 'centres of growth and innovation' (Docherty, Gulliver and Drake, 2004, p. 446). Additionally, the process

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[9] Sustainable Development Goals (SDGs) include: 1. No poverty; 2. Zero hunger; 3. Good health and well-being; 4. Quality education; 5. Gender equality; 6. Clean water and sanitation; 7. Affordable and clean energy; 8. Decent work and economic growth; 9. Industry, innovation and infrastructure; 10. Reduced inequalities; *11. Sustainable cities and communities*; 12. Responsible consumption and production; 13. Climate action; 14. Life below water; 15. Life on land; 16. Peace, justice and strong institutions; and 17. Partnership for the goals (UN, 2015).

of globalisation provided the need for supranational coordination together with regional and local states (Jessop, 1994), giving a more significant role to cities and city regions as more powerful agents in the global economic and political arena (Cowley, 2016).

Into the 21st century, this changing perspective on cities has gained a more convincing position when the human civilisation has entered the 'urban age' that more than half the world population have come to inhabit in cities (UNDESA, 2014; UN-Habitat, 2016). Such global trend has become recognised more explicitly as 'transformative force of urbanisation' (UN-Habitat, 2016, p. 27), by which global SD shall be accelerated. Cities are the critical geographical unit in which opportunities for change are envisaged as a result of concentration and intensity of transformative actions, such as green infrastructure (Hodson and Marvin, 2010), innovative technology (SDSN, 2013), financial resources (Wu, 2014), intellectual knowledge and expertise (Fuenfschilling, 2017) and sustainable policies (Joss, 2015). Most crucially, such urbanisation power has reached across multiple socio-cultural, political, environmental and economic dimensions, of which interaction processes provide the potential for realignments of the urban system towards sustainability, such as urban society, ecology, technology and infrastructure, urban culture and lifestyle as well as governance and institutional frameworks (Rotmans, 2006; Frantzeskaki *et al.*, 2017b). In this sense, cities have come to serve as a spatial frame where such realignments are most actively occurring (Rotmans, 2006b; Loorbach, 2010; Nevens *et al.*, 2013), which is referred to as 'transformation' – a process of fundamental change towards sustainability (Wolfram and Frantzeskaki, 2016; Frantzeskaki *et al.*, 2017b).

Basically, this transformation occurs due to the attribute of the human society that they are not inherently stable, but tend to change from one state to another, while the direction of change is neither predictable nor linear (Gallopin *et al.*, 2001). Such societal changes have been most evidently observed in the past few decades, fuelled by unprecedented demographic, technological, economic and social restructuring in the processes of urbanisation as discussed above (Martens and Rotmans, 2005). This tendency of change is not what has to be prevented or controlled, but conversely, can be considered as motors for the emergence of a new order and structure (Rotmans, 2006a). Such unstable properties rather generate more favourable conditions for change, but only if it is ensured that the change is directed to a better (sustainable) state for the society (Gallopin, 2003). In the sense that the force of urbanisation has given cities favourable conditions for transformation, and this transformation is what can lead to a sustainable future, the primary step to take is to understand about dynamics and

patterns through which urban transformation is initiated and performed, as will be the main discussion of the next Section.

2.2 Urban sustainability transformations

This Section traces a rising body of discourse on systemic change, which has collectively established the research field of 'transformations' [10]. This study has been driven by sustainability concerns, especially based on the recognition of the systemic character of societal sustainability challenges. It primarily focuses on societal systems, as how Joss (2015a) describes, dominantly 'from current fossil-fuel dependent socio-economic activity to future resource-efficient development based on drastically reduced carbon footprints' (p. 49). Transformations can be explained with their basic characteristics: first, a temporal dimension of a medium- to long-term period (25-30 years); second, a thematic focus on GHG reductions and energy efficiency; and third, a conceptual relation to various infrastructure systems, including energy, transport, water, waste and agriculture (Joss, 2015).

Emerged in the early 2000s, the concept of transformation has been increasingly addressed within policy frameworks, such as green economy (UNEP, 2011) and green growth (OECD, 2011), and as well in the social-science research (Gunderson and Holling, 2002; Folke *et al.*, 2010; Grin, Rotmans and Schot, 2010). Fundamentally built on systems thinking or complex systems theory[11], transformation studies have recognised the systemic character of societal sustainability reconfigurations (Wolfram and Frantzeskaki, 2016): the society is composed of two or more components, and these elements interact with each other (Clayton and Radcliffe, 1997; Dodder and Dare, 2000; Gallopin, 2003). The critical point here is that such

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[10] The term 'transformation' conceptually indicates both the process and outcome of changes, while 'transition' means only the former. Both terms are used without differences in meaning, but while 'transformation' is used in more various fields, 'transition' is preferred in STS studies. In this sense, this thesis adopts 'transformation' as a more open concept, which covers interdisciplinary sustainability-oriented research fields (Wolfram, Frantzeskaki and Maschmeyer, 2016, pp. 19–20).

[11] Systems studies have been established from a range of scientific areas, including physics (e.g. Gell-Man, 1994), biology (e.g. Holland, 1995; Kauffman, 1995), economics (e.g. Arthur, 1999) and political science (e.g. Axelrod, 1997), mainly established by multidisciplinary researchers of the *Santa Fe Institute* who have contributed to an understanding about the fundamental characteristics of 'complex adaptive systems (CAS)'. The CAS is distinguished from the simple systems or merely complicated systems in that its interactions cannot be predicted by the application of a standard model nor captured from a single perspective, and in that systems behaviour is not linear even with deterministic set of rules (Gallopin *et al.*, 2001).

interactions are established based on a high degree of interrelatedness between different elements and different scale levels (Rotmans, 2006a). By this attribute, changes in one element and/or level directly induce changes of others, and therefore there are emergent properties that cannot be analysed solely by referring to a part of the societal system, and that only by interactions the society can function (Gallopin, 2003).

As Markard (2011, pp. 955-956) notes, such understanding on transformations is distinguished in terms of their particular focus on systemic interconnectedness, from other relevant theoretical approaches that have been used to study transformations, such as general theories (e.g. evolutionary economic theory, actor network theory), and research on technology (e.g. long waves, constructive technology assessment, reflexive governance, sociology of expectations) and green issues (e.g. ecological modernisation, sustainability sciences, eco-innovation, green management and corporate social responsibility). In this sense, transformation is understood as a 'co-evolutionary' process of societal system that involves diverse agency in interrelated, multiple dimensions and scale levels.

In addition, Rotmans (2006a) explains that transformation is established on the power of 'radical' change that are completely contrary to 'the traditional, pervasive paradigm of incremental, cumulative change that has been strongly influenced by Darwin's theory of evolution' (p. 162). As the society is intertwined with structures and behaviours that are dependent on, and committed to the (advantages of) current equilibrium, there arises a high tendency to retain the equilibrium as well as heavy resistance to shift to another state (Rip and Kemp, 1998). Under this rigid condition, incremental changes cannot suffice to alter the whole system, and only 'great forces' can bring the system out of equilibrium (Dosi, 1982; Kemp, 1994). In the process, the radical change unavoidably leads the system temporarily disorganised and unstable, but its chaotic status spontaneously generates such changes and consequently dismantles existing structures and behaviours[12] (Holland, 1995).

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[12] The systems have the ability to produce self-organised, coordinated structures and behaviours, such as 'patterns' of systems change (Rotmans, 2006a). The patterns can be explained in terms of an equilibrium: CAS continuously has a continuous process of realignments, reconfigurations and revisions (dynamic equilibrium); relatively long periods of equilibrium are replaced with relatively short periods of change (punctuated equilibrium (Gersick, 1991). The patterns then generate a cyclical mechanism of systems change (Rotmans, 2006a, pp. 162–163): first, the system evolves in a direction of certain state (attractor), and then settles with dominant regime and resources with stability; the system experiences changes in internal structures and behaviours and/or in its environment; tensions arise and crises appear, leading the system to the edge of chaos with a high degree of instability but for a relatively short period (Holland, 1995; Kauffman, 1995); the system then reconfigures itself with fundamentally different structures and behaviours, and thus settles with different regime and

This knowledge on systemic change has contributed to developing a range of conceptual frameworks that illustrate dynamics and patterns of transformation, mainly from the perspective of the socio-technical systems (STS) (Elzen, Geels and Green, 2004). The STS, with the focus on technologies and system innovations, has explored the path-dependent patterns that are described with the central concept of 'regime'. The socio-technical regime, or configuration, refers to a conglomerate of incumbent scientific knowledge, engineering practices and technologies that are closely interrelated with structures (institutional and physical setting), culture (prevailing perception) and practices (routine, behaviours, rules) (Rotmans and Loorbach, 2009). The regime offers stability to the society, which therefore allows only incremental changes along the established pathways of development (Geels, 2004; Markard, Raven and Truffer, 2012). In this sense, the question of how to destabilise the underlying values and structures of the existing system have been the main focus of its early works (Schot, 1992; Kemp, 1994, p. 1994). To answer this question, another important concept of 'niche' has been embraced, initially conceptualised as protected spaces in which novel technologies and radical innovations can emerge without depending on the regime (Kemp, Schot and Hoogma, 1998). Through the process of leaning, experimenting and networking, the niche can compete with the existing technologies and eventually become a new regime (Geels, 2005; Geels and Raven, 2006).

Based on the two concepts, the socio-technical systems (STS) is roughly grouped into four different conceptual frames. First, the framework of 'strategic niche management' (SNM) focuses on the creation and nurturing of niches that may trigger off regime shifts (Kemp, Schot and Hoogma, 1998; Hoogma *et al.*, 2002). It later has formed the ground for the bottom-up perspective regarding how niches emerge, develop and decline with the dynamics of regimes. One frame that stems from the 'strategic niche management' (SNM) is 'multi-level perspective' (MLP) which unpacks interactions between regimes and niches, and their developments in the system environment (landscape; within which regimes and niches are located) (Geels, 2002, 2005). Another frame is developed with the ideas about 'transition management' (TM) that embraces the insights from governance approaches, and proposes prescriptive, practice-oriented model for steering the ongoing transition processes (Rotmans, Kemp and van Asselt, 2001; Kern and Smith, 2008; Loorbach, 2010). Lastly, the research on 'technological innovation systems' (TIS) addresses the emergence of novel technologies, and the role of actors and

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resources; here, the overall complexity increases, leading the system to a different state (attractor), or destruction.

institutions in this (Bergek *et al.*, 2008). However, the socio-technical systems (STS) has been often limited to the study of sector-based systemic changes (Burch *et al.*, 2014; Frantzeskaki *et al.*, 2017a).

The transformation studies, over the recent decades, have been applied to urban dimensions, based on the understanding of cities as critical sites where a range of components such as actors (individuals, organisations, firms), their knowledge and value, and institutions (societal norms, regulations, standards) interact between social, ecological and economic processes across spatial scales (local, regional, national, transnational) that are collectively shaping and shaped by the urban society. More critically, drawing on the analysed phenomenon that transformation is a result of dynamic interactions between their elements that accompanies complex, adaptive, non-linear and uncertain processes, urban studies have begun to adopt systemic perspectives for transforming the urban, with the purpose of exploring how to frame urban approaches to govern such urban transformations (lessons and strategies for urban development and policy).

In the development of transformation studies, cities have increasingly received attention, in that the urbanisation force has provided cities potentially advantageous environments where major societal transformations are initiated and developed, in terms of urban agglomerations that are conducive to not only technological but policy, social and cultural innovations (see Chapter 2.1), and in that urban responses therefore can accelerate changes towards both local and global sustainability (Hall, 1998; Glaeser, 2000; Mieg and Toepfer, 2013; Wolfram and Frantzeskaki, 2016). Drawing on different conceptual frames, scholars have started to explore particular dynamics and patterns of urban transformations, so as to draw out implications for urban policy and planning that can govern and steer such transformation processes. Essentially, central to the understanding of urban transformation lies in its distinction from sector-specific, domain-oriented approaches; it involves 'multiple' system changes across action domains and sectors that together bring about urban transformations (Frantzeskaki *et al.*, 2017b). In other words, urban change is the result of interrelated sub-transformations in the urban setting.

According to the analysis by Wolfram and Frantzeskaki (2016), the 'multi-level perspective' (MLP) is the most widely adopted framework in urban transformation studies. Urban transformation policies can be conceived of as niches that challenge mainstream urban planning and governance (described as 'niche-regime interaction'), by combining new technology (renewable energy, urban farming, public transportation), new urban planning

practices (multilevel governance, social networks), and socio-cultural activities (community participation, sustainable lifestyles) (Geels, 2011a; cited in Joss, 2015, p. 53). The conceptualisation of the urban scale has particularly been addressed relating to the field of low carbon transitions (Bulkeley *et al.*, 2011; Geels, 2011b; Raven, Schot and Berkhout, 2012), which has begun to understand cities as seedbeds for experimenting with and learning about low carbon innovations (Geels, 2011b). This understanding reflects the niche-driven (bottom-up) typology of transformation processes where transformations can be triggered by nurturing and developing niche-innovations, and therefore describes the dynamics of 'regime exogenous' transitions where newcomers and fringe actors drive changes (Geels and Schot, 2007). By contrast, Quitzau *et al.* (2013) examine 'regime endogenous' dynamics where incumbent regime actors (e.g. urban governments) make 'conscious and planned efforts' so as to redress 'perceived pressures by using regime-internal resources' (p. 140). The case of *Egedal* municipality in Denmark provides an example of how incumbent actors struggle to transform the regime by implementing new technologies and readjusting the systems (*ibid.*).

However, the 'multi-level perspective' has been criticised with its ambiguity about how these conceptual frameworks should be applied empirically (Berkhout, Smith and Stirling, 2004), and therefore required to be combined with other system and/or urban theories to provide intervention options (Wolfram and Frantzeskaki, 2016). In this regard, the 'transition management' (TM) has provided an operational tool to investigate cycles of urban transitions, particularly based on governance perspectives (Loorbach *et al.*, 2016), and triggered by locally-driven activities (Wittmayer *et al.*, 2014; ARTS, 2015). It has framed the urban 'governance' approach that can analyse and assess transition processes in terms of actor types (frontrunners, border-crossers, incumbents), interaction forms (transition arena), and activities (orientating, agenda stetting, activating, reflecting) (Loorbach and Rotmans, 2010; cited in Wolfram, 2016b, p. 8). Therefore, it has characterised urban transformations as multi-domain and multi-scale interactions (Wittmayer and Loorbach, 2016), based on the understanding of cities as places where changes in different domains (energy, mobility, social care) across different (geographical) scales come together and interact (Coenen and Truffer, 2012; Nevens *et al.*, 2013).

The city of *Higashiohmi* in Japan shows the dynamics of multilevel governance where multiple niche innovations interact both within multiple domains and with multi-regimes, underscoring the critical role of reflexive activities in managing urban transitions (Mizuguchi *et al.*, 2016). This conceptualisation has further driven the discussion about critical factors that

have formed the dynamics of urban governance in managing transitions, including: power and politics (Jhagroe and Loorbach, 2014; Shiroyama and Kajiki, 2016); (policy) actors (Bettini, Arklay and Head, 2017); (community) foresight (Eames and Egmose, 2011); networks and partnerships between cities (Wittmayer *et al.*, 2016) as well as within cities (Frantzeskaki, Wittmayer and Loorbach, 2014).

Staying focused on the governance approach to urban transitions, the 'strategic niche management' (SNM) has presented an analytical view that zooms in to explore environments and conditions that can create and harbour urban 'niches'. It has opened up the discussion about 'locally embedded niches', based on the recognition of the need to examine 'place-specific' constitution of innovations and strategies for urban planning and policy. A Danish town, *Egedal* shows how the aggregated knowledge of local authorities and policymakers has contributed to the success of niche management of local development projects, which consequently has redressed the challenge of policy visions that often failed to be aligned with local implementations (Quitzau, Hoffmann and Elle, 2012). This focus on the local niches has given a rise of community-based social initiatives and grassroots innovations in urban transitions, founded on their ability to create practical know-how (Seyfang and Haxeltine, 2012; Smith and Seyfang, 2013).

The social innovation policies of the city of *Seoul* in South Korea deal with the enabling factors that bring civil society-driven grassroots niches, such as empowerment, involvement in urban governance and in experimentation, and reconfiguration of social relations, as well as articulation of visions and shared expectations, social learning and diversity of community-based activities (Wolfram, 2017). In shaping such local innovations, the role of actors has been emphasised in instigating local policy change and localising ideas and solutions, as witnessed from the case of three Chinese cities – *Beijing, Shanghai and Xi'an*, whose grassroots play as intermediaries in connecting local innovation processes and resource flows (Binz and Truffer, 2017).

The 'technological innovation systems' (TIS) have taken a different direction by drawing on the creation, adoption and diffusion of new 'technologies' or products that are shaped by emerging actor constellations and institutional structures (Coenen, Benneworth and Truffer, 2012). It has focused on sub-national territories (defined as transition regions) that have devolved governance in the fields of innovation – technologies, industries and markets, and acted as regional 'lighthouse' for eco-innovation both to other regions and countries (Cooke, 2011). The green cluster initiative of *Central Massachusetts* in the U.S. can be an

example to illustrate how a group of stakeholders including politicians, academics, local citizens and society have facilitated the emergence of an integrated cluster of eco-activities (McCauley and Stephens, 2012). They contribute to a transition in energy regimes, by promoting institutional thickness, generating regional atmosphere around sustainable activities, and building trust relationship between multiple stakeholders in the region. In addition to the multi-actor innovations, the 'technological innovation systems' (TIS) has also analysed the multi-level character of transition processes in urban areas, as examined in sustainable lifestyle dynamics where urban consumers, producers and policy become connected, co-shaping urban lifestyles and global production and consumption patterns (Reusswig, 2010).

Table 2.1 Summary of discussions above - conceptual frames of urban systemic transformation

Conceptual frame	Understanding	Empirical case
'multi-level perspective' (MLP)	- Urban transformation policies as 'niches', challenging mainstream urban planning and *governance* – 'niche-regime interaction' - Regime transformation by newcomers and/or by incumbent regime actors	*Egedal* municipality – incumbent actors to transform the regime by new technologies and structures
'transition management' (TM)	- An operational tool to investigate transformation cycles, based on *governance perspectives* - Actor types (frontrunners, border-crossers, incumbents), interaction forms (transition arena), and activities (orientating, agenda stetting, activating, reflecting) - Multi-domain/-scale interactions	*Higashiohmi* city –dynamics of multi-level governance where multiple niche innovations interact both within multiple domains and with multi-regimes
'strategic niche management' (SNM)	- Environments to create and harbour urban 'niches', based on *governance perspectives* - 'Locally embedded niches', e.g. 'place-specific' constitution of innovations for urban planning - Community-based initiatives and grassroots innovations	Chinese cities – *Beijing, Shanghai and Xi'an*, whose local actors intermediates local innovation processes for niche creation
'technological innovation systems' (TIS)	- New 'technologies' shaped by emerging *actor constellations* and institutional structures - Regional (sub-national) 'lighthouse' for eco-innovation to be replicated in other regions	*Central Massachusetts* – emergence of an integrated cluster of eco-activities

Source: constructed by the author based on discussions above; Geels, 2011a; Bulkeley *et al.*, 2011; Coenen, Benneworth and Truffer, 2012; Coenen and Truffer, 2012; Loorbach *et al.*, 2016; Smith and Seyfang, 2013; Wittmayer and Loorbach, 2016

These conceptual frames have explained how systemic changes can be illustrated by diverse forms of interaction between regime(s) and niche(s), or within niche(s), and particularly between human agency. In other words, these perspectives commonly focus on the interaction dynamics as the core process of systems change. Furthermore, the discussions above recognise agency-related dynamics as a critical condition for changes, as summarised in Table 2.1 above. Then, the question that follows is in which conditions such dynamics can occur more actively. The next Section, in this regard, mainly investigates the factors for change dynamics that are particularly associated with societal agency. In order to explore the agency-related factors, the discussions consider the aspect of agency ability that is required to initiate and perform changes, inspired by the recent concept of transformative capacity (Wolfram 2016). The Section specifically focuses on governance characteristics as an essential agency factor, and raises a question of whether and how governance influences the transformation processes.

2.3   Agency-related capacity factors for urban transformations

Drawing on previous analyses—which provide an understanding of system dynamics for changes and the role of societal agency in driving such dynamics—this section explores the change factors associated with societal agency. For this, the following discussion looks into the agency-related factors involved in transformation processes. The factors are understood as the ability of agency to initiate and perform change dynamics. In sustainability-oriented discourse, this exploration is reflected in the attention paid to the conditions that enable change. For example, Wang *et al.* (2012, p. 842) ask whether 'we have the conditions for changes'. This leads society toward a new focus on the transformative factors that can motivate and facilitate transformation processes.

As mentioned above, transformation factors are understood here as the ability of societal agency to induce change dynamics, inspired by the concept of transformative capacity defined by Wolfram (2016). Drawing on contributions from diverse research spheres, he identified numerous factors, amongst which governance is recognised as the essential pillar of transformation processes. The discussions on governance generally place emphasis on the

process (such as how decisions are made), rather than what is actually done (OECD, 2020). Furthermore, the relations and ways of interacting amongst stakeholders (the state and society) have been recognised as comprising the core of the discourse (World Bank, 2017). In particular, the broad, inclusive participation of stakeholders has primarily formed the discourse on governance. Echoing this, a growing body of literature has sought to define the notion of inclusive governance and, by extension, how it conditions the processes involved in systemic change. Fukuyama (2013) understands governance as 'the ability of actors to perform towards objectives and ambitions that derive from the dynamic interaction and power struggles […]'. However, inclusive governance can be defined as 'a normative sensibility that stands in favour of inclusion' (Hickey, 2015). The extent to which governance is more or less inclusive is related to the degree to which diverse stakeholders—including previously marginalised groups—participate in and exert influence on decision-making processes (Innes and Booher, 2003; Joshi, Hughes and Sisk, 2015).

Inclusive governance involves diverse stakeholders (including formerly excluded ones) and supports their participation and contribution, especially by empowering community groups (e.g. through the formation of communities of practice [CoPs] and access to resources). In addition, the remarkable roles of intermediaries are highlighted—which includes those who are positioned between societal stakeholders in aligning different agency interests—helping to create a shared discourse. Especially in the industry study, intermediaries are considered to be entities that create the ecosystem needed for social organisations to work. They provide consultation and guidance, technical assistance, and build a network of supportive funders (Cornell, 2018). Recently, intermediaries have gained attention in the literature on sustainability transitions. Kivimaa *et al.* (2019) define transition intermediaries as actors and platforms that influence transition processes by linking actors, activities, skills, and resources, and which generate collaborations to bring about new configurations. Furthermore, intermediaries articulate expectations and visions, exchange knowledge and build capacity, and provide institutional support (Howells, 2006).

Scholars, by extension, emphasise the interaction amongst diverse actors who can jointly solve problems (Innes and Booher, 2003, p. 8) in light of collaborative planning and action (e.g. Healey 1998). In this process, the involvement and empowerment of CoPs (mentioned earlier) are stressed as groups of people who attempt to produce social innovation. The notion of CoPs contains critical characteristics that should be distinguished from a community such as a neighbourhood (Wenger-Trayner, 2015). Beyond a network of people, a

CoP's identity is defined by a shared domain of interest (e.g. environmental activities, neighbourhood redevelopment, etc.). Members have a shared competence and mutually learn from one another. Likewise, members build relationships based on discussions and joint activities. Lastly, a CoP is a community of practitioners, and thus implements shared practices and experiments.

Drawing on these characteristics, three crucial conditions are required to enable CoPs to facilitate transformation processes: leadership, empowerment, and experimentations. First, a CoP's leadership is distinguished from the general recognition of 'leaders' and 'followers', but is less hierarchical (Sullivan, 2007). Onyx and Leonard (2011) identify common elements of successful leadership empirically based on different cases: leaders have integrity in pursuing the public's interests; leaders make shared decisions and share skills with members; leaders fill identified gaps in knowledge, skills, and material resources for the public's benefit; leaders articulate a broad vision for the community and find a way to attain it; and leaders have practical skills in coordination and good communication with (and between) members (pp. 503–505). These leadership elements indicate the extent to which leaders actively encourage and empower members to take action by sharing and providing knowledge, vision, and resources.

The elements for successful leadership are closely tied to the empowerment of CoPs. Although the concept of empowerment is shared by many scholarly and practical disciplines, in its most general sense, it refers to the process by which individuals and communities gain power and act effectively by obtaining greater control, efficacy, and social justice in addressing social needs and changing their environment (Kasmel and Andersen, 2011). A large volume of research has sought to identify empowerment factors that enable community members to initiate and deliver actions for change. From the capacity angle, empowerment factors include the active and purposeful participation of community members, competence in problem assessment and solving, access to resources (skills, information, social networks and organisations, funding), a shared vision, and a sense of community (*ibid.*; Smith, Littlejohns and Roym, 2003).

The empowerment process should constitute diverse activities to motivate and support community members' participation to initiate and deliver community practices, and also to create a supportive environment for such practices to bring about change. Furthermore, community-based experimentations are required in and across various action domains such as energy, food, and transportation. At the same time, these experimentations should aim to

simultaneously address innovations in the urban environment, cultures, institutions, governance, markets, and technology. In initiating and performing experimentations, it is essential to establish enabling environments with access to human, financial, technical, and organisational resources.

In addition to the above-mentioned community-related factors, transformative knowledge forms a significant part of the systemic configuration process. Transformative knowledge should take an integrative approach and treat systems as a whole, and aim to address the complexity of the status quo (DRIFT, 2019). In the sustainability context, transformative knowledge refers to 'knowledge on how to shape and implement the transition from the existing to the target situation' (ProClim, 1997, p. 15). For instance, to transition from a fossil to a bio-based economy requires revising existing values and norms such as the belief in cheap fossil energy (Urmetzer *et al.*, 2020). Transformative knowledge thus involves the skills to change personal norms and assumptions, thereby leading to the transition of ideas, theories, and practices. Such knowledge includes the systemic analysis of the interrelations between perspectives, cultures, infrastructure, institutions, and practices, as well as recognition of the rigidity of such elements (Frantzeskaki, 2015; Wolfram, 2016a). Moreover, envisioning sustainability can begin with knowledge of the future (i.e. foresight), which is articulated as an explicit vision and concrete scenarios to achieve it (Eames and Egmose, 2011). Here, concrete plans and regulatory frameworks are required to translate the vision into reality.

In this sense, one vital condition to (co-)produce transformative knowledge is learning and reflexivity processes (Wals, 2007). Learning is generally defined as changes in thought and behaviour (Sol *et al.*, 2018). In contrast, non-learning processes are self-sealing, repetitive, and non-changeable (Argyris, 2003). In transition studies, learning processes are recognised as the centre of societal change (Kemp, Loorbach and Rotmans, 2007; Loorbach, 2010). There have been fewer studies regarding how these learning processes can be conceptualised (van Mierlo *et al.*, 2020). However, it is agreed that social learning involves changes in attitude, norms, and behaviour, which consequently contribute to system innovation.

Pesch (2015) describes social learning as an interactive process in which knowledge is exchanged. Hence, actors learn and co-produce new knowledge; this is possible through communicative interactions amongst learning partners. In recent transition studies, social learning is perceived as:

'a process of acquiring and generating new knowledge and insights, and of meaning-making of experiences in communicative interaction, [… and] in which ideas and possibilities for collaborative action are being developed, experimented with and pursued in a diversity of networks. (van Mierlo *et al.*, 2020, p. 253)'.

Yet the extent to which learning leads to transformation is determined by institutional and social contexts, which go beyond individual motivation. This understanding suggests that we employ an instrumental perspective on learning with a more contextual view *(ibid.).*

Lastly, many scholars have increasingly emphasised the multi-scalar perspective on sustainability transitions (Coenen and Truffer, 2012; Caprotti and Harmer, 2017; Frantzeskaki *et al.*, 2017b). Reflecting on a growing body of literature that has put an emphasis on the geography of sustainability transitions (Truffer, Murphy and Raven, 2015), the emergence of transformation processes is considerably conditioned by geographical scalar interactions (international, national, local scales etc.). The geography of sustainability transitions acknowledges diverse change pathways emerging across geographical and political-administrative scale levels. Such a perspective, therefore, challenges established conceptual frameworks (notably, those with a multi-level perspective), which only distinguish between different levels of niches, regimes, and landscapes, but within a single scale (Coenen, Benneworth and Truffer, 2012). This geographical approach helps to explain different forms of institutional embedding in different territorial spaces (socio-spatial configurations), and displays niche-regime dynamics influenced by scalar interaction processes. In addition, this approach focuses on 'embedded' strengths and weaknesses of spaces (socio-cultural, political, and ecological conditions such as institutional thickness, established social networks, leadership style, and external political relationships). It is useful for analysing specific sustainability challenges and environments in order to find a more fertile foundation for transformative innovations and activities.

Recently, the above-mentioned capacity factors have been empirically reviewed based on an exploration of diverse spatial and sectoral contexts (Wolfram, Borgstroem and Farrelly, 2019). The analyses have identified directions and strategies required to enhance capacity factors. These include increased connectivity amongst local sustainability initiatives (Borgstroem, 2019), city-university partnerships (Withycombe Keeler *et al.*, 2019), children's participation in planning (Nordstroem and Wales, 2019), and the inclusion of the urban poor in planning (Ziervogel, 2019). Additionally, a comparative study of three selected cities in South Korea indicates a range of capacity components that are deficient (systems thinking,

sustainability foresight, social learning) and are emerging as drivers (visioning, community empowerment, trusted intermediation, and local science actors) (Wolfram, 2019).

While these studies strive to find strategies to enhance capacity factors, they give less consideration to the systemic property embedded amongst factors. Castán Broto *et al.* (2019) raised a concern regarding the need to understand the patterns and interrelations across factors. The findings claim that there may be factors with the most relevance or importance as a pre-condition for the emergence of others, while recognising that it might be unreasonable to expect the emergence of all factors simultaneously. This research intends to investigate the interrelations between the factors discussed above, and more specifically, to examine decisive capacity factors that can help to foster others, and consequently influence transformation processes.

2.4   Raising questions

Increasing concerns for sustainability have motivated a new thinking that sustainability challenges are deeply rooted in unsustainable systems within which diverse elements interact, while tightly interrelated and dependent on each other. This perspective provides an implication that contemporary agendas are to cope with such systems, transforming them to a more sustainable state. In this context, cities are understood as a crucial spatial frame where such systemic changes are occurring most dominantly within and across a range of dimensions and scale levels, as a result of urban agglomeration. Cities, in this respect, have increasingly come to represent potential solutions to global sustainability concerns. The process of urbanisation has placed cities as an arena to present powerful changes in coupled human-environment systems. It leads to the necessity to develop urban responses that can invert current (unsustainable) systems into a sustainable form.

Against this background, the research explored a range of agency-related factors that are required for sustainability transformations, and specifically discussed about governance characteristics at the centre of transformations. In this regards, the research aims to analyse implemented capacity factors in the real-world case of the *Eco-capital Suwon*. Accordingly, the research is conducted by answering the main question: *To which extent do governance characteristics influence urban transformation processes?* The research is guided by the main proposition: *'Inclusive governance' conditions the emergence and characteristics of agency-related factors for urban transformations.*

The factors are divided into four categories. The first category includes governance characteristics, leadership, and communities of practice (CoPs) empowerment and experimentations. Given that the role of agency to bring about urban transformations is of importance (Brown, Farrelly and Loorbach, 2013; Fischer and Newig, 2016), the first sub-question sheds light on the role of multiple and inclusive forms of agency (public sector, private businesses, citizens and civil society organisations, intermediaries), and forms of interaction (centralised and decentralised, formal and informal governance mode), with particular attention to the critical role of leadership from diverse sectors. The second category is composed of transformative knowledge and social learning. The particular attention is given to the ways and processes of transformations (e.g. de-/centralised/participatory/inclusive ways). The analysis will focus to investigate how such processes are interrelated to governance modes and actor networks – for example, how they help the co-production of transformative knowledge, and the empowerment of citizens and communities to take part in the policy-/decision-making. The third one focuses on community-based/-led actions and enabling environment to facilitate such experiments. The last one is related to multi-level and cross-scale dynamics of sustainability transformations. It draws on the understanding that each agency has respective contributions to urban transformations, and also transformations occur through cross-scale relations. The particular attention is given to diverse forms of interactions among different agency and scale levels – for example, public-citizen partnership, and trans-urban government association.

3. Methodology

This chapter outlines the methodology adopted to explore implemented capacity factors in a real-world urban development and governance context, following the 'qualitative, case analysis' approach. The following sections respectively explain the rationale of the case selection (the *Eco-capital Suwon* as a governance intervention to achieve sustainability transformation), the case analysis design (the three sub-case approaches for the purpose of a comparative perspective), and the advantage of selecting the qualitative methods of document analysis and in-depth, semi-structured interviews. Additionally, the detailed processes of collecting documents and conducting interviews are described, which point to the need to include informal documents for analysing subjective and abstract factors. Furthermore, the chapter emphasises the role of the relationships built with the interviewees in expanding connections the among them, and in enabling additional post-fieldwork, as well as follow-up interviews and document collection through emails and phone calls.

3.1 Research design

This research chooses a single case study for in-depth, exploratory analysis (Bhattacherjee, 2012). When it comes to learning about human society, a case study is useful in producing practical, context-dependent knowledge to understand a phenomenon within its real-life context (compared to theoretical, context-independent knowledge) (Flyvbjerg, 2001). By extension, a case study is useful in exploring a set of contemporary practices over which researchers have little or no control (which are urban policies and projects in this research) (Yin, 2009). Conversely, a case study can empower researchers to argue for or against theories more rigorously, provided that the application of cases is a truly disciplined design not only to test (prove or disprove) the validity of a given theory, but also to develop the theory at all stages (from conceptualisation to generalisation) (Flyvbjerg, 2006, pp. 11, 13). This research selected a single-case study design in order to examine circumstances that can be used to test the propositions (Yin, 2009). Against this background, appropriate case selection is required (Flyvbjerg, 2006, pp. 14–15).

The real-world case chosen for this research is the *Eco-capital Suwon* in South Korea. It not only represents urban transformation policy, but also a vital case of the governance

approach regarding sustainability transformation (Huh, 2012). Moreover, it encompasses multiple transformation experiments in various systems (e.g. energy, water). Particularly, it fits into a multi-stakeholder, participatory model of sustainability-oriented urban development and governance. At the same time, it is well-placed to demonstrate how transformation processes interact with the wider context where a more state government-led, centralised practice is dominant. Having such characteristics, this case is well-positioned to simultaneously portray various dynamics and processes of transformations. In addition, it presents interactions amongst a wide range of stakeholders in diverse forms, not only from different sectors (the public sector, civil society, and communities) but also from political-administrative levels (neighbourhood, urban and national territories, particularly between the state and local governments).

The case of the *Eco-capital* can be interpreted as a set of transformative experiments across action domains, which collectively attempt to challenge current unsustainable systems and behaviours. The research adopts a single-case design (the *Eco-capital)* in order to explore how governance characteristics influence the conditions needed for transformation processes in cities. The single case is composed of multiple sub-cases (*Rain-city*—rainwater management, *EcoMobility*—low-carbon transport, *CSE (Citizens Solar Energy)*—solar energy generation). The sub-cases are selected to represent situations of different governance characteristics (e.g. agency participation and inclusion, governance modes, and intermediaries). The three sub-cases, therefore, can explain the extent to which different governance characteristics condition transformation dynamics. Additionally, the sub-cases are selected to show different systems (i.e. water, transport, energy). This approach is advantageous in exploring not only changes in various systems, but also changes that may occur across multiple systems. The last criterion for sub-case selection is the inclusion in the 1st and/or 2nd Eco-capital Plan. The selection process entailed both document analysis (policy papers/reports) and consultation with the scientific experts (n=6) of the Suwon Research Institute, who have been actively involved in various transformation experiments within the Eco-capital Plans.

3.2   Research methods

The research adopts a qualitative approach to examining capacity factors that are employed in the case. This approach includes two key methods: document analysis and in-depth, semi-structured interviews. These methods are applied to analyse capacity factors and their

interrelations in respective sub-cases with the comparative perspective. The rationale of adopting these methods attributes to the characteristics of the framework that is developed as qualitative measure for an emergent property that reflects attributes of urban stakeholders. Particularly, informal documents (e.g. social media) and in-depth interviews were essential to help analyse subjective and abstract factors such as the degree of feelings and awareness and recognition. In addition, the national system of open online access to policy documents archive is advantageous to exploring a wide range of documents (from old to recent materials, and from various views on the same policy/project), in addition to acquiring relevant documents from the interviewees (particularly internal reports/minutes and informal documents that are included in the official archive). Above all, building a relationship with interviewees considerably helped to not only broaden the connections to a wide range of informants from diverse sectors (especially community groups), but also enable the post-fieldwork, additional interviews and documents collection by phone/email (overcoming the limit of conducting the research in a foreign country).

Document analysis

Numerous documents and materials were analysed to acquire information that individually and collectively helps to analyse capacity factors. The types of documents and materials are broadly classified into four categories. First, diverse policy documents are the primary source for gaining detailed information on policy/project history and background, objectives, current status and progress (institutional, legislative, financial arrangements), and future plans. This includes financing in the form of the Eco-capital Plan and its periodic internal reports on progress; reports, press releases, and descriptive materials on the three respective sub-projects; urban planning and development documents (master plans, district plans, and urban regeneration plans, Primary Policy Tasks, community building); sustainability-oriented documents (related municipal ordinances/rules, master plans, progress reports, white papers, and indicator assessments). Second, policy research reports were included regarding the overall urban development of Suwon and sustainability-related policies/projects, many of which were published by the Suwon Research Institute (SRI). These materials offered knowledge of the political/socio-economic/environmental background behind current sustainability challenges across domains, as well as an overview of practices/actions that have been taken, and room for alternative solutions.

Third, mass/social media documents are useful not only in understanding various views on policies/projects (especially in the non-public sector), but also in gaining access to the-then current opinions about policies/projects (for example, how the *Eco-capital* was seen by the public) and very recent status and progress updates (for example, ministerial decisions on renewable energy policies, but not yet articulated in official documents): 1) newspaper articles (opinions and stakeholder interviews on policies/projects, background information about related past and current issues) and 2) blog posts and Facebook (of stakeholders and stakeholder groups/organisations regarding their perspectives on policies/projects, the introduction of—and announcements about—their activities/events tied to policies/projects—which are particularly useful in analysing subjective and abstract capacity factors, such as the 'awareness' of systemic relations and 'feelings' of autonomy). Fourth, statistical reports were included to explore the status and trends of sustainability challenges (national and local GHG emissions and energy consumption), and to grasp the consciousness and behaviours/lifestyles of citizens regarding sustainability-related issues (through the national and Suwon statistical databases, and annual survey-based statistical reports on Suwon).

In collecting documents, the South Korean government's policy on 'open access to information' was helpful in collecting a broad range of policy documents through 'online' platforms. These included national acts/municipal ordinances (the National Law Information Centre) and master and concrete work plans (the website-based database of the Suwon Government and the Open Mayor's Office, related ministries, and websites/blogs of the respective sub-case projects). In particular, in terms of taking advantage of cultural aspects observed during the interviews, notably, most of the interviewees (such as the Mayor's active use of social media [i.e. Facebook]) are engaged in interaction platforms amongst stakeholders. With the public, up-to-date information about projects and related activities was accessible during the entire period of the research. Further, the researchers were not bound to the spatial limitations of being in a different place from the case city. A large number of documents were obtained from 'interviewees' based on openness to the public. These include internal status/progress reports (containing concrete future plans), white papers (detailed descriptions of planning and implementation processes), the presentation materials of each project (obtained from responsible government officials), and informal and internal documents (such as work plans and self-assessment documents of community/resident groups).

Table 3.1 Overview of document analysis

	Information	Access to documents
Policy documents	- Policy/project history and background, objectives, current status and progress (institutional, legislative, financial arrangements), and future plans including financing	- Online access (official websites and database) - From interviewees (public officials)
Policy research reports	- Political/socio-economic/ environmental background behind current sustainability challenges across domains - Overview about practices/actions have been taken and alternative solutions	- Online access (official websites and database) - From interviewees (mostly of SRI)
Mass/social media documents	- Various views on policies/projects (especially of the non-public sector) - Access to the-then current opinions about policies/projects and their very recent status and progress	- Online access - Based on previously built network (Facebook)
Statistic reports	- Status and trends of sustainability challenges (national and local GHG emissions and energy consumption) - Consciousness and behaviours/lifestyles of citizens regarding sustainability-related issues	- National and Suwon statistic database and reports - Annual survey-based statistic report of Suwon

(Source: constructed by the author)

In-depth, semi-structured interviews

In-depth, semi-structured interviews (n=36) were conducted with a range of stakeholders (n=45) from May 25–July 24, 2017 in three South Korean cities—mainly in Suwon, and also in Seoul (the nation's capital) and Sejong (a city where government ministries are located). Potential respondents were initially identified through documents of relevant organisations (which pointed the researcher to responsible officials), and also through recommendations from the researcher's contact (those who are connected with the policy research institutes in South Korea and the SRI). In particular, the SRI researcher (noted in the in-text reference as E2) provided considerable support with regard to offering connections to key informants from diverse organisations, including citizen groups (who are rarely mentioned in formal documents), the Suwon Government, and sustainability-oriented public organisations (some of which are not mentioned in current documents, but had participated in the projects with a significant role). Moreover, the researcher offered a work space for fieldwork study in the SRI,

which is located in the city's public complex ('Together Park') along with a majority of key public organisations, including the Suwon Council for SD, the Suwon Sustainable City Foundation, and the ICLEI South Korea office (more details are provided in the following chapters). This contributed substantially to conducting interviews in terms of improved access to interviewees thanks to geographical proximity, flexibility in scheduling interviews, and improved relationships with interviewees working in the complex for post-fieldwork follow-up interviews and document collection. In addition, the complex serving as the city's centre for sustainability held a range of workshops/seminars and programmes that are relevant to the case policy, including public forums on sustainability and the Citizen Autonomy School (by SRI), for which the author was invited to take part and talk to participating citizens.

All interviewees were approached first by email or phone, with a brief description of the nature of the research. Following their agreement to take part, further information about possible areas to be covered in the interview was provided prior to the interview. All interviews were conducted by the author, mostly face-to-face, and in some cases by phone either for post-fieldwork interviews (see the in-text reference as U9; U11) or at the request of the interviewees (in-text reference as U2; L4; L5; E1). Interviews were audio recorded with each respondent's written consent; these recordings were manually transcribed into written form by the author for analytical purposes. The author has retained copies of all correspondence and signed consent forms. The interviews lasted approximately 30 to 130 minutes, and took the form of a conversation, rather than a fixed series of questions and answers.

As a result, interviews were conducted with 45 informants from 14 organisations and 2 neighbourhoods; details of the interviewees (with in-text references) are presented in Appendix 1. First, the national ministries and research institutes in charge of the national-level legislation and policies on sustainable transport and neighbourhood community building. Second, Suwon Government officials (including the mayor and former vice mayor) who were—or are— directly or indirectly involved in the *Eco-capital* and the three selected projects. Third, neighbourhood-level public officials and resident group leaders/residents from the two neighbourhoods of Haenggung-dong and Hwaseo 1-dong[13], who have participated in the respective projects (neighbourhood/household-scale). Fourth, urban-level intermediary organisations (the Suwon Council for Sustainable Development [SCSD] and the Suwon

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[13] Neighbourhood is translated in South Korean as 'dong'. See Footnote 22 for more details.

Sustainability City Foundation [SSCF]) and research institutes (the Suwon Research Institute [SRI]), which work on providing policy advice and mobilising interactions amongst multi-stakeholders. Fifth, local community organisations, such as (social) cooperatives and citizen/resident groups involved in the respective projects. An interview with the mayor was arranged within the internal application system of the Suwon Government with the help of the Sustainability Division (after conducting interviews with its officials).

The relationships built with some interviewees helped to facilitate group interviews in which open discussions amongst the interviewees were simultaneously conducted, while the author participated as a moderator, guiding the discussions by introducing various topics. Group interviews included: resident volunteers of the EcoMobility Community Centre in Haenggung-dong (NH 2 – 4) through the introduction of an officer from the Neighbourhood Community Service Centre (NH1, after conducting an individual interview); neighbourhood-level public officials and resident group leaders of Hwaseo 1-dong (NH 5 – 9) via the coordination of the former general director of Neighbourhood Community Service Centre (NH 6, after having an individual interview); and resident coordinators of the Centre for Neighbourhood Community Renaissance (I4 – 7) through the coordination of its chief officer (I3, after conducting an individual interview). Notably, being a part of discussions amongst citizen/resident interviewees was very useful in grasping subjective aspects, such as the question of how much CoPs feel empowered and autonomous, how they view the city's policy goals, and with which kind of motivation they participate in related projects.

Interviews were held based on the interview topics (Table 3.2), which were tailored for individual participants. They were designed to yield a general perspective on the *Eco-capital* and its three sub-projects, their role within the broader context of Suwon's urban development (with a focus on the transitional process from the previous mayor's growth-oriented policy regime to the current sustainability-driven urban structuring), and more specifically on the respective factors of the framework (according to the respondent's involvement). These matters were covered through informal conversation in order not to interfere with the flow of the interviews. The most critical part was figuring out how to translate vocabulary words related to factors that were difficult for the interviewees to understand, such as 'systemic relations' and 'systems obduracy and changeability'. Several interviews with the researchers of SRI helped to rephrase these terms into more practical forms, articulated as 'What policies/strategies are employed to raise public awareness of problems embedded in current lifestyles?' and 'What policies and/or strategies are employed

to alter existing regulations/institutions/values/infrastructures that may hinder changes to the current system(s) in moving towards sustainability?'

Table 3.2 Interview topics

Subject	Interview topic (tailored for individual interviewees)
Background and general information	Yourself • Brief overview of your job role and current projects • Your involvement in the *Eco-capital* (and the 3 projects)
	Suwon • Your views on what makes Suwon different to other cities • Key challenges that Suwon faces currently and in future
	Eco-capital • How critical would you see is the *Eco-capital* to Suwon's urban development towards sustainability? From which perspective? • Which factors would you see make the *Eco-capital* different from other urban sustainability policies in South Korea?
Capacity factors	Governance characteristics, leadership, communities of practice • Who is participating in the *Eco-capital*? How proactive are they in the decision making process? • Which governance modes and actor networks are employed? • Which leadership do you recognize in the *Eco-capital*? • How would you see the status/role of communities? Any support for their organisational formation?
	Transformative knowledge, social learning, inclusive planning • How would you see the participating agency is aware of systemic relations and obduracy/changeability within current system? • Your views on the vision for the *Eco-capital*, and suggestions on alternative scenarios and future pathways • Community-based practices related to the *Eco-capital* and support for their practices • Institutional/financial/regulatory environment to enable and accelerate the *Eco-capital* • Monitoring/evaluation process, including interaction formats among agency
	Multi-dimensionality • Policy measures to improve the respective contributions of individual citizens/residents, households, social groups, organisations and their networks to the achievement of the *Eco-capital*? • Interactions of agency across neighbourhood, urban, provincial, national and inter- and transnational territories
Implementation	• Ongoing implementation successes and difficulties of the *Eco-capital* • How would you see the opportunities and threats to their implementation in the long term?

(Source: constructed by the author, inspired by the categorisation in Wolfram, 2016)

Table 3.3 Overview of in-depth, semi-structured interviews

Before the interviews	Interviews	After the interviews
• Pre-fieldwork - Selection of potential interviewees - Approaching selected interviewees by phone or email - Sending interview topics (tailored) following the respondents' agreement to participate • During the fieldwork - Meetings with the SRI researcher to check the appropriateness of selected interviewees, and to make interview appointments with introduced interviewees - Setting up the work space in the SRI in Together Park	• During the fieldwork - A total of 45 interviewees (national and local government officials, public sector organisations, civil society organisations, residents) - Audio recording of the interviews, based on signed consent of the participants - Conducting interviews based on pre-sent interview topics, but in the form of conversation - 2 group interviews in 2 neighbourhoods (public sector and residents) - Collecting relevant documents from the interviewees	• During the fieldwork - Translating interview recordings into a written form (after each interview, in accordance with the topic) - Building relationships with the interviewees, using the lunch time (in the cafeteria of Together Park) and visiting the office in case other interviews occur in the same organisation • Post-fieldwork - Conducting additional phone interviews - Collecting additional documents from interviewees by email

(Source: constructed by the author)

4. Case study of the Eco-capital Suwon

This Chapter introduces the case city, Suwon, especially in the context of being geographically located in the heart of South Korea (the capital region), which has influenced the development of the city's demographic and socio-economic characteristics. The focus is put on the transition process of urban development that has begun along with the political transition of the Suwon Government since 2010. The 'Eco-capital' is presented as the representative policy of the new government whose aim is to transform existing urban system to a more sustainable form, with the focus on environmental aspects. Finally, detailed description of case design is explained, in order to lay the groundwork for the empirical analysis (Chapter 5-8).

4.1   Suwon city: main characteristics

Suwon is located in the north-western part of South Korea, approximately 40 kilometres south of the capital (Seoul) (Figure 4.1). Since the 1960s, Suwon has served as the capital of Gyeonggi province[14], the country's most populous province surrounding Seoul. This province has a quarter of the national population (KOSIS, 2017c), largely coupled with its geographical factor - lying within the capital region (Seoul metropolitan area, or *[Sudogwon]* in South Korean) where the country's administrative, economic and cultural infrastructures and services are heavily centralised (W. Lee, 2013; Byun, 2014). Overpopulation of this region had begun since the 1960s, being the main concern to develop the Planning Act on Seoul Metropolitan Area Readjustment (1982) that aimed at 'balanced development' of the country, by restraining the attraction of population and industries within the capital region while establishing the independent metropolitan systems including economic functions as well as transport and water services (Ministry of Works, 1982). The ensuing master plans, however, have not been successful in that the degree of concentration in the region has rather risen around 40% comparing to 1980, reaching around 50% since 2010 (KOSIS, 2017b). Suwon, located in the middle of this region, has been the most densely populated area among municipal-level

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[14] The Gyeonggi Provincial office has the second government office in Uigeongbu city, lying down on the northern part of the province.

cities[15], with 1.2 million residents (9.3% of the Gyeonggi population) on a land area of 121 km^2 (density of more than 10 thousand people per km^2) (Figure 4.2) (KOSIS, 2017c; SG, 2017o).

Figure 4.1 Map of South Korea, Gyeonggi-do, and Suwon

(Data source: NaturalEarth 4.0 (2018); map construction by the author)

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[15] South Korea's administrative area is governed by metropolitan local governments and local governments. Metropolitan local governments include 1 special city (Seoul), 6 metropolitan cities (Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan), 1 special autonomous city (Sejong), 8 provinces (Gyeonggi, Gangwon, North Chungcheong, South Chungcheong, North Jeolla, South Jeolla, North Gyeongsang, South Gyeongsang), and 1 special province (Jeju). Local governments include municipal-level cities [si], counties [gun] and districts [gu]. The capital region refers to Seoul, Gyeonggi province and Incheon, which has half of the national population, as of 2017 (KOSIS, 2017c). The overall local government system is presented in Appendix 2.
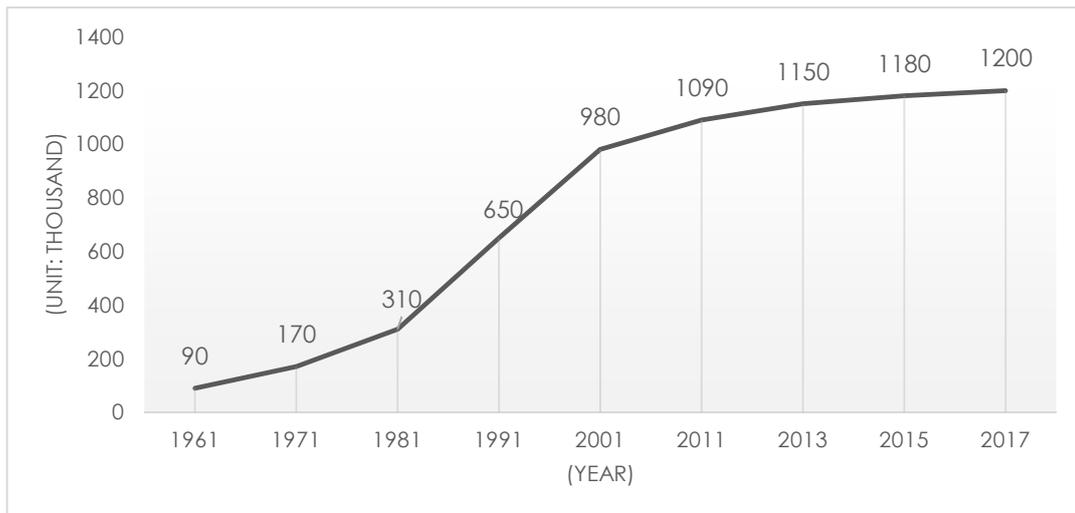
Figure 4.2 Trends of Suwon population

(Source: own compilation based on SG, 2008; KOSIS, 2017c)

Suwon's another demographical aspect refers to a relatively large number of population (around the half) who has resided in the city for longer than 20 years (KOSIS, 2017c). Differing from many other cities which are designed as a satellite city or bed town of Seoul, Suwon has rather autonomously performed diverse urban functions in terms of providing decent job opportunities, advanced education, and various socio-cultural services within the city region (E5; E6; U1; SG, 2014g, pp. 37–38). This notion of 'self-sufficiency' was actually planned earlier in the early 1990s when the national government presented the Suwon's master plan to nurture it as a hub of the southern part of the capital region specialised in education and research as well as industry (Joongang Ilbo, 1993; SG, 2008, p. 42). As parts of the plan, a range of development policies have been implemented including the development of 14 housing sites (SG, 2008) and the Suwon Industrial Complex (SIC)[16]. The neighbouring cities have considerably depended on the urban functions that Suwon provides, such as banking and insurance as well as public infrastructures and services, which has accordingly brought up discussions to integrate the city of Hwaseong[17] and Osan to the administrative boundary of Suwon (Kim, 2009; SG, 2014g, p. 37).

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[16] As of 2017, the SIC is composed of 3 complexes with 227 plots in an area of 1,3 km², specialised in IT, electronics, mechanical industries (SG, 2017p).

[17] Note that Hwaseong city refers to a neighbouring city of Suwon, not the Hwaseong Fortress located in Suwon.

Relatedly, Suwon has recorded remarkable economic growth as reflected in its high GRDP and fiscal independence rate[18], due to the city's strong industrial tax base, which is in fact largely backed by another significant feature of Suwon as the birthplace and headquarter of Samsung Electronics, the country's top multinational company. Since the company's establishment in the late 1960s, Suwon had experienced a drastic growth with the annual population growth rate of 4.8%, and GRDP growth rate of 18% in 1970s[19] (Hong, 2017). Since the 2000s, the company altered its manufacturing plants to the R&D centre, named Samsung Digital City (SCD), replacing the city's blue workers with highly educated employees, by which more non-Suwon residents have moved in the city, and the city's population age has become younger with the majority of 30s and 40s (SG, 2016a, p. 5; Hong, 2017). The region in which the SDC is located became the city's fourth district named 'Yeongtong-gu' in 2003, adding to other 3 established districts, Gwonseon-gu, Jangan-gu and Paldal-gu[20] (Figure 4.3) (SG, 2017n); it has been rapidly developed with 22% of annual population growth rate (KOSIS, 2017c) taking up 29% of the city population (SG, 2017o), as well as having the largest number of Suwon employees (34%) – a quarter of which is of Samsung companies' (Jang, 2016; SG, 2016e). Consequently, Yeongtong-gu has begun to serve as a new urban centre in the city's east region.

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[18] Suwon has GRDP (gross regional domestic product – at current prices, 2014) of around 27,4 trillion Won; 20,6 billion euro (Gyeonggi Statistics, 2014), and fiscal independence rate (calculated as the percentage of local own resources over total budget) of 59% in 2017 (average 39% in municipal-level cities) (KOSIS, 2017a).

[19] Samsung Electronics paid 21.3% of Suwon's local tax income in 2016 (Hong, 2017).

[20] Municipal-level cities are divided into districts ('gu' in South Korean).
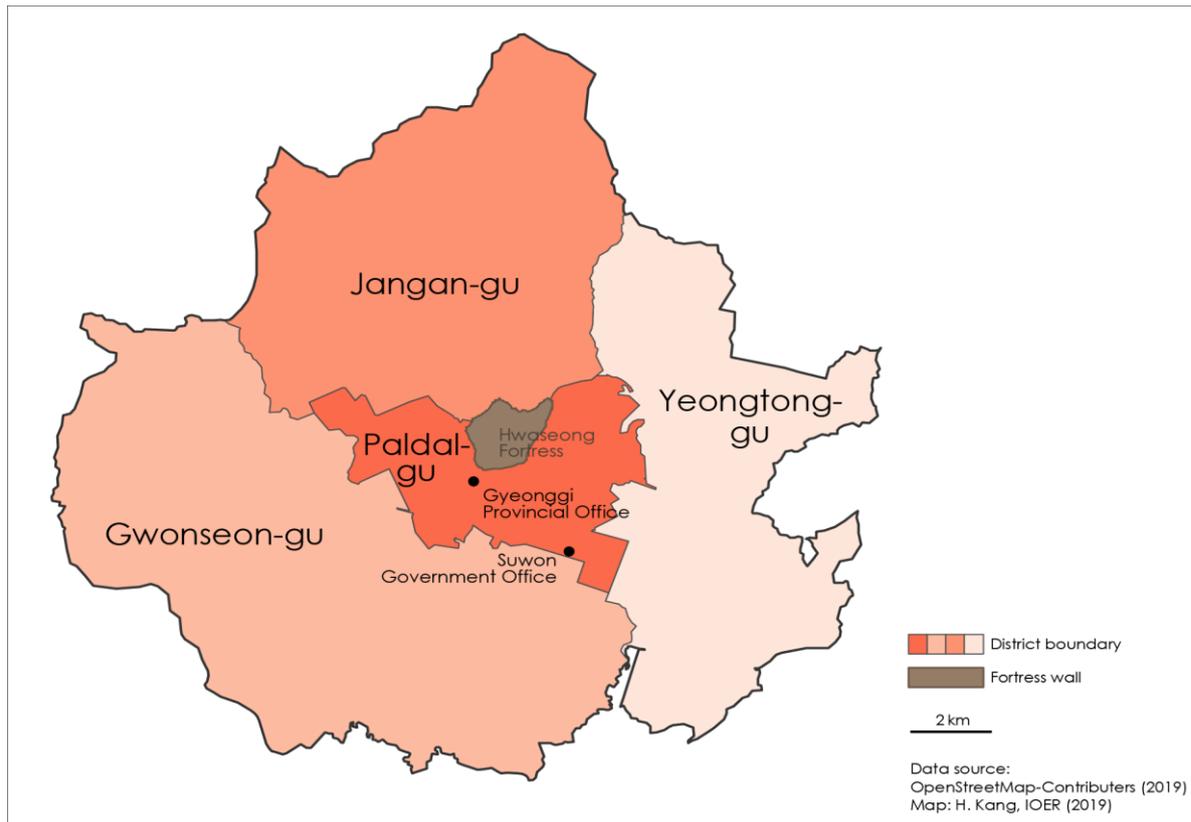
Figure 4.3 Suwon's 4 districts (gu)

(Data source: OpenStreetMap-Contributers (2019); map construction by the author)

In earlier days, however, Suwon had been established around the central region of the city, in which the city's symbolic figure is located, the Hwaseong Fortress. Its historical stories are traced back to the Joseon Dynasty of South Korea when the King Jeongjo[21] made an ambitious attempt to build a new city, named 'Hwaseong' in today's Suwon area. As the country's first city-building project, Hwaseong was designed around 5.7 km of fortress, based on the planning guide which was later enforced as the King's Master Plan on Hwaseong, and completed within only 2.6 years (1794-96) largely helped by the invention of construction equipment (Kim, 2002; Han, 2007, p. 71). This Hwaseong development is evaluated in the 200 years of Suwon Urban Planning as the pioneering urban paradigm envisaging 'self-

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[21] The Joseon Dynasty (officially the Kingdom of Great Joseon) is the last dynasty of South Korea from 1392 to 1897, which was succeeded by the South Korean Empire (1897-1910), the South Korean Provisional Government of the Republic of South Korea (1919-1948), and later the Republic of South Korea (1948 onward). During the Dynasty, the capital was relocated to Hanseong (the old name of Seoul). Jeongjo is the 22nd King of Joseon, one of the most respected Kings in the history.

sufficiency' in that the city was commissioned to independently take roles of the national administrative, military and financial functions (Choi, 2001; Yu, 2001; SG, 2008, p. 17).

The area all within, and some adjacent to the fortress boundary was classified as Haenggung-dong[22] in Paldal-gu that had previously served main urban functions – being home to the Suwon Government office and Gyeonggi Provincial office, and 10 universities/colleges, and also providing cultural spaces such as municipal library, museum and art hall. Over the course of time, the city has gradually become divided into the east and west of Paldal-gu (E2; NH3), mainly coupled with the construction of the Gyeongbu Expressway[23] (the east) and Gyeongbu Railway (the west), as well as the development of planned housing sites in the Gwanggyo New Town (GNT)[24] (the east) and Homaesil residence zone[25] (the west) (SG, 2014g). This division, more critically, has broadened a regional gap, structuring a new, developing east region and old, shrinking west region (Kim, 2017). This gap is expected to become more obvious along with the administrative factors that the east will host the Gyeonggi Provincial office (in GNT) by 2021 while the west has to face a range of development restrictions imposed by the designation of Hwaseong as a UNESCO World

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[22] South Korea's administrative system applies two different classification on neighbourhoods ('dong'). An administrative neighbourhood [haengjeong-dong] is classified based on the different governing agency, the Neighbourhood Community Service Centre, while legal neighbourhood [beopjeong-dong] is based on the historical regional division, address, and cadastre. There are different cases of the application: one administrative neighbourhood governs one legal neighbourhood; one administrative neighbourhood governs multiple legal neighbourhoods; one legal neighbourhood is governed by different administrative neighbourhoods (in this case, the legal neighbourhood is classified by number). Haenggung-dong is the administrative neighbourhood that governs 12 legal neighbourhoods.

[23] The Gyeongbu Expressway, or Expressway No. 1, is the second oldest and most travelled expressway, of which length is 416 km from the country's north to south, connecting Seoul to Suwon, Daejeon, Gumi, Daegu and Busan.

[24] GNT is a planned city built in an area of 11.3 km[2] in Yeongtong-gu of Suwon (88%) and Suji-gu of Yongin city (12%), Gyeonggi province. Approximately 9.3 trillion Won; 7 billion euro was invested for the construction by the cooperation of Suwon city, Yongin city, Gyeonggi province and Gyeonggi Development Corporation. Starting the urban function in 2011, it is expected to accommodate 77 thousand residents (Gyeonggi Development Corporation, 2008).

[25] The Korea Land and Housing Corporation invested 2,3 billion Won (1,7 billion euro) in the development of Homaesil residence zone in an area of 3,1 km[2] in Homaesil-dong and Geumgok-dong, Gwonseon-gu, and which was complete in 2015, accommodating 55 thousand residents (SG, 2015e).

Heritage Site[26] as well as the operation of Suwon Air Base[27] (Kim, 2012; Hong, 2015). This regional gap has given the necessity for developing policies that are oriented to revitalise the west region, and therefore to bring about balanced regional development of the city.

This issue of regional balance has been clearly reflected in Suwon's 10-year Urban Planning for 2030 (hereafter, 2030 Plan) as a policy direction for (sustainable) urban development, which will be directed by the 'regeneration of old urban regions', rather than the conventional approach of demolishing and (re)constructing housing sites (SG, 2014g, p. 52). Such concept of urban regeneration has been taken as an essential mechanism of developing and managing urban areas, under the label of Suwon Urban Renaissance that is particularly oriented to refurbish densely populated sites (SG, 2014e). Since 2014, a total of 6 regeneration programmes have been, and will be implemented in old urban areas which include Haenggung-dong (Hwaseong Fortress neighbourhood) and Maesan-dong (development restriction area) in Paldal-gu (SG, 2017j, 2018s). This project has made itself distinguished from other urban (re)development models in that: it conceptualises regeneration as the process of building 'sustainable urban space' by the integration of physical, socio-economic and cultural improvement; it seeks to establish and invigorate 'green local community' by which local capacity can be strengthened; and it is implemented by the mechanism of 'participatory governance' among residents, planning experts and officers (SG, 2014e).

4.2   The Eco-capital Suwon for urban transformations

Such regeneration approach is in fact founded on the changed paradigm of urban development that is motivated by the recognition of the previous growth-oriented, construction-based urban practices (Huh, 2012). This paradigm shift has begun to occur along with the city's political transition in 2010 when the Mayor Tae-young Yeom led the government, declaring the city's vision to become the 'Eco-capital' of the country (SG, 2010a, 2014g; Park and Bak, 2018). Accordingly, for the first time at the municipal level, an ambitious

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[26] The Suwon Government has put efforts to revive the Fortress neighbourhoods by loosening the development restrictions and building urban infrastructure (Kim, 2012).

[27] While the Suwon Air Base of South Korea's Air Force was decided to be relocated, the process of relocation has not been implemented due to the opposition of Hwaseong city, a proposed site by the Ministry of National Defense (M. Kim, 2017).

target was set to slash the city's GHG emissions by 40 percent by 2030 compared with 2005 levels, which should be supported by committed efforts to transform Suwon to a climate-safe, environmentally-friendly city (SG, 2011b). Under the Mayor's transition team, an Eco-capital Task Force (TF) was formed in cooperation with Eco-capital Advisory Committee (EAC) composed of 12 experts from civil organisations and academia (H. Lee, 2011; Huh, 2012). One year later, a range of stakeholders from different sectors have gathered and announced the Declaration on Eco-capital Suwon:

> *'Today, we have recognised that the planetary environmental crisis is the result of human desires for material affluence that exceed ecological carrying capacity. Accordingly, we call upon the fundamental transformation of urban spatial planning and policy as well as lifestyle, therefore declaring to become South Korea's Eco-capital. Based upon various opinions and suggestions from citizens who look forward to establishing Eco-capital Suwon, we put efforts to reduce the city's greenhouse gas (GHG) emissions by 40 percent by 2030 compared with 2005 levels, in order to transform Suwon from grey city to green city…'* (SG, 2011c).

The Eco-capital vision was set to develop Suwon as 'an environmental model city that is built based on active citizen participation in achieving urban sustainability' (SG, 2015a). A year later after the declaration, the Eco-capital Plan was formulated, which set a vision of becoming a sustainable city where human and nature coexist by accomplishing three overarching goals (and strategies). They include: ecological city (by establishing resource circulation system, carbon sinks, urban ecological agriculture); climate-safe low-carbon city (by building sustainable urban space, green transportation structure and energy sufficiency); and inclusive governance city (by developing a platform for citizen participation, environmental education, and promoting green lifestyle) (SG, 2012a). In fact, this effort was already tried in the mid-1990s when the ME developed an ecological planning that applied such concepts and principles to Suwon as a pilot city which was undergoing urban (environmental) changes coupled with a range of land and housing development (ME, 1996). Suwon's ecological planning was designed around the Hwaseong Fortress, with an aim to harmonise ecological protection and economic development by recovering 4 local streams, introducing inter-city ecosystem network connected to each stream, and building an energy-efficient housing zone (solar energy) (*ibid.*, pp. 56–62).

This vision to make Suwon as an environmentally sustainable city was, furthermore, reflected in the city's 2030 Plan, which set its policy direction as 'harmonisation between human and nature' (SG, 2014g, p. 95). In particular, an experimental planning mechanism was adopted, which attempted to replace government-centred policy making practices with multi-stakeholder partnership-based urban planning, introducing a Citizens Planning Group (CPG) of 130 citizen representatives who were assigned to participate in one of 6 thematic planning groups (Huh, 2012; Lee and Kim, 2012b). In particular, the Eco-capital group was responsible for realising the urban concept of 'clean and healthy environment' that is to be achieved by promoting ecological urban development (housing), and green infrastructure and industries, especially founded on cooperation among the public and private sector, and civil society and citizens (SG, 2014g, pp. 93–98).

Suwon's effort to become Eco-capital was once more facilitated when Mayor Yeom was re-elected, solidifying and concretising the municipal environment-related regulations and policies, including: the municipal framework ordinance on Low-Carbon Green Growth, and Sustainable Development; revision of the municipal framework ordinance on the Environment; and Environmental Conservation Plan (2016-25)[28]. Significantly, these papers clarified Suwon's own conceptualisation on Eco-capital and the rationale for this:

> *'Suwon is not ecologically planned, nor having eco-friendly environment. Therefore, we see 'citizens' as the most critical resource that can contribute to making Suwon sustainable. In order to motivate citizens and civil society to take part in Eco-capital making journey, there should be transformation of citizens' perception on the environment and their agreement to conform to the suggested eco-lifestyle. Additionally, a strong green partnership among diverse stakeholders – not only from the government but civil society and industries – should be established and promoted. Relatedly, an Environmental White Paper is to be published periodically so as to inform these stakeholders of the city's environment status and progress of relevant policies'* (SG, 2015b, 2016b, chap. 4).

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[28] The ECP is a 10-year environmental plan, of which overarching goal is to achieve environmentally-sound and sustainable development. It sees that Suwon has faced a range of sustainability challenges from continuous population increase and housing construction as well as limited climate responsive urban structure while undergoing decreasing local fiscal capacity. A set of 30 indicators were selected for implementation and monitoring of the plan, including in the section of natural resources, atmosphere, water, waste, energy and hygiene (SG, 2016b).

2010	Municipal Framework Ordinance on Low-Carbon Green Growth
2011	Eco-capital Declaration
2012	Eco-capital Plan
2014	2030 Plan
2015	Eco-capital Plan (2nd) Municipal Framework Ordinance on the Environment (revision)
2016	Environmental Conservation Plan
2017	Eco-capital Plan (3rd) Municipal Framework Ordinance on SD

Figure 4.4 Policies on Eco-capital and related legislation

(Source: designed by the author)

The Eco-capital Plan was positioned to be prior to the city's other environment-related plans and policies, while covering socio-cultural and institutional interventions rather than spatial solution (SG, 2016b). In 2017, as a response to speed up the GHG reduction by 20% by 2020[29], the plan was reset with 8 strategic areas and 16 projects (Figure 4.5) that were selected out of total 50 (SG, 2017b). Selected projects have diverse and different stakeholders and approaches. Some projects are primarily driven by the public sector (notably Suwon Government) and partnering experts/technicians in related areas, and with a infrastructural/technical approach (rainwater facility installation and operation, green building construction, and eco-town regeneration), as well as regulatory approach (waste management, emissions trading system - ETS). In contrast, other projects include non-public stakeholders, and with more focus on behavioural and lifestyle aspect, in the cases of car sharing based on the partnership between the public sector and private car rental company, and ecological stream making largely led by civil organisations (Suwon Small-Medium Stream Network composed of separate entities from 4 streams).

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[29] Suwon has reduced 4% of GHG by 2015, which was initially planned to be 5% according to the 3-phase GHG reduction plan (SG, 2017b).

1. Water circulation	**2. Energy self-sufficiency**
1.1 Rain-city	2.1 Sharing Solar Energy
1.2 Ecological stream & forest	2.2 Renewable energy

3. GHG reduction	**4. Resource circulation**
3.1 Emission Trading System (ETS)	4.1 Waste management
3.2 GHG reduction	4.2 Resource reuse and recycle

5. Green transportation	**6. Sustainable urban space**
5.1 Low-carbon transportation(EcoMobility)	6.1 Green building
5.2 Car Sharing	6.2 Urban Renaissance and eco-town

7. Urban environment	**8. Environmental education**
7.1 Healing environment (Atopy healing centre)	8.1 Textbook on the environment
7.2 Urban eco-friendly agriculture	8.2 Climate change education centre

Figure 4.5 Eco-capital strategic areas and projects

(Source: own compilation based on SG, 2017b)

Drawing on the background mentioned above, the research takes the *Eco-capital* as Suwon's representative policy on urban sustainability with the emphasis on environmental aspect, incorporating diverse action domains (areas). In order to scrutinise capacity factors that are employed not only in the *Eco-capital* in general, but more specifically in its different projects, the research selects 3 projects as sub-cases for analysis, based on the differences in terms of action domains, and also participating agency and their roles. The 3 selected projects cover domains of (rain)water management, green transportation, and renewable (solar) energy, with participation of (inter)national/urban/neighbourhood-scale agency from the public and private sector, academia and research institute, civil society, and individual citizens and residents. First, the *Rain-city* has been established primarily by national/urban government officials and scientific/technical experts, experimenting on a series of rainwater facilities in public buildings and spaces, and also in houses (rooftop and garden).

The second project, the *EcoMobility* refers to both a month-long experimentation on 'no car in one neighbourhood' (*Festival*) and follow-up regular community-led 'car-free day', in

which the Suwon Government and public organisations actively support autonomous ecomobile experiments of diverse resident groups (of each neighbourhood). Third, the *Citizens Solar Energy* (*CSE*) was launched by the citizen organisation (Suwon Citizens Solar Energy Social Cooperative) in cooperation of the Suwon Government, aiming to motivate solar energy generation by citizens/residents. In addition to the project selection, 2 neighbourhoods are selected (Figure 4.6): 'Haenggung-dong' where the *EcoMobility Festival* was held and 'Hwaseo 1-dong' where neighbourhood-scale solar plant is operated as one of *CSE* projects. Accordingly, the following empirical study (Chapter 5-8) will focus on the analysis of capacity factors employed in the *Eco-capital* in general, and 3 projects respectively.
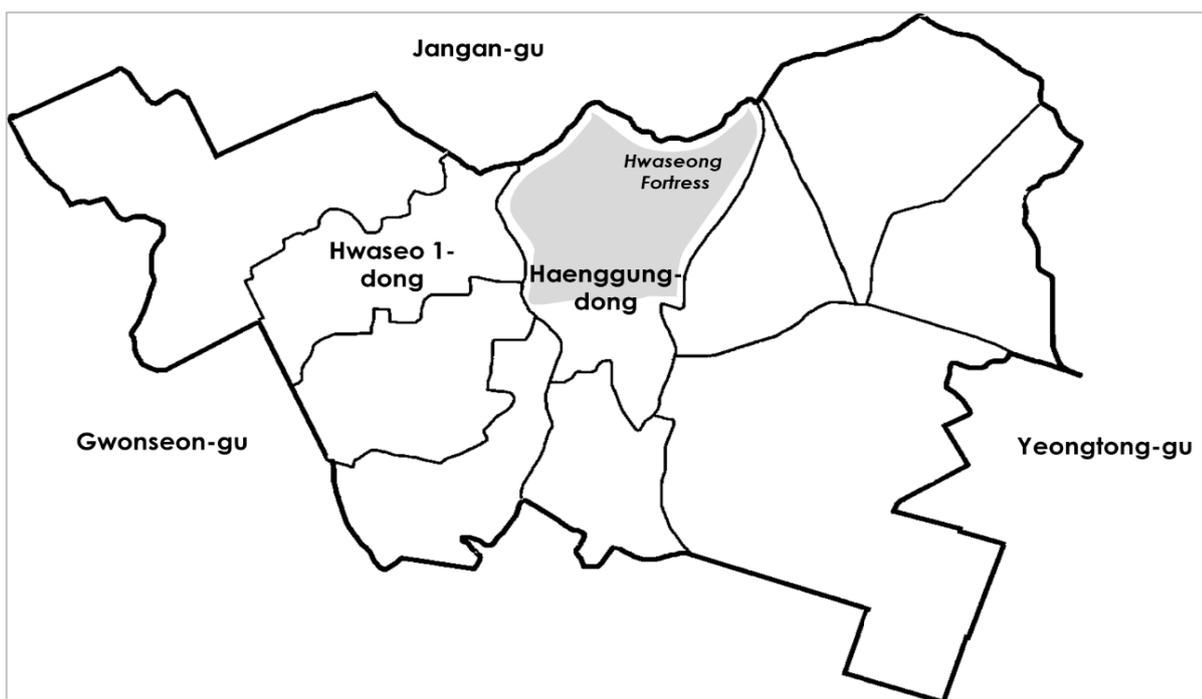
Figure 4.6 Location of Haenggung-dong and Hwaseo 1-dong (in Paldal-gu)
(Source: designed by the author based on SG, 2018t)

5. Agency and governance characteristics

This Chapter is devoted to exploring diverse agency forms and their interaction involved in the process of developing enabling conditions. It is analysed with particular regard to inclusive governance where diverse stakeholders directly participate in the deliberation of actions. In addition, it examines diverse transformative leadership oriented at systemic change for sustainability, and also empowered and autonomous communities of practice. The findings articulate the critical role of the political leadership (of local government) in initiating policy decision on drastic change in urban development pathways towards sustainability. But at the same time, they imply concerns arising from a term limit of government leaders and accordingly their term-bound transformative influence. This, therefore, leads to the implication on the complementary role of the public sector (especially 'intermediary organisations') in 'empowering' the leadership from various sectors, particularly of citizen/resident-led communities of practice (CoPs). By extension, related implication is drawn that the process of empowerment is to be accompanied with practical institutional and organisational support oriented to mobilising 'autonomous' actions of CoPs even outside of the institutional boundary, and ultimately enhancing their feelings of ownership for continuous experimentations.

5.1   Inclusive governance at the centre of transformations

This Section analyses a range of 'agency' directly participating in the *Eco-capital* and its three selected projects, as well as 'governance mode' that is employed in the process of planning and practicing. In the Suwon Government (SG), each *Eco-capital* project is directly charged by a range of responsible teams within the Environment Bureau (EB) and Transportation Bureau (TB)[30]. The Environment Policy Team of EB takes charge of establishing the 'Eco-Capital Plan' and coordinating its subordinate projects with the respective teams in charge. Several teams collaborate, especially when it comes to dealing with natural resources – for example, stream management is governed by several teams who are responsible for water circulation, sewage

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[30] The administrative unit 'team' is directly in charge of policy making and implementation of specific tasks that are assigned by higher 'division'/'office' or 'bureau'.

management and environment safety of the Suwon Government, as well as stream sewage management in four District Offices (of Gwonseon-gu, Jangan-gu, Paldal-gu and Yeongtong-gu). By project, on the one hand, the EB works in areas of water management (rainwater, wastewater, streams), climate change and GHG (atmosphere condition, the emissions trading system (ETS), (renewable) energy, resource circulation (waste management, reuse and recycle) and environmental education, and the other hand, the TB conducts transport-related works including public transportation (subway, bus, train within Suwon and across surrounding cities) and low-carbon transportation means (public bicycle, electric car, car-sharing) [31]. Additionally, a separate centre for park and green space work on ecological park establishment and management in cooperation with related teams in four District Offices.

In 2017, the Sustainability Division was founded according to the establishment of the city's sustainability-oriented organisation, the Suwon Sustainable City Foundation (SSCF)[32]. Confronted with increasing public demands that cannot be solved with existing public services that were limited in their fragmented system across action domains, as well as lacking communication among sectors (public officials, citizens, businesses), the SSCF was assigned the role of intermediation bridging these relevant gaps (SSCF, 2018b). Based on the municipal ordinance on its establishment and operation (SG, 2016c), the SSCF became able to secure its financial basis through the Suwon Government's financial contribution, along with revenues from its project operation. The SSCF aims to provide an integrated public service by issue-based, 8 different centres, through close cooperation with related teams of the Sustainability Division in developing and implementing policies in areas of ecology (water environment), social economy (housing welfare, school feeding, start-up assistance) and urban development (urban regeneration, community building) (SSCF, 2018b). These different centres' common goal is to develop a 'cooperative platform' where diverse stakeholders are brought together for seeking solutions, as a new policy-making process: citizens give opinions and suggestions to urban policy and projects, the SSCF develops work plans based on these ideas and also

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[31] As of July 2018, Suwon Government has been reorganised for the third term of the Yeom Administration (SG, 2018n).

[32] The SSCF was founded in 2016 with the Suwon Government contribution (5 billion Won; 3.75 million euro), and the operational cost is covered by other types of contribution and its own earnings from projects (SG, 2016c).

comments from experts in different areas, and the Suwon Government's responsible teams[33] review the feasibility and make up a budget while all stakeholders are encouraged to participate in monitoring and review process (Figure 5.1) (Ahn, 2018).

Suwon Government	Project plan review	→	Budget compilation	→	Project monitoring
SSCF	Project planning based on citizens' opinion	→	Concrete work plan	→	Implementation/ monitoring and report
Citizens	Providing opinions			→	Implementation/ monitoring and report
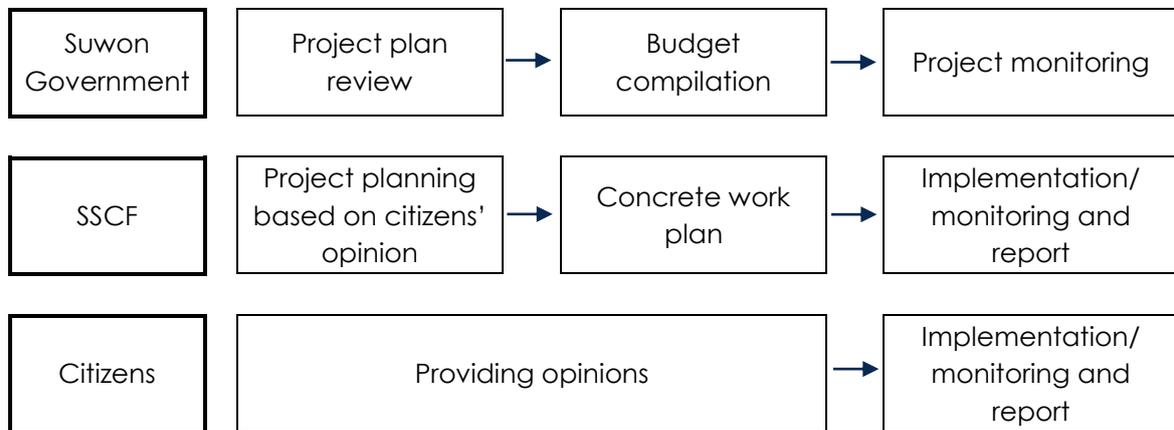
Figure 5.1 SSCF's multi-stakeholder planning and monitoring process
(Source: own compilation based on (Ahn, 2018, p. 15)

The city's another sustainability-oriented intermediary organisation, the Suwon Council for Sustainable Development (SCSD)[34], already began working in 1997, following the international adoption of *Agenda 21* and its call for local actions (UNDESA, 1992, para. 28), along with the national implementation of 'local self-government system' with the citizen-elected Mayor in the mid-1990s[35]. The SCSD is Suwon's first public-private partnering body

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[33] Since the reorganisation/expansion of the SSCF in early 2018, the Suwon Government also has reorganised/expanded its organisational structure with 10 responsible teams along the third term of the Yeom Administration (Ahn, 2018).

[34] The SCSD was first started as the '21st century Suwon Council', then reformed as 'Suwon Council for Agenda 21' in accordance with the enactment of the municipal ordinance related to its establishment and operation in 2009 (SG, 2009). Then, it was renamed as SCSD according to the decision of the Local Sustainability Alliance of South Korea (LSAK) to standardise the title of (metropolitan) local-level councils.

[35] After a long period of strongly centralised government system, local governments were first guaranteed by the Constitution in 1948, and a year later, the Local Autonomy Law was enacted. In 1952, the first local election was carried out only for city assembly, and the April 19 civil revolution acted as a trigger to expand the range of local election to mayors in 1960. But a year later, along the May 16 military coup and the temporary measures on local autonomy, city assembly was dispersed, and mayors were selected by the central government. Fuelled by civil revolution in 1987, the new Constitution revived the election of city assembly in 1991. Finally, the election of mayors by citizens

that aims to 'achieve sustainable urban development in collaboration with the civil society organisations (CSOs), citizens, businesses and the local government' (SG, 2009). In compliance with the mandate by the municipal ordinance (SG, 2009), the SCSD employs a multi-stakeholder governance structure which is co-chaired by 3 CSO leaders (each representing the citizen, women and business) and the Vice Mayor, and composed of the steering committee (the Suwon Assembly members, CSOs, and government institutions), research committee (professors, researchers), and three sectional (environmental, social, economic) committees (related CSOs, researchers, and public officials) (SCSD, 2018b). The Suwon Government is responsible for providing financial support for the operation of the SCSD, and for their sustainability-related practices/activities, including the establishment of Suwon's SD indicators, and its annual evaluation within the Suwon Sustainability Report, the design and implementation of sustainability-oriented projects/programs, and the development of interactions among inter-/national organisations (SG, 2009).

This effort of the public sector in encouraging citizen participation has been coupled with the established strong civil society and diverse local CSOs who have worked on a range of urban issues. This is, on the one hand, related to the characteristics of Suwon citizens who have strong loyalty to their city and accordingly high degree of interest to take part in city-related affairs (U1; I1; I2), and on the other hand, influenced by the emerging citizen movement after the 'June Revolution 1987'[36] at the national level. The Suwon Centre for Environmental Movement (SCEM), established in 1994, is the citizen association of 15 CSOs that aims to raise environmental awareness of individual citizens and to monitor the city's environmental pollution to be properly managed at the policy level. Its research centre (the Green and Environment Research Institute) was set up separately in order to develop the knowledge related to the local environment, especially streams and green spaces (SCEM, 2018). Another CSO, the Suwon Federation for Environmental Movement (SFEM), as one of 53 branch organisations of the Federation at the national level, plays a role of communicating with other urban-level branch organisations in sharing place-based environmental issues and solutions, and also with other CSOs in Suwon by building up networks in areas of stream (the Suwon

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was carried out for the first time in 1995, which signalled the current local self-government system (Chong-Min Park, 2006).

[36] A nationwide democracy movement against the dictatorial government, substantially triggered the promotion of citizen-led social movement (610 Movement, 2018).

Small-Medium Stream Network) as well as climate change (the Suwon Climate Action Network) (SFEM, 2018a).

These strong citizen activities have been further encouraged with the establishment of the Good Governance Committee (GGC) which was employed as a strategic tool to implement the Yeom Administration's new policy direction of 'multi-stakeholder, participatory governance' (SG, 2018b). The GGC is chaired by one committeeperson (the Mayor), and composed of one steering committee and five sectional committees that are the respectively responsible for five thematic tasks including employment, urban safety and regeneration, environment and transportation, autonomy and education, and welfare and woman empowerment (SG, 2015d). In order to meet its purpose, diverse stakeholders participate as committee members from the public sector (the Suwon Assembly members and government officials), experts (researchers), and citizens and CSOs members (SG, 2018e). Its main function is twofold – one is to develop urban policies through the analysis of current urban problems and the discussion on solutions by regular meetings (every other month) of each committee, and the other is to monitor and assess the Primary Policy Tasks of the Suwon Government every two years (Huh, 2012). The Environmental Policy Committee (EPC) is another environment-focused advisory body, composed of the Vice Mayor, the Suwon Assembly members, government officials, experts and CSOs (SG, 2006). By contrast, the Urban Environment Committee (UEC) within the Suwon Assembly (composed of 8 members) works as a centralised decision-making framework on the enactment of environment-related municipal ordinance, regulations and plans/policies (SG, 2018g).

In supporting the multi-stakeholder governance, the Suwon Research Institute (SRI) plays a significant role with policy research and advice. Established as the first municipal-level research institute in 2013[37], it aims to conduct research analysis on current policy tasks with close considerations on local conditions and traits, and to suggest practical policy guidelines and the city's mid-/long-term vision (SG, 2012e). The research areas have been expanded to public administration, urban planning, and urban safety and environment, with the separate centre for Suwon studies (history, culture and citizen identity) (SRI, 2018b). Each research fellow who is specialised in different research areas closely works with related government

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[37] By revision of the law (MIS, 2012), municipal cities with population over 1 million became eligible to establish and operate local government-invested research institutes, in addition to special city, metropolitan cities, special autonomous city and (special) provinces (art. 4).

teams (officials) in policy design and implementation, while serving as an advisor of related committees (for example, of the GGC) to integrate ideas and opinions from the committees to the policy-level discussion with related government teams. Additionally, the SRI has developed a series of citizen participatory programs that can attract public interest in current urban policies, and encourage citizen involvement in policy making processes (more details in Chapter 5.3). In 2018, the SRI embraced the international and trans-urban dimensions by integrating the ICLEI South Korea office[38] into its one research centre (the Global Future Research Centre) in order to cooperate with other national and international cities on commonly interested urban issues including low-carbon transportation and biodiversity (SRI, 2018b).

The *Rain-city* represents South Korea's hierarchical governance model that is led by key actors from the national and urban government, and academia/research. As a part of the 'Water-city Suwon' initiative since 2001 which claimed to establish the integrated water resource management (IWRM)[39] to solve the city's water shortage (Won, 2009b), the *Rain-city* was designed through the agreement (MoU) between the Suwon Government (the Water Circulation Team[40]) and the Rainwater Research Centre (the Seoul National University) in 2009. By the enactment of the national Act on Water Reuse (ME, 2010), the Water Quality Team was set up at the ME to work on promoting and supporting water reuse including rainwater management at the urban level. Based on related legislation and regulations, the national officials have played a role of developing project guidelines and providing financial support, and the urban officials have developed concrete work plans including the 'working design' of rainwater management facility in collaboration with engineering/construction firms as well as research institutes (more details in the following Chapters). These plans are examined by governmental organisations – the South Korea Environment Corporation (conducting the study on economic feasibility and suitability of applied facilities) and the National

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[38] ICLEI – Local Governments for Sustainability (International Council for Local Environmental Initiatives) was founded in 1990 as a global network of local and regional governments committed to sustainable urban development. The ICLEI network is united for worldwide action, and more than 1,750 local and regional governments (as of 2018) work together through peer exchange, partnerships and capacity building to create systemic change for urban sustainability. ICLEI has 22 offices worldwide, and East Asian office was established in Seoul, South Korea in 2012, and South Korea office in 2002, the later located in Jeju, South Korea, and in Suwon since 2012 (ICLEI, 2018b).

[39] It covers 4 areas, including streams, water supply, sewerage, and rainwater (Won, 2005).

[40] It was named as 'water quality team' at the time of MoU.

Environment Research Institute (conducting the modelling part, including the facility capacity on decreasing nonpoint pollution and increasing rainwater permeability), and then the results are sent to the Han River Basin Agency[41] for further revisions and corrections in order to get the final approval of the ME (U9). At the neighbourhood level, the Suwon Government has provided financial support for the installation of small-scale household rainwater facilities based on the application of interested residents, accompanied with the administrative support of the respective Neighbourhood Community Service Centre (NCSC) (the neighbourhood-level public administrative office).

	The public sector	Citizens	Businesses	Academia/experts
Urban	Suwon Government - Water Circulation Team		Engineering firms	
Neighbour - hood	Neighbourhood Community Service Centre	Households		
National	- Ministry of Environment - South Korea Environment Corp. - Han River Basin Agency			- Seoul Nat'l Univ. - South Korea Inst. of Safe Drinking Water Research - Nat'l Environment Research Inst.

Figure 5.2 Stakeholders participating in the *Rain-city*
(Source: constructed by the author)

The *EcoMobility Festival* was planned with an aim to experiment on multi-stakeholder and participatory governance, based on the recognition that it basically requires the agreement and active participation of citizens and particularly the residents of project neighbourhood (Haenggung-dong) (E2; Eun and Chung, 2014). As a top decision-making body, the Organising/Executive Committee were set up in order to establish multi-stakeholder networks composed of representatives from the Suwon Government, the National and Suwon

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[41] There are four River Basin Agency which are the respectively responsible for four rivers (Han, Nakdong, Keum and Youngsan) in controlling water quality and ecosystem.

Assembly, CSOs, businesses and international organisations. In the Suwon Government, the 'EcoMobility task force (TF)' was set up with 20 dedicated officials whose working place was stationed in the project neighbourhood. In addition, a group of 240 chief officials (named as the Administrative Supporters) was dispatched to each household with the purpose of giving face-to-face explanation about the project, collecting complaints and figuring out areas to be improved, and encouraging community participation (U4; U5). For more voices to be included, the SRI conducted a survey on how far residents understood about the project and its objective, and used the survey result as a basis to develop project strategies, and then, the South Korea Environment Institute (KEI) integrated these strategies into the development of the Master Plan on *EcoMobility Festival*.

At the neighbourhood level, the Resident Working Group (RWG) was established to take a partnering role with the Suwon Government, which was divided into 11 sections working on respective areas, including means of transportation, street recreation, green lifestyle, and festivals that are entirely planned and implemented by the (leading) members. In addition, the EcoMobility Neighbourhood Centre (ENC), composed of Haenggung-dong residents, was in charge of 'intermediation' between the public sector and the residents. Their mission was not only to promote the interaction between the public sector and residents for cooperation, but also to design a range of programs for mobilising resident participation by taking the advantage of established relationship among the ENC members and residents (U4; U5; NH2). Also, the Resident Committee Association (composed of leaders of 13 resident committees of Haenggung-dong), was actively involved in the application process for the project neighbourhood selection with the support of the NCSC, and in mobilising residents to be part of the RWG. The formation of a broad range of resident groups were encouraged to initiate self-organised projects (e.g. in areas of culture, environment, and tour), in which previously excluded actor groups (social enterprises/(social) cooperatives, the disabled) played an active role (E2; Eun and Chung, 2014; U4). At the urban level, the SCSD played a significant role as a motivator and supporter who collaborated with the ecomobility-oriented CSO network (named as the 'Citizens Playing on Streets', or 'Dorothy') and the Suwon Government-organised 'Citizen Volunteers' and 'Citizen (e-)Supporters' in motivating public awareness of, and participation in the *Festival*. At the international level, the ICLEI EcoMobility Secretariat, as a project proposer, worked to promote the interaction with ecomobility-related international networks and businesses for financial support and media exposure, as well as the provision of EcoMobility vehicles (UI1).

	The public sector	Intermediaries	Citizens/CSOs	Businesses	Experts
Urban	Suwon Government - Task Force - Administrative Supporters - EcoMobility Team	Suwon Council for SD	- Citizen Volunteers - (e)Supporters - CSOs network (Dorothy)	- (Social) cooperatives/ enterprises	Suwon Research Inst.
Neigh -bour -hood	(Haenggung) Neighbourhood Community Service Centre	(Haenggung) - EcoMobility Neighbour-hood Centre - Resident Working Group	(Haenggung) - Resident Committee Association - Resident groups		
Nat'l				Ecomobile firms	South Korea Environment Inst.
Inter-/nat'l		ICLEI		Ecomobile firms	

Figure 5.3 *Stakeholders participating in the EcoMobility Festival*
(Source: constructed by the author)

The CSE was launched by a citizen-led organisation, the Suwon Citizens Solar Energy Social Cooperative (SCSE-SC). Having observed an earthquake and tsunami-triggered nuclear crisis that occurred in the neighbouring country, Japan in 2011, an anti-nuclear movement has started to spread over the nation, and accordingly citizen-led solar energy cooperative has emerged as a promising alternative governance for the change of current energy system (L5; Lee, 2013). Closely influenced by such national discourse, the formation of the SCSE-SC was agreed by 10 founding members (citizens), and by their request, the Suwon Government (the New and Renewable Energy Team) took part in by signing the MoU with the intermediation of the SCSD (U10; L5). By taking the organisational form of 'social cooperative', the SCSE-SC has become eligible to be supported by the Social Economy Centre (SEC) within the SSCF (an organisation responsible for the foundation and operation of Suwon-based (social) cooperatives/enterprises). Particularly regarding the making of profits, the national-level energy exchange system has been essentially involved, in which electric power that is

produced from the solar plants is purchased by the South Korea Electric Power Corporation (KEPC), and additionally the Renewable Energy Certificate (REC) is issued by the South Korea Energy Agency (KEA), and also purchased by power generation corporates who are obligated to provide certain amount of renewable energy to the South Korea Power Exchange (KPX) (more details will be explained in Chapter 7.2). By extension, the neighbourhood-level solar plant has been operating, which started as a cooperative project of the NCSC and resident committees of Hwaseo 1-dong.

	The public sector	Intermediaries	Citizens/CSOs
Urban	Suwon Government - New and Renewable Energy Team	- Suwon Council for SD - Centre for Social Economy	Suwon Citizens Solar Energy Social Cooperative
Neighbour - hood	(Hwaseo 1) Neighbourhood Community Service Centre		(Hwaseo 1) Resident committees
National	- South Korea Electric Power Corp. - South Korea Energy Agency - South Korea Power Exchange		

Figure 5.4 Stakeholders participating in the *CSE*
(Source: constructed by the author)

In summary, the *Eco-capital* encompasses diverse governance modes and actor networks. The *Rain-city* applies a more formal and centralised governance mode in which hierarchical interaction between the national and urban government plays a leading role in both designing and practising the project, and by this character, there are active actor relations, especially between the government officials and technical/scientific experts established upon strong governmental support. In contrast, the *EcoMobility Festival* employed diverse governance modes, not only hierarchical actor networks with the public sector in delivering different tasks (for example, of conducting feasibility study, developing master plan, providing financial and institutional support, and mobilising networks), but also inclusive

governance in promoting multi-stakeholder participation and their interaction (particularly, between the public officials and Haenggung-dong residents, as well as among the residents). The *CSE* can be characterised as a combination of cooperative governance between the Suwon Government and the Suwon Citizens Solar Energy Social Cooperative (SCSE-SC) (from the administrative perspective), and citizen-led network among participating members of the SCSE-SC (from the organisational perspective). Among these differences between the projects, one thing in common can be identified as the outstanding role of the public sector (national and urban government, public organisations) in directly participating in the project (in the case of centralised governance), and/or experimenting on participatory and inclusive governance approach for the promotion of diverse stakeholder engagement in the project (in the case of participatory actor network).

5.2   Transformative leadership arising from diverse sectors

The *Eco-capital* has started with strong political commitment of Mayor Yeom shortly after his first term of office began, as a policy tool to achieve his election promise to 'make Suwon an environmentally-friendly, sustainable city' (Huh, 2012; U2). The background about this uncommon policy direction, particularly in the South Korean context where economic prosperity has been the primary strategy for urban development (E2; I1; U1; U4), is traced back to the early-1990s. In the similar line of development paths of many South Korean (large) cities, Suwon was undergoing fast industrialisation, which led to severe traffic congestion with increasing cars. As a solution to this, the Suwon Government decided to cover over the 'Suwon Stream' which had been severely polluted with sewage and garbage during the industrialisation period, and instead build a car road and parking lot on the covered area (I2; Jeong, 1994). The 1991 election of Suwon Assembly member has provided a political motivation to facilitate the coverage construction, as it was turned out that majority of citizens voted for this. Furthermore, being included as the pledge of 1992 presidential election (Dae-Jung Kim), the construction had been accelerated as a national project, and consequently, the coverage of the first section (Maegyo bridge ~ Jidong bridge, 780m) was complete in 1994 (Eum, 2012; I2).

Meanwhile, there had been increasing concerns about the environment, following a sequence of national and local environmental accidents (such as Nakdong River phenol contamination incident, waste water spill from Suwon industrial filled-up land) (Choi, 2013; I2). This is the time when Mr. Yeom[42], a professional engineer on water quality control, begun working as an environmental activist (U1). In 1994, he founded the Suwon Centre for Environmental Movement (SCEM) as a network of citizen organisations, having envisioned the synergy generated from cooperative relations among citizen groups (SCEM, 2018). One year later, he started a citizen campaign aiming to discontinue the ongoing construction on coverage, through organising the Citizen Movement for Suwon Stream Recovery. Taking advantage of his expertise, the SCEM conducted a research on occurring and expected problems caused by the coverage, particularly related to water quality deterioration, pollutants inflow and flood damage. Such research work has been expanded, following the foundation of the Green and Environment Research Institute, as the affiliated organisation of the SCEM (SCEM, 2018; I2).

In addition, the action of coverage was accused by a group of citizens, of violating the Cultural Properties Protection Law, based on the status of the Stream located within the cultural property, the Hwaseong Fortress (Kim, 1990). Despite of increasing opposition to the coverage, the second-stage construction had started (Jidong bridge ~ Maehyang bridge, 480m). On the occasion of Mayor election in 1995, the former director of the Suwon Cultural Centre, Jae-Deok Shim, who initiated the citizen-led accusation of the coverage, was elected, and the following year, he declared to discontinue the construction and recover it as an 'ecological stream' (Eum, 2012). During his terms of office (1995-98-2002), a total of 5.8km of the Stream was transformed into a close-to-nature stream (U1; I2).

This successful experience that brought the change at the policy level accelerated citizen movement in Suwon, influencing the establishment of the '21st century Suwon Council' (the SCSD of today) where Mr. Yeom served as a chairperson. Since 2000s, he has started working to encourage locally-based citizen activities, through taking part in the 'National Council for Local Agenda 21' (the National Council for SD of today). By this time, a new Mayor, Yong-Seo Kim was elected (2002-06-10), and Suwon has been considerably guided towards growth-oriented urban development (U4; E2; I1). His Administration has primarily

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[42] In order to prevent any misunderstanding by different positions that Mayor Yeom had had before the Mayor, the title, 'Mayor', is only used to describe his works as the Mayor.

promoted transportation policy that focused to expand car road construction as a solution to the challenge of increasing population and traffic volume. This often had caused conflicts between the Suwon Government and environmental citizen groups, for example, in the case of the construction of the 'Wooman Overpass' which had been conducted without embracing the opposite voices (Hong, 2003). During his first term of office, an annual 30% of city budget was allocated to the construction of car roads, whereas few to promoting public transportation (Ahn, 2003).

In 2010, Mr. Yeom won the mayoral election in which he promised to discourage physical development (such as car roads), but instead to build healthy environment, and to recover communities (Yeom, 2010). In this transitional context, the *Eco-capital* was the presentation of his ambitious vision that Suwon would be changed from existing unsustainable development pathways (U1; U3; E2; I1). In order to accelerate this vision, he appointed an urban planner/professor, Jae-Joon Lee, to the 2nd Vice Mayor, soon after establishing his Administration. Having built up diverse scholarly experiences, especially in the field of ecological planning, Vice Mayor Lee undertook policy tasks in areas of urban regeneration, environmental sustainability and community building, and ultimately to shift from the existing concrete-based growth to human-centred, environmentally-friendly urbanism (M. Lee, 2011).

Shortly afterwards Mayor Yeom declared the vision of *Eco-capital* in 2011, he took part in the congress where the concept of 'EcoMobility' was introduced by Mr. Konrad Otto-Zimmermann, the then ICLEI Chair of Urban Agenda, as a transformative model of urban transportation oriented to achieve the principle of '3Ds' – Down-sizing of vehicles to human scale, Down-speeding cars to city speed, and Down-numbering the cars in use in a city by moving from the privately owned car to car-sharing (ICLEI, 2011). There, Suwon was suggested to be the first city who translates this concept into a real-life practice, and Mayor Yeom agreed to use this project as one of the *Eco-capital* model which embeds his policy value. *'The project idea comes from the wish to turn our current car-centred policy into ecomobile transportation, and to prepare citizens for the oil depletion era where cars cannot be used freely. I hope to transform Suwon into a world's top eco-city, but also setting ourselves as a real-life ecomobile example for other cities to follow'* (from the interview with Mayor Yeom by ICLEI, 2013).

Building upon strong political commitment to prioritise pedestrians over cars, Mr. Lee took charge of leading this experimentation that envisions 'EcoMobility' as the key to creating eco-friendly and people-centred cities of the future, and accordingly developed the overall project design in a way to 'visualise' a real-life ecomobile transport that is harmonised with Suwon's history and urban environment, as well as combined with urban generation (more details in Chapter 7). There was a significant mission he emphasised to integrate into the project design, which was related to the principle of 'citizen participatory and inclusive governance', from developing related master plan based on survey and discussion with the residents of Haenggung-dong, to implementing a range of community activities led by resident groups. By extension, Vice Mayor Lee has underscored autonomous actions by diverse communities of practice (CoPs) such as resident groups (and their leaders) through the provision of required resources for their contribution to achieving the vision of pedestrian-centred urban and neighbourhood structure, and accordingly, has introduced diverse forms of actor networks, especially for direct participation of citizens/residents in diverse areas of the project, such as the RWG. Furthermore, Vice Mayor Lee resided in Haenggung-dong prior to the project with the purpose of mobilising an on-site, daily interaction with residents for their improved access and opportunity to deliver opinions and ideas (Choi, 2013; U2).

Whereas government leaders took charge of initiating the *EcoMobility Festival*, the *Rain-city* and *CSE* can be put into the case that is initially suggested by non-public actors. First of all, the *Rain-city* is the project that was launched by the suggestion of Prof. Moo-Young Han, an environmental engineer and the director of the Rainwater Research Centre. Prof. Han (also called 'Dr. Rainwater' in South Korea), as being a pioneer in the field of rainwater, has worked on rainwater-use architecture which was applied to a large apartment complex, named 'Star City'. It has been used as a real-life laboratory where a set of rainwater management facilities are installed around the complex for the use of landscape gardening and flushing, by which four million tons of water was saved for the first year of operation and which was equivalent to 20% of tap water that 1,310 tenant households used for that period (Seong, 2008; Han, 2010).

Having proved the potential of rainwater management as a complementary water supply system, Prof. Han suggested the Suwon Government to implement South Korea's first city-scale rainwater project that installs and operates the rainwater management system in a range of urban spaces and public buildings (E1; Jeong, 2009). Founded on the knowledge and experience gained from the Water-city program that integrated the management of streams, water supply, and wastewater and rainwater since 2001 (Won, 2005, 2017), the then Water

Quality Team who was responsible for the program undertook this experimental task by the leadership of Mr. Jeung-Yeon Won, one of four chief officials specialised in environmental policies. The collaborative work of these two leadership-driven organisations has laid the foundation for articulating the vision of self-reliant water supply system and developing a series of rainwater projects, by providing innovative knowledge and technical support on one hand, and on the other hand, by bringing this unprecedented experimentation to the policy level to be implemented in a real urban setting, particularly enabled by related institutional arrangements with the national government actors, as will be described in Chapter 7.2.

Different from the *EcoMobility Festival* and *Rain-city* that were enabled by formal leadership either of the public sector or of academia, the *CSE* is the case that was initially launched by a group of citizen leaders who have long worked on environment-related activities, including the issue of Suwon Stream coverage. After participating in many years of anti-nuclear protests, Mr. In-Ho Kim, the then co-chair of the SCEM, and his co-activists have agreed to establish a citizen-participatory organisation of which orientation is to mobilise citizen activities to the extent that they directly participate in generating alternative solar energy, and consequently bring fundamental change in the local energy system (L5; Lee, 2013). For a stable operation of the organisation and sustained activities, they suggested cooperative relationship with the Suwon Government, by which institutional arrangements (such as regulatory frameworks, financial support) can be established more efficiently in addition to administrative advice about interaction with the national system (e.g. power exchange) (SCSE-SC, 2013). Accordingly, proposed solar project has been integrated into the policy program of the Suwon Government, as one of the *Eco-capital* strategic project, and also of the Primary Policy Tasks, with an aim to promote self-reliant energy community (SG, 2017e).

In summary, the *Eco-capital* has been largely enabled by a strong political commitment of Mayor Yeom to transforming the city towards sustainability, accompanied with an ecological and participatory planning scheme employed by the then Vice Mayor Lee. Leaders from diverse sectors (the Suwon Government, academia, international organisation, citizen-led organisation, and resident groups) have not only integrated collective vision of urban sustainability into the policy realm, but also have directly delivered, and/or mobilised contribution of diverse stakeholders to the delivery of vision-oriented urban actions in diverse action domains: rainwater management for self-reliant water supply system (*Rain-city*), ecomobile lifestyle for low-carbon urban transportation (*EcoMobility Festival*), and citizen-generating solar energy for local energy transition (*CSE*). In addition, the leaders have

translated the (inter-)national discourse into urban-scale activities (for example, world-wide discourse on renewable energy transition and low-carbon urbanism), and relatedly, have disseminated local transformative knowledge and practices to regional/national/global arenas for sharing and mainstreaming (more details of multi-scale interactions in Chapter 8). The leadership, of the public sector in particular, has significantly contributed to 'empowering' individual citizens and also citizen/resident groups for their active participation in urban policies, and by extension, for their 'autonomous' transformational activities, as will be mainly discussed in Chapter 5.3.

5.3 Communities of 'practice' beyond a network

Under the policy motto of the Yeom Administration to establish the 'government of citizens' which shall 'open an era of inclusive democracy through autonomous citizens', all policies were demanded to reflect three principles of citizen participation, cooperative governance and social inclusiveness in the process of planning and implementation (SG, 2017f). This policy strategy, in fact, has been already employed by a range of experimental policy programs (of which overview is summarised in Appendix 3). Since Mayor Yeom organised his Administration, various governance models have been established which primarily aimed to empower citizens in decision-making related to policy design and practice, for example, multi-stakeholder policy making and monitoring (the GGC), the Citizen Participatory Budget System, the Citizen Juries, and community building program (the Neighbourhood Community Renaissance, NCR) (Lee and Kim, 2012a). Building on the experience from such governance programs, Vice Mayor Lee suggested to experiment on the transition in urban planning paradigm, from what has been traditionally undertaken by the public officials and professional urban planners, to the inclusion of citizens to the planning process. Accordingly, for the first time in South Korea, a 'citizen participatory urban planning' was exercised as the Citizens Planning Group (CPG) was launched in 2012 for the 2030 Plan (SG, 2014a).

The overall structure of the CPG was designed in a way that planning experts (master planners, public officials, researchers) and citizens discuss on the overarching 'directions' the city should follow for the next 15 years. First of all, a support group was set up, who would take charge of providing information on a set of issues to discuss, of intermediating the discussions by a range of issue-based round tables (taken by the SRI researchers), of arranging

opinions from the discussions (taken by the master planner group), and of applying derived opinions to the 2030 Plan (taken by the Suwon Government officials of related teams) (Kim and Choi, 2014). Then, 130 representative citizens were selected, some of which were by application, and others appointed by the support group (mostly the members of CSOs). The member citizens were respectively assigned to discuss on 6 issues that are to be reflected in the 2030 Plan, which include the issue of urban regeneration, balanced regional development, urban environment and ecology, history and culture, community building, and economic revitalisation (D. Y. Kim *et al.*, 2015).

In addition, a preparatory session was conducted as a way to provide educational information about a set of issues, in addition to a package of discussion tutorial books distributed to the participants in advance for their improved understanding of the roles to play during the discussions, such as (co-)producing the vision, goals, and strategies of the Plan. Above all, there accompanied a plenty of interactions devoted to convincing the participants that their opinions merged from the discussions would be surely reflected in the Plan, and that, therefore, their participation would be a critical asset to guide the future of Suwon (D. Y. Kim *et al.*, 2015). After 4 times of discussions, the participants' opinions were translated as the main frame of the Plan, 'a human city where the value of human and nature is equally cherished, and additionally, applied to 12 different policy sectors of the Suwon Government (Kim and Choi, 2014). This four-month long experience has not only encouraged citizen participation in urban planning process, but also, more critically, has elevated the degree of the participants' accountability as well as capacity to the extent that they were entitled to decide on the future of their own city (Lee and Kim, 2012; Kim *et al.*, 2015; U3).

About a year later, this experiment was exercised at the smaller scale where residents were encouraged to decide on the issues of their own 'neighbourhood' (named as 'dong' in South Korean) as being a member of the Neighbourhood Planning Groups (NPGs). It was another exercise of 'participatory' planning model (Kim and Choi, 2014) that a total of 34 NPGs (approximately 15 residents for each NPG) were organised to work on the neighbourhood planning, in close interaction with the support group composed of 4 professors (working as a planning mentor in charge of 4 respective districts) as well as public officials and researchers. The 7-weeks planning process was divided into three phases, including the analysis of the current challenges of the neighbourhood, and solutions based on its geographical/environmental/cultural strengths and weaknesses (particularly, using a method of neighbourhood mapping and community profiling), formulation of the

neighbourhood plan with a vision, goals and strategies according to derived analysis, and development of community programs that are oriented to solve diagnosed challenges (CNCR and SG, 2015).

Such efforts to establish a participatory and inclusive governance have been further accelerated by arranging an institutional and organisational measures to promote 'citizen autonomy' (Park *et al.*, 2015b). In order to establish an integrated framework that combines related policies and programs that have been implemented separately, the Suwon Government has proposed the Municipal Ordinance/Master Plan on Citizens Autonomy, which reflect on the 'governing of the city based on the participation of empowered citizens' (substantially supported by the government sector, including Mayor) (Park *et al.*, 2015b). With regard to an organisational arrangement, a neighbourhood-level cooperative format has been formed between the Resident Autonomy Committee (RAC) and Neighbourhood Community Service Centre (NCSC) of every neighbourhood, and entitled to discuss and decide on a set of issues related to promoting the autonomous community activities. Moreover, the Suwon Government has introduced a strengthened model of resident autonomy, the Resident Autonomy Council, who is authorised as a resident representative body to co-produce the 'neighbourhood autonomous plan'[43], independently from the NCSC (Park *et al.*, 2015a).

In promoting citizen autonomy, a range of educational programs have been delivered. The Citizen Autonomy School (CAS) was launched with an aim to develop citizens' 'autonomous role' in decision-/policy-making process, which eventually contributes to building participatory governance (D. B. Ryu, 2018). The Suwon Research Institute (SRI), as a responsible organisation, has opened a series of courses oriented to preparing citizens a set of capacity, including community leadership, discussion skills, conflict coordination, budget compilation, as well as knowledge on Suwon and urban sustainability (SCAS, 2017). These courses were designed to have connections to real-life policy practices that have been conducted in Suwon, such as the GGC (participatory policy discussions) and the Citizen Participatory Budget System, through which the graduates were entitled to take part in as a facilitator/coordinator and committee members (S. Han, 2018). Having produced more than 1,200 graduates during 6 terms, it is additionally expected to nurture citizen leaders in various areas, and also to produce a favourable environment where diverse community networks arise

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[43] The Resident Autonomy Council was test-operated in three neighbourhoods (Songjook-dong, Haenggung-dong, Gwanggyo 1-dong) in 2016 (SG, 2013b, 2016d).

and exercise autonomous community practices (Kim, Lee and Choi, 2015). In addition, more focused on the subject of sustainability, the SSCF has developed the 'Integrated Sustainability Course' with an aim to nurture 'sustainability activists' (Ahn, 2018). The course consists of three levels of curriculum: knowledge on sustainable city and citizen autonomy; practical skills for communication/facilitation and for organisational operation; and in-situ field study to analyse social needs of neighbourhood and explore solutions (SSCF, 2018a).

These programs have been actively implemented at the neighbourhood level, through the Neighbourhood Community Renaissance (NCR) which has served as the primary platform in which resident-driven activities are exercised (SG, 2010c). As one of the key policy programs of the Yeom Administration, the NCR first began in 2011 motivated by the recognition that urban development would be less successful without the support of residents, and accordingly can be more accelerated with the participation of residents in the process of seeking for solutions to diverse social needs (SG, 2011a). In searching for an alternative urban development paradigm, the NCR has experimented on the alternative governance model within which the public sector plays not as a policy maker and/or practitioner, but rather of empowering residents by providing access to resources required to meet social needs of their neighbourhood (U2). For this purpose, institutional and organisational efforts have been made, such as the enactment of the Municipal Ordinance on NCR which provides a legal basis for the formation of responsible group, named as the Neighbourhood Community Renaissance Committee (NCRC) which is composed of 20 representative residents by application, and entitled to produce a neighbourhood plan as well as to cooperate with diverse NCR resident groups in conducting neighbourhood-based, issue-driven activities (more details in Chapter 7.1) (SG, 2010c). By extension, these activities have been supported by the partnership of the public sector (including the Neighbourhood Community Renaissance Team of the Suwon Government), the Administrative Council for the NCR (composed of chief officials of the Suwon Government involved in the areas of urban planning, environment and culture), and the Centre for Neighbourhood Community Renaissance (CNCR, as an intermediary organisation of the SSCF) (CNCR, 2017b).

As one *CSE* project, the Resident Solar Energy (RSE) has been delivered combined with the NCR project of Hwaseo 1-dong. This project was already planned on the occasion of the 2013 Neighbourhood Planning when member residents agreed to set the vision of building a 'low-carbon, green energy neighbourhood' (Kim and Choi, 2014; NH6). With the leadership of the then general director of the NCSC (Mr. Won), the resident committees (mainly the RAC

and NCRC) took the initiative in launching the cooperative solar energy project with the SCSE-SC. In addition, a neighbourhood-based 'green energy' project was conducted which combines household-scale solar energy generation and rainwater usage for self-sufficient supply. The project was delivered in the way that the government sector (the NCSC of Hwaseo 1-dong and responsible teams of the Suwon Government) took the leading role in initiating the project, and encouraged the participation of residents in the practice by providing (financial) support for the installation of household-scale solar panels and rainwater facilities (U9; E1; NH6). The project, however, has less considered the process of encouraging the formation of resident groups for their activities which can simultaneously occur with the government-led neighbourhood project.

By contrast, in the case of the *EcoMobility Festival*, the government actors focused more on empowering diverse resident groups to the extent that they play as a main actor in the overall process of designing and delivering the project (E2; Eun and Chung, 2014). As a way to transfer the initiative to the Haenggung-dong residents, the Suwon Government organised a resident-led project group (the Resident Working Group, RWG) who was entitled to take the primary lead of organising a range of citizen participatory programs which were exercised by diverse newly established and existing urban and neighbourhood CoPs (more details about their activities in Chapter 7.1) (U4; E2). In the recognition of critical role of inclusive interaction with the residents, the Task Force organised a neighbourhood-scale organisation, the EcoMobility Neighbourhood Centre (ENC), closely cooperating with the Resident Committee Association (including the NCRC, RAC) of Haenggung-dong, who were encouraged to serve the role of intermediation (largely regarding conflict mediation), not only between the government and residents, but also among residents who have different and/or opposite opinions towards the project (for example, one of the significant missions was to resolve conflict with the shop owners who opposed the 'no-car' regulation) (Valmero, 2015).

Relatedly, the public sector provided educational and training courses to resident groups who applied to open a series of cultural, educational and tour programs, developed based on the knowledge on neighbourhood history and culture, as well as the concept of ecomobility. In particular, there were special considerations to encourage the participation of previously excluded stakeholders: for example, the Suwon Rehabilitation Centre for the Disabled organised a tour program ('Heart Tour') during which participants cover their eyes or use wheelchairs, with an aim to deliver the message about 'inclusive transportation' which shall promote the access of the vulnerable to safe, barrier-free transport service (EOC, 2013e).

Additionally, a neighbourhood-based social enterprise, 'Yellow Bike' was entrusted to provide a city-subsidised training course on bike riding, open to all Haenggung-dong residents (many of who, especially the elderly, had not ridden the bike before) (Kang, 2013). After the *Festival*, the EcoMobility Community Centre (ECC) was opened in Haenggung-dong, by the request of the residents, in order to continue ecomobile culture in the neighbourhood, and by extension, to serve as a focal point to disseminate the pedestrian-centred transport experimentation to interested neighbourhoods to follow. Significantly, a group of residents offered to work as a volunteer for the ECC, who said during the interview that: *We had 'feelings of pride' from working as a member of the RWG, and also witnessed that the Festival has changed our neighbourhood in a good way. That is why we want to continue this ecomobile movement* (NH3; NH4).

In summary, a range of policy programs have been exercised with an aim to empower individual citizens and residents, as well as communities of practice (CoP). In doing this, the public sector has significantly contributed to promoting roles of citizens in policy-making process, for example, by developing a set of participatory governance programs (such as the Good Governance Committee, Citizen Participatory Budget System, Citizen Juries), and by employing experimental urban and neighbourhood planning schemes (such as the Citizens/Neighbourhood Planning Group(s), Neighbourhood Community Renaissance). By extension, public organisations have provided a series of educational programs that aim to improve citizens' autonomous actions, for example, through the Citizen Autonomy School where participating citizens can develop knowledge and skills for community leadership. Furthermore, institutional support has been arranged, especially for the formation of CoP at the neighbourhood level, such as the Resident Autonomy Committees (RACs), as well as the Neighbourhood Community Renaissance Committees (NCRCs) and NCR resident groups, who have been encouraged to exercise neighbourhood-based activities (such as resident-led solar energy generation of Hwaseo 1-dong). Particularly, experiences from the working as the CoP (in the case of the Resident Working Group) has granted the participating residents 'feelings of pride' in improving their neighbourhood, and which, ultimately, has motivated the residents to continuously deliver voluntary community activities (of which detail will be described in Chapter 7.1).

5.4   Conclusions

Drawing upon the empirical analyses (also summarised in the last paragraphs of Chapter 5.1-5.3, respectively), some findings were derived. First, *multi-sectoral agency* produced active interactions across *scale levels* oriented towards network formation, experimentation, and mutual learning, not only at the urban scale (mostly local government and public organisations), but also at the (inter-)national level (mostly urban/national governments and technical/scientific experts) and the neighbourhood level (mostly resident groups). Second, such interactions occurred via formal, hierarchical, and less inclusive *multiple forms* (mostly between the national and urban governments), through formal/informal and participatory actor networks (between the urban/neighbourhood public sector and citizen/resident groups, as well as amongst citizen/resident groups), and also through combined governance modes. Third, inclusive governance was actively developed by the public sector, especially by urban and neighbourhood intermediary organisations. These efforts contributed to the formation of diverse types of CoPs by developing a range of policy programmes.

The overall findings, by extension, provide related implications that can be divided into three spheres. First, the *'political will'* of the government leaders is critical to initiating decisions on drastic changes in the direction of urban development (especially in triggering the early stages of urban transformation). The background story of the *Eco-capital* (which started from the issue of the Suwon Stream coverage) clearly shows that Mayor Yeom has vocally executed the structural reconfiguration of the entire administration, from previous growth-based, industry-driven development pathways to a human-centred, sustainability-oriented urban system. Such change has been simultaneously carried out by organisational restructuring (e.g. the establishment of the 'Sustainability Division' and the 'Climate Change Adaptation Division'), legislative and regulatory arrangements (e.g. the enactment of the Municipal Ordinance on SD, and the establishment of the Master Plan on Eco-capital), and by enhancing transformative leadership by engaging the vice mayor, who specialises in ecological urban planning. However, the vital role of political leadership in altering the urban future also means that the process of urban sustainability transition can be halted if political will moves in the opposite direction. This was the case—particularly concerning the mayor's term limits[44], which was also mentioned during the interview with the author for the purpose

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[44] In South Korea, the Mayor is limited to three consecutive four-year terms in office. In Suwon, Mayor Yeom has been serving his third term which ends in 2022.

of this study that occurred prior to the 2018 election—with government officials who expressed concern about the potential abolition and/or weakening of sustainability-oriented organisations by the new leadership, which showed an opposite policy direction.

These limitations of government leaders motivated the Yeom administration to embrace various experimentations regarding an inclusive, participatory governance system. In doing so, diverse stakeholders—not only from the public sector, but also individual citizens/residents and their CoPs—have been encouraged to take part in decision-/policy-making processes of urban development. The second implication is related to this governance experiment, where the *'public sector'* (the Suwon Government and urban-/neighbourhood-scale intermediaries) has substantially helped to establish enabling conditions for the inclusion of previously excluded stakeholders (notably, citizens and residents); for example, in urban planning (in the case of the '2030 Plan' through citizens' direct participation) and sustainability-oriented urban/neighbourhood projects (e.g. rainwater management by households). Unfortunately, the government-led citizen participatory programme in the case of the *Rain-city* has not led to the replication of rainwater-use activities that are voluntarily delivered by citizens/residents.

This constraint of a government-led participatory programme leads to the third implication: the process of mobilising citizen participation should encompass the *'empowerment'* of citizens/residents. This can be enhanced through institutional and organisational arrangements (e.g. for the formation of NCRC and NCR projects by each NCR resident group), as well as through education and training on knowledge and skills required for sustainability-oriented CoP activities (e.g. via the Citizen Autonomy School). The Resident Working Group (RWG) of the *EcoMobility Festival*—which was supported by the government sector to autonomously exercise ecomobility-related projects/programmes—is a good example, whereby participating residents have been voluntarily performing follow-up ecomobility actions ('car-free days') in order to continue and accelerate an ecomobile culture/lifestyle, largely driven by feelings of pride and ownership that they experienced by taking part in the collective actions of improving their neighbourhood.

6. Knowledge and social learning through interaction

This Chapter is devoted to analysing the processes of knowledge (co-)production and social learning of societal agency. Transformative knowledge here refers to a set of new ideas and paradigm based on systems thinking, and such knowledge is generated and also shared through learning processes among stakeholders. Critically, social learning should encompass the processes of reconfigurations in interconnected ways of thinking and doing of learners, and this can be effectively achieved when learners proactively interact and communicate each other. The findings from the analysis have implications on policy direction for future urban development, and which are considerably related to establishing *inclusive governance* within which transformational knowledge is widely shared among diverse stakeholders for social learning.

6.1   New knowledge on systemic dynamics and its application to governance structures and institutions

The *Eco-capital* was an ambitious attempt to initiate political decision on drastic change in the city's overall direction of urban development, from the growth-oriented planning to human-centred, environmentally-sustainable urban development (U1; U12; I1). The Eco-capital task force (TF) and Advisory Committee (AC) have worked on reconfiguring interrelated components of stakeholder perception, policy, and governance structure (SG, 2010a). In order to destabilise unsustainable urban system that had been established during the previous Administration (2002-10), an effort has been preferentially taken to change the definition of 'urban development', from fast, physical growth, to urban management with less impact on the environment (U3; U4). Accordingly, policy priority has been set to alter existing growth-oriented policies that had induced resource-dependent urban structure to new policies that pursue structural reconfiguration towards a low-carbon green city (SG, 2011c). They include the restructuring of energy systems (increasing the proportion of renewable energy to fossil fuels), urban space and infrastructure (securing green spaces against urban infrastructures such as car roads and building), urban ecology (altering the focus from waste disposal to

resource circulation), and regulations (adopting laws that restrain and discourage CO_2 transport and industry) (SG, 2017b). In addition, a green lifestyle was recognised as a critical element that can make such transformative policies to be really implemented in practice (H. Lee, 2011; Huh, 2012), through providing educational programs and launching public campaigns, particularly in areas of transportation (using less cars and more public transportation) and energy (less consumption of electricity) (SG, 2012a). Such transformative policies have encompassed experimentations on establishing participatory governance, notably the Good Governance Committee (GGC), through which multiple stakeholders were encouraged to decide on the direction of Eco-capital Plan and its strategic areas. This systemic relation has been recognised primarily by the public officials and researchers who have worked since the previous Administration, so have observed the obduracy within the system.

The *Rain-city* has been introduced with an aim to change the overall water supply system of Suwon (and also of South Korea) which has heavily depended on centralised, inter-regional piped-water network since 1970s. This change is related to deficits of existing water system which requires high level of energy and cost for operation, and also contains high risks of water pollution during transmission. Significantly, considering that more than 30% of water used in cities are for cleaning, flushing and gardening, it is inefficient to supply high quality water for these uses (Han, Kim and Choi, 2005). This recognition has changed the paradigm of urban water management from being reliant on a centralised piped-water supply ('life line') to more self-reliant system that is enabled by a range of decentralised water supply facilities ('life dot') (*ibid.*). However, a conventional practice of considerably relying on river water and ground water has generated reluctance in adopting rainwater as a water resource and also for water supply system (Won, Kim and Han, 2009). In the first place, there has been a concern about safety of rainwater to be (re)used even for non-drinking purposes (U9), now that South Korea has long been appointed as a region exposed to damages from acid rain (Yoon, 1983). This is related to uncertainty about efficiency of rainwater utilisation, as existing built environment has been adjusted to piped water and accordingly a large amount of additional cost would be required for installing and operating rainwater infrastructures (U9; E1). On account of few precedent, real-world urban cases that present scientific and empirical analysis on necessity and effectiveness of rainwater management, it was rather considered as a redundant and costly work in perceptions of policy makers (U8; U9). Relatedly, citizens were hardly motivated to use rainwater as a partial substitute for piped-water because of its stable provision at low rate (NH6).

In awareness of the need to change these negative perceptions on rainwater, a feasibility study was conducted by a group of hydro scientists (Rainwater Research Centre) to develop a place-based rainwater model (including facility design) that was used to present potential reduction of piped water and CO_2 (SG, 2017i). Furthermore, a municipal ordinance was enacted in order to provide a legal basis for this paradigm shift, and to acknowledge rainwater management as a useful policy tool for promoting overall water supply system to be more integrated and sustainable (SG, 2012f). Based on the national law on promoting water reuse, which demands installation and operation of rainwater facilities in public buildings (e.g. city halls, schools, stadium) (ME, 2010), a great amount of funding (combination of national, regional and municipal) was granted to Suwon's first rainwater project to install and operate 3 facilities to store and absorb rainwater within a large-scale complex stadium for the usage of gardening and cleaning (SG, 2017i). For this experiment to be continued and extended, one Suwon Government team has been responsible for consecutive rainwater projects (of which details will be explained later in this Chapter).

Rainwater management was not only an adoption of new infrastructure, but rather an ambitious attempt to bring changes to overall water supply system to become more self-reliant: current water services provided for areas which do not require high quality of water shall be taken over by (re)use of rainwater, and accordingly dependency on centralised piped water as well as energy consumption during transmission would be reduced (E1; NH6; Won, Kim and Han, 2009). Especially, in the South Korean context of undergoing a concentrated period of heavy rain, it can also improve water circulation through storing rainwater, which then reduces pressure on risks of flood as well as sewerage treatment (Park and Han, 2011). Such recognition of systemic relations, however, has been rarely shared with stakeholders, except responsible public officials and engineers involved in the project. It is partially related to the characteristics of large-scale, technology-centred experiments which require less consideration on lifestyle change of citizens (E1).

If the *Rain-city* has dealt with negative perception toward rainwater (management), the *EcoMobility* has faced a task to change peoples' daily life related to transportation. The basis lies in the recognition of car-dependent urban transportation system which has been established through considerable investment in transport infrastructure, primarily fuelled by urbanisation and economic growth of South Korea. A series of governmental programmes for railway reconstruction after the South Korea War (1950-53) had been shifted to car roads due to its relatively lower cost of construction. As a result, the share of roads soared from 17% to

65% during the 1st Five-Year Plan for Economic Development (1962-66)[45], and number of cars per resident increased by 540% between 1980 and 1990 (OECD, 2017b; KOSIS, 2018a). Suwon was one of the cities who has given transport policy priority to cars for several decades as the city's main development strategy (Eun and Chung, 2014). This had been coupled with Suwon's geographical characteristics of closeness to Seoul that about one fifth of residents commute to Seoul by car on a daily basis, as well as of serving as a transportation hub among neighbouring cities (OECD, 2017b). Such policy approach has stimulated more construction and extension of car roads in order to give faster speed and higher mobility to cars, especially during the Kim Administration whose annual 30% budget was allocated to car road construction (Ahn, 2003).

Additionally, process of fast industrialisation and urbanisation has generated social values which understand cars as a driver of economic growth and also a symbol of/criterion for development (I1; OECD, 2017; U12). Consequently, car roads have exceeded their capacity to accommodate considerably increased cars, inducing increased congestion and accordingly deteriorated service quality of public transportation. Such built environment and cultural perception has resulted in creating car-centred routines of peoples' daily life, while public transport improvement has been rarely considered in urban development policy (U4; U5). Several attempts by civil society to break car-oriented urban transportation system, such as advocating enactment of pedestrian environment improvement and suggesting directions for green transport, had ended up with being pushed back in policy precedence (Eun and Chung, 2014). Also, people who have long been accustomed to driving were unwilling to give up on benefits from it, such as door-to-door convenience and mobility (OECD, 2017b). As a result, Suwon's car dominance reached 46% as of 2010, even higher than the one of Seoul (27.6%) (GTIC, 2010).

Given the recognition of necessity to change the car-centred paradigm, the *EcoMobility Festival* employed a scheme of mise-en-scène through which one neighbourhood was transformed into a real-world stage where only zero/low carbon vehicles were used. It had an aim to provide an opportunity for residents to learn that it is possible to live without cars, and furthermore, to have first-hand experiences of sustainable urban transportation (SG, 2012c;

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[45] An economic development project of South Korea to achieve self-reliant economy after the South Korean War based on an export-oriented industrialisation model. It has been continued to the 7th term (-1996), and during this period, GNP per capita had risen from less than one hundred dollars (1961) to more than 10 thousand dollars (1995) (Jaehyeong Jeong, 2014).

OECD, 2017b). This experiment was designed to convey a message which interprets roads not as an exclusive property of cars but a space where people can walk and even play in (ICLEI, 2013; U5). In order to encourage residents to enjoy more of ecomobile life, large-scale road reconstruction was implemented to make them more pedestrian-friendly with increased accessibility and safety (through, for example, burying utility poles for broader sidewalk, s-curve roads for car speed restriction, planting trees along the sidewalk). In addition to infrastructural works, public transportation system was reformed that bus service frequency and routes were increased enough to substitute for car uses for travelling between Haenggung-dong and several main destinations in the city, and additionally a diverse types of green transport modes were introduced for daily use within the neighbourhood (Valmero, 2015; Nam, 2017b).

Governance structures and institutions were adjusted accordingly in order to facilitate awareness-raising of the necessity to build green transport system. Given the recognition that success of the project is critically dependent on willingness of residents to give up on car use and to choose green transportation modes instead, the Suwon Government has considerably put efforts to develop participatory, inclusive governance (for example, supporting establishment and/or activities of diverse community working groups; see Chapter 5.1), so that a broader range of residents can have an opportunity to learn and experience about concepts and benefits of ecomobile transport in practice (E2; SG, 2012; U4). Such efforts aimed to encourage participating residents, to claim 'ownership' of the project and take the initiative in designing and practicing a range of related community activities such as car-free days (Valmero, 2015), and consequently to become more willing to change their transport-related lifestyles (SG, 2012c).

The *Festival* has, indeed, served as a stepping stone to bring about changes in interconnected components of overall transport system, especially towards the direction of improving both access and quality of public transportation (ICLEI, 2013; OECD, 2017; U11). Especially, it's main infrastructural restructuring from car-centred to pedestrian-friendly streets was coupled with a series of related policy projects, including tram operation (urban rail vehicles) and establishment of transit mall (within a part of tramways), as well as expansion of subway train lines/routes (Eun and Chung, 2014). Such transport projects are expected to create an environment where public transportation and walking are prioritised, with the support of institutional and financial rearrangement, as will be explained later in this Chapter. This policy direction intends to present an alternative model of urban transportation

which should take account of its comprehensive impacts across environment, economy and society (U1; Valmero, 2015; Nam, 2017).

Such understanding about systemic relations between awareness-raising and lifestyle change has driven the direction of *CSE* (B. Lee, 2013; SCSE-SC, 2017). The *CSE* has employed an alternative governance structure of 'social cooperative (SC)' which is primarily operated based on networks of participating members. In this structure, those who voluntarily join the SC become entitled and obliged to both directly participate in, and make decisions on, activities of the SC (MOEF, 2012). Particularly confronted with challenges of increasing energy consumption, the Suwon Citizens Solar Energy SC (SCSE-SC) was established with an aim to raise public awareness of alternative energy system (sustainable and self-reliant), and furthermore, to engage citizens as a member in the process of generating solar energy from household facilities (SCSE-SC, 2013; SG, 2016f). In a way to strengthen such interrelations, the public sector (Suwon Government – Renewable Energy Team, and SCSD) and environmental CSOs have taken part in promoting membership of SCSE-SC, and providing educational programs to students about overall environment-related issues as well as environmental and economic benefits of operating solar plants (B. Lee, 2013; SG, 2017e).

The ultimate goal of such activities is set to break down the current energy system that has been tremendously dependent on energy imports – 95.7% of total primary energy at the time of establishment of SCSE-SC in 2013[46] (KEEI, 2017). The further challenge is that around 94% of primary energy provision relied on fossil fuel and nuclear energy in the same year (*ibid.*). Particularly, there has been increasing concern over possible fatal dangers involved with nuclear power generation, considering that South Korea has 24 nuclear power plants that are concentrated in 5 locations (as of 2018) in which earthquakes have occurred lately, and more seriously, 30km radius from which 3.8 million people of 37 cities reside (Chang, 2016; Kim, Shin and Choi, 2017; KHNP, 2018). Despite transitional energy policy of the new state government to decrease coal-fired/nuclear power generation (MOTIE, 2017a), challenges still remained regarding possibilities of generating alternative energy enough to substitute current energy supply (Nam, 2018). Under the circumstance that renewable energy currently takes up only 2.8% of overall energy supply (Lee, 2018), and is to be expanded to 20% by 2030 (MOTIE, 2017a), household-based, small-scale (renewable) energy generation has been increasingly

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[46] It costs around annual 200 trillion Won; 150 billion euro), which takes up more than half of the national annual budget (KEA, 2014).

recognised as an alternative mechanism to successfully achieve a shift towards more environmental and safe energy supply. This recognition has motivated emergence of numerous (nationwide) citizens network, including SC-S*CSE*, devoted to establishing self-reliant energy supply system (LC5).

In summary, the *Eco-capital* has been developed upon the recognition of problematic existing development pathway that had been oriented to pursuing fast industrialisation and construction-driven growth (such as roads and buildings). As a response to the recognition, the *Eco-capital* has focused to break up the rigid, unsustainable system across diverse action domains, including radical shift from centralised to self-reliant water supply (*Rain-city*), from car-centred to pedestrian-friendly transport (*EcoMobility*), from fossil fuel/nuclear-dependent to renewable energy generation (*CSE*). However, there has been less consideration on interconnected systemic changes across systems (trans-domain characteristics of urban transformation). As a way to discontinue path dependencies on unsustainability (in terms of infrastructure, regulation, institution, and value), systemic interrelations between thinking (awareness-raising), organising (governance structures and institutions) and doing (practices and lifestyles) have been taken into considerations, leading to institutional arrangements for paradigm shift of policy makers (with an aim to intercept negative perception of rainwater in the case of *Rain-city*), and to the establishment of participatory, inclusive governance for diverse stakeholder participation (with an aim to promote awareness of problematic current system, and accordingly to encourage their contribution to transitioning the system in the case of the *Eco-Mobility* and *CSE*). This systemic knowledge has been primarily developed by the public sector (responsible teams of Suwon Government, and public intermediary organisations) and scientific/technical experts (related national and urban research institutes) (exceptionally by the SCSE-SC leading members in the case of the *CSE*), and then shared to stakeholders (Haenggung-dong communities in the case of the *EcoMobility*).

6.2 (Co-)production of knowledge and transitional goals for the urban future

The *Eco-capital* has declared a long-term vision of *'changing Suwon from a grey to green city'* (SG, 2011c). To achieve this transition, it has called upon drastic departure from the existing urban development mechanism and lifestyle that had required high energy consumption (Huh, 2012;

Park and Bak, 2018). It has set a goal of reducing GHG emissions by 20% by 2020 (SG, 2011c). Science experts (Eco-capital Advisory Committee composed of researchers and urban planners) and task force (TF) primarily took charge of establishing the Eco-capital Plan (see Chapter 4.2). Then, a range of stakeholders including CSOs and NGOs were invited to learn about the vision by using the platform of multi-stakeholder meetings as well as information sharing through off-/on-line media (Suwon Government/Mayor website, social media service, press release), and furthermore, encouraged to contribute to implementing the respective project. This mechanism that is first suggested by public officials and experts and then shared to other stakeholders, was similarly reflected in the *Rain-city* and *EcoMobility Festival* but with different degree of motivating effect on stakeholders as well as provision of orientation for related programmes/projects.

The *Rain-city* was included in the city's 10-year plan on the Integrated Water Resource Management that has guided the direction of water management policy. This is based on understanding of fundamental causes of Suwon's water scarcity that steep slope from upstream hinders infiltration of rainwater into the ground while there is no big river or dam to store and manage (rain)water (Won, 2009b). As a result, Suwon has largely depended on centralised water supply (89%), and which is far higher comparing to the average rate of other cities' (28%) (SG, 2017i). Responding to this challenge, the Suwon Government has started to embrace rainwater as a water resource that can increase self-reliant water provision (Won, Kim and Han, 2009). This transitional idea was expected to bring about a long-term change *'from centralised, piped-water supply to decentralised, self-reliant water system'* (Park and Han, 2011).

This idea of raising water independency through rainwater management was initially suggested by scientific engineers (Rainwater Research Centre of Seoul National University), and introduced to the then chief official who was in charge of water quality team of Suwon Government (E1; NH6). They alleviated this idea to the policy level with an ambitious goal of improving Suwon's water self-reliance to 30% (which was about three times higher than that of BAU) (Kim, Han and Won, 2009; SG, 2017i). In designing the plans, a co-evolutionary process across different areas was considered, in terms of generating positive influences on other environmental aspects such as preventing floods by storing heavy rain in summer, and reducing CO_2 emissions from reduced centralised water supply (Won, 2009a; SG, 2018p). When it comes to motivating residents to contribute to its achievement, financial support was provided such as government subsidies for installing rainwater management facilities and reduction in water rates (Kim, 2016; SG, 2017i). Despite such measures, household

participation has remained less and even decreased as the project became large in scale with increased emphasis on technological aspects (U9).

In this regard, the *EcoMobility* has taken a different direction that gave weight to promoting various stakeholder participation in practicing the vision (U2; E2). Being the biggest GHG emitting sector in Suwon, changing transportation system has been considered of great importance as a prerequisite for greening the city (SG, 2014f, p. 179). This awareness among Suwon policy makers corresponded with the ideas of international agency, ICLEI, who has presented an ideal future image of urban transportation. The idea was derived from the question of how we can live in coming years when fossil fuels may be used up, and as an answer, they suggested alternative transport culture that is independent or less dependent on unsustainable resources (ICLEI, 2013a). In principal, people (travellers) are encouraged to avoid a car-dependent lifestyle, but instead to shift to 'ecological mobility (EcoMobility)' which is defined as: *'travelling through integrated, socially inclusive and environmentally-friendly transport options, including and integrating walking, cycling, wheeling, passenging (use of any kind of public or mass transportation means) and car-sharing'* (ICLEI, 2013d, p. 1).

In realising this concept in an urban setting, a method of 'CityScene' was employed. Coined by Mr. Zimmerman, the then ICLEI Chair of Urban Agenda, it stages a temporary mise-en-scene with real people in a real neighbourhood. As a result, the neighbourhood would present a real-life image of an ecomobile city, and residents could experience unique urban life that is not dependent on a private car (Eun and Chung, 2014). By suggestion of ICLEI, Mayor Yeom decided to make this experiment in one neighbourhood of Suwon in the format of a month-long festival, and then scientific stakeholders (South Korea Environment Institute, Suwon Research Institute) worked on setting up the project direction that promotes both resident awareness about ecomobile transport and infrastructural alteration favourable for alternative modes of transportation (SG, 2012c). Founded on these works, the Suwon Government in collaboration with the ICLEI declared to be an ecomobile pioneer by achieving following goals that read:

> *'We […] make efforts to shift away from vehicle-oriented towards EcoMobility-centred transportation system, and to allow EcoMobility issues including walking, cycling and public transportation to take first priority on the policy agenda. […]. We will transform the transportation policy which focuses on 'vehicles, possession and growth' towards on that centres around 'people, sharing and environment'* (Yeom and Otto-Zimmermann, 2013).

This transitional vision has led to a new departure for Suwon's transport planning (ICLEI, 2013a; H. S. Park, 2013). It has provided orientation for a range of programmes/projects oriented to green transportation which reflects 4 ecomobile concepts of: 'passenging' through environment-friendly, public transportation modes (tram, subway train lines/routes expansion), 'cycling' (public sharing bicycle), 'walking' (transit mall within a part of tramway, pedestrian environment improvement, car-free day) and 'sharing' (car-sharing) (R. Park, 2013; OECD, 2017b). Not only limited to the transport system, but the *Festival* has also given the neighbourhood powerful momentum for 'urban regeneration', as it was initially designed to be integrated with infrastructural readjustments such as road reconstruction, small-scale park creation, and alley refurbishment (ICLEI, 2013; U2; Valmero, 2015). Such integrated work has brought about social changes of the neighbourhood who were left underdeveloped that they experienced a considerable influx of new residents particularly young families and artists, while challenges of land value rise from the renewal process (so-called 'gentrification') has remained unsolved (NH2; NH3; NH4). Furthermore, combined two projects on operating tram service and transit mall have considered their influences on different aspects of urban development, including the creation of pedestrian-centred culture through broadening and improving pedestrian space, and vitalisation of deprived areas and their economy (through improved access to shops and restaurants on the street) (SG, 2018u).

Distinct from the cases above which lack inclusiveness within the process of knowledge production, the Suwon Council for SD (SCSD), an intermediary institution, has initiated an experiment on developing sustainability-oriented vision of Suwon based on collective opinions of diverse stakeholders (SG, 2009). Since 2016, the SCSD has started working on establishing '2030 Suwon SDGs' founded on primary principles of public-private cooperative, citizen-participatory production (Park, 2017; Kang, 2018). For this, the SCSD has organised three committees and respective working groups that are composed of public officials, city assembly members, citizens and entrepreneurs (I1; L1). In cooperation with scientific experts, all committee members have gathered every month (general and sectional workshops/seminars and discussions (SCSD, 2017c). After a year, for the first time in municipal-level cities, they produced 10 goals, 57 targets and 133 indicators (SCSD, 2017b). This set of SDGs has been modified based on feedbacks from external stakeholders, citizen online survey, and a round-table discussion (by 400 citizens as well as public and private representatives), followed by the overall expert review (Park, 2017; SCSD, 2017a; Kang, 2018).

Vision	A sustainable city where human and nature coexist		
Sections	Environment: Clean and bright urban environment	Economy: Living together in a sufficient condition	Society: Harmonious social community
Goals	1. Good energy for all for climate adaptation 2. Healthy and harmonious biodiversity 3. Clear and clean water circulation	4. Healthy and sustainable agriculture and foods 5. Decent job and innovative industry 6. Sustainable consumption and production	7. Welfare/health/ education for citizen happiness 8. Gender equality and multi-cultural society 9. Sustainable culture for all 10. Autonomy for justice/peace/ cooperation
Targets	17 targets	17 targets	23 targets
Indicators	37 indicators	29 indicators	67 indicators

Figure 6.1 Suwon SDGs

(Source: SCSD, 2017a)

The *CSE* also takes this collective approach of co-producing sustainable development pathways by diverse stakeholders. It was initially suggested by a group of citizens who recognised the urgency to establish a citizen network (i.e. SCSE-SC) devoted to tackle existing systemic challenge of high dependence on coal-fired/nuclear power as well as imported fossil fuels. As this concern corresponded to the policy task of Suwon Government (Renewable Energy Team), they organised the public-private governance structure as an implementation tool to pursue the vision of transforming Suwon to be *'self-sufficient in energy use through increased renewable energy generation'*(SCSE-SC, 2013). This vision has motivated interested citizens to join the organisation (by making a contract on investment) and its activities of constructing and operating solar plants (SCSE-SC, 2013). The *CSE* aims to provide an alternative solution that is achieved by 'collective practices of citizens' in generating solar energy, which is ultimately expected to become a culture among citizens (SCSE-SC, 2017).

This goal of encouraging public participation has guided the project direction towards public awareness and education, which includes not only among members but also young generation (students) by integrating lectures into school classes about energy-related

challenges and activities for solution (L5; Lee, 2013). In order to contribute to promoting public participation, the Suwon Government designed a policy of subsidising installation of small-scale solar energy generator on household rooftop and veranda (SG, 2017e). Additionally, the *CSE* was incorporated into a neighbourhood project ('Resident Solar Energy' of Hwaseo 1-dong) which operates a solar plant on the rooftop of a public building in order to produce energy used for the building and to operate a neighbourhood funding from the profits to initiate sustainability-oriented activities (NH5; NH6; SG, 2017). This mechanism of profit generation has been the motive of 'Sharing Solar Energy' which is oriented to share half of profits to pay for electricity charge of low-income households and the other to reinvest on plant construction, by which not only environmental benefits of GHG reduction is ensured but also economic profits are created in combination with social inclusion (SG, 2016; U10).

In summary, the *Eco-capital* and three projects have been developed under a strong, transitional vision that aims for a drastic departure from the current state to sustainability, by mutual shaping of self-reliant water supply (*Rain-city*), pedestrian-centred transportation (*EcoMobility*), and renewable energy (*CSE*). Such vision was produced by collaborative works among the public sector (responsible teams of Suwon Government, public intermediary organisations) and scientific/technical experts (national and urban research institutes), exceptionally by the SCSE-SC leading members in cooperation with the public sector in the case of the *CSE*. The *Rain-city* has paid less attention to motivating citizens to participate in the project, whereas the *EcoMobility* and *CSE* have emphasised on sharing the vision with stakeholders (Haenggung-dong resident groups and SCSE-SC members, respectively) and also encouraging their contribution to achieving the vision. Furthermore, such knowledge future has provided orientation for a range of programmes/projects in diverse action domains, including green transport (introduction of trams and transit mall, expansion of subway train lines and routes), as well as in various geographical scales, including solar energy generation at the neighbourhood and household level.

6.3   Social learning that leads to change

Since 2012, the Suwon Council for SD (SCSD) has conducted monitoring on Suwon's sustainability based on selected evaluation indicators of social, economic and environmental agenda, including energy-/water-saving lifestyle, low-carbon transportation (walking and

biking), and social enterprise and green industry, and of which evaluation result is published as an annual 'Sustainability Report' (SCSD, 2016). This scheme of monitoring has been integrated into the 'Suwon SDGs' of which performance is evaluated based on 133 indicators that can be measured with available statistical data (SCSD, 2017a). The evaluation result, then, identifies a list of tasks that are to be implemented by each stakeholder (citizen, business, and the public sector) for each SDG, and is publicised in the format of report and public meeting for the purpose of awareness-raising and policy feedback (SCSD, 2017a). In order to facilitate the process, the SCSD initiated an interaction platform where diverse participants (researcher, public official, CSO and citizen) of sustainability-related activities (related to each SDG) share their knowledge and assess experiences, and of which outcome will be published as a collection of good practices (4 practices for each SDG) (SCSD, 2018a).

This know-how sharing is actively encouraged in the neighbourhood setting that diverse neighbourhood network groups (not limited to the geographical neighbourhood boundary, but grouped based on the activity theme) has developed a monthly communication format ('Neighbourhood Community Conversation') through which different resident groups share ideas about solutions and learn from each other in a more open, cooperative environment, rather than driven by the feeling of rivalry (Jung, 2017). In order to manage such know-how gained from the interaction, the Centre for Neighbourhood Community Renaissance (CNCR) has focused on documenting stories of NCR activities on an annual report containing performance reports written by each NCR committee (CNCR, 2017a), as well as within the video clip recorded and broadcasted by the Suwon Neighbourhood Media Association (SMC, 2018). By extension, they established a neighbourhood archive programme which consists of in-depth interviews with key NCR activists with an aim to document their on-site, practical knowledge and experience regarding how to build up the community (CNCR, 2016a, 2018).

Extended to the urban spectrum, the Suwon Government has established multi-stakeholder monitoring structure (Figure 6.2) to assess the implementation of its Primary Policy Tasks ('Manifesto') by employing both quantitative and qualitative assessment. On the one hand, the public officials responsible for the respective Task conducted yearly performance evaluation based on different set of indicators, as well as budget and future plan (for four years of project span in accordance with the administration term) (SG, 2018b). On the other hand, the Good Governance Committee (GGC) took in charge of qualitative assessment on governance structure (inclusiveness), planning, institutional/legislative arrangements, and

outcome/impact of each Task that is assigned to one of the five thematic committees (a total of 65 members composed of researcher, professor, CSO member, public official, intermediator, and city assembly member) (GGC, 2018; SG, 2018b). Furthermore, the assessment was followed by suggestions on areas for improvements as well as solutions for ongoing implementational difficulties (of which examples are presented in Table 6.1), and these suggestions were reflected in the work plan of the next Administration (SG, 2019b). In parallel with the GGC assessment, the Citizen Monitoring Group[47] which is organised by citizens' application made their own evaluation using online survey with five-point scale based on performance data prepared by the responsible team for each Task (SG, 2018v).

Monitoring on the Primary Policy Task of the 6th Suwon Government		
Quantitative method	Qualitative method	
Responsible team of Suwon Government	Good Governance Committee	Citizen Monitoring Group
Indicator evaluation (yearly) Budget and Future plan	Assessment and suggestion (governance, regulation/legislation, planning, outcome/impact)	Assessment (five-point scale survey) and opinion

Figure 6.2 Multi-stakeholder monitoring on policy implementation (Primary Policy Task)

(Source: designed by the author)

Table 6.1 Suggestions by the GGC on selected Primary Policy Tasks of the 6th Administration

Task (project)	Diagnosed implementational difficulties	Suggested solutions/ Areas of improvements
Urban railway network	Low priority in the national railway plan due to low value on benefit cost analysis	Continuous discussion with the related ministry (MOLIT)/ Establishing a public-private committee for conflict management (for the Sooin line)
Urban railway (tram)	Low value on benefit cost analysis	Improving regulation on benefit cost analysis within investment assessment system

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[47] The Citizen Monitoring Group is organised under the GGC in 2016, and composed of 584 registered citizens (as of 2018). They plays a role of policy monitoring and feedback with regard to current policy issues (SG, 2018f).

Task (project)	Diagnosed implementational difficulties	Suggested solutions/ Areas of improvements
EcoMobility	Concern about continuity of neighbourhood car-free day	More emphasis on awareness-raising about pedestrian-centred transport system
Public bicycle	Unsafe urban environment for biking	Expanding bike road/ Promoting public bike use (using SNS, broadcast media)
Public transportation	Passenger complaints about changed transfer system	Feedback program by passengers/ Consideration on vulnerable users
Renewable energy	Limited participation of citizens (school, house)	Establishing public-private implementation organisation/ Expanding related budget according to expanded national budget
Rain-city (season 2)	Limited to large-scale facility operation	Promoting citizen awareness and participation (household, small-scale facility)/ Developing a set of indicators for periodical evaluation

(Source: own compilation based on GGC, 2018)

In addition to such indicator-based evaluation, a range of on-site researches have been conducted with regard to different realms of changes that the *EcoMobility Festival* has brought to Haenggung-dong and its residents. For this, a resident survey (one-to-one questionnaire) was carried out after the *Festival* to understand the close relationship between improved pedestrian environment and travel behaviour change (decreased car use and increased use of ecomobile transport means such as public transport, bicycle and walking by 7% within the neighbourhood) (Kim *et al.*, 2014). Moreover, another set of survey (before and after the *Festival*) was designed to identify the impact of changed pedestrian-centred environment (including neighbourhood rest area) on increased neighbourhood community communication as well as increased community activity on the street (Kim and Geon, 2014). Furthermore, the result of both surveys indicates a policy implication on mobility management that improvement of pedestrian environment should be accompanied with practical solutions for parking-related challenges (when cars are not used), especially in the case of old urban areas with limited parking lots (Kim and Lee, 2014b, 2014a; J. H. Kim *et al.*, 2015; Kim, Lee and Choi, 2017). By extension, in recognition of necessity for a long-tern monitoring, the Suwon Research Institute has developed a set of evaluation indicators in 3 aspects of enabling element (political will, personnel, budget, planning), land use and ecomobile infrastructure/transport service, and ecomobile influence and impact (safety, environment, satisfaction), which was applied to

evaluate the status of Suwon ecomobile transport system for the city's future policy direction (Kim and Kim, 2015).

A few days later, a multi-stakeholder discussion table was open with around 300 citizens (incl. the Haenggung residents) as well as the public sector (Mayor and Vice Mayor) and researchers. With the topic of 'sustainability of ecomobility', participants discussed on specific plans to continue the ecomobile transport lifestyle based on the ideas from the prior open survey via telephone, and consequently agreed to initiate a monthly car-free day in the neighbourhood that is autonomously delivered by the resident groups with the administrative and financial support of the Suwon Government, as well as with rental service of ecomobile vehicles by related businesses (e.g. Yellow Bike, Ecomobile Culture Cooperative) (Eun and Chung, 2014). The idea from the discussion was implemented as the policy program of the EcoMobility Team of Suwon Government that four neighbourhoods started the car-free day for the first time in 2014, which was expanded to 15 neighbourhoods in 2018 (SG, 2018j). Furthermore, the residents groups of Haenggung-dong (including EcoMobility Promotion Association, Resident Autonomy Committee) has hosted *EcoMobility Festival* anniversary events every year with an aim to not only recreate and revitalise an ecomobile ambience with bike parades and car-free streets, but also gather diverse stakeholders who have worked on establishing an ecomobile neighbourhood and to share their knowledge and experiences through forums and workshops (Gyeong, 2014; J. K. Ryu, 2018).

Considering that the *EcoMobility Festival* was the world's first real-world experimentation on a car-free neighbourhood for a month, documenting and recording the entire project process was one of the critical tasks. For this, different spectrum of documentation was conducted simultaneously for the replication in other cities, such as the congress report on ecomobility-related policy ideas by Mayors, public officials and experts (ICLEI), academic journals with policy implications (Suwon Research Institute), a white paper and project guidance (Suwon Government), as well as video documentaries (ICLEI and Suwon Government) and clips (*Festival* participants), and social media (blogs, Facebook, Twitter by e-Supporters). Furthermore, the EcoMobility Alley Museum was opened in Haenggung-dong as a space to exhibit the stories of neighbourhood transformation (pedestrian-centred infrastructural reformation) and memories of the *Festival* (photos, newspaper articles and videos), in combination with a field tour around the Festival area (D. H. Choi, 2017a).

In the case of the *Rain-city*, technical experts have played a significant role in developing and applying a quantification model to monitor on the effect of installed rainwater

management facilities, with regard to reused and infiltrated rainwater, reduced CO_2, and saved water rate in comparison to the data before installation (Table 6.2) (KISD, 2017b, 2017a). Such quantification was used as a scientific source to design the follow-up projects (LID and GI – season 2), and also to secure the national/municipal funding (that is provided based on the performance) for the continuity and expansion of the project (SG, 2017c). Selected as a good practice in the municipal policy award (of Ministry of Environment, ME), practical know-how was once shared with a range of policy makers and academic experts in addition to an on-site field visit (rainwater management facilities) (SG, 2018l). While urban stakeholders were able to communicate with the responsible public officials through the format of Good Governance Committee (GGC) monitoring (included as one of the Primary Policy Tasks), the projects have been primarily founded on the interaction with the national stakeholders (the ME and research institutes) in aspects of technical advancement and financial arrangements (GGC, 2018; U9).

Table 6.2 Effect of rainwater management facilities (as of 2017)

	Rainwater utilisation [a] (ton)	Rainwater reuse (ton)	Rainwater infiltration [b] (ton)	CO_2 reduction [c] (ton)	Water rate saving [d] (Won; euro)
Total	**107,386**	**85,254**	**22,132**	**35,652**	**214 million; 0.16 million**
Suwon World Cup Stadium	43,485	35,600	7,885	14,437	87 million; 65 thousand
Jangan District Office	13,703	12,600	1,103	4,549	27 million; 20 thousand
Suwon Sports Complex	20,492	14,900	5,592	6,803	41 million; 31 thousand
Suwon City Hall	2,584	1,040	1,544	858	5 million; 4 thousand
Public storage facilities	15,106	15,106	-	5,015	30 million; 23 thousand
Green spaces	12,016	6,008	6,008	3,989	24 million; 18 thousand
Water self-sufficiency [e]	10.9% (before the *Rain-city*, 2009) → 26.5% (2017) (Goal: 30% by 2020)				

(Source: own compilation based on SG, 2018a, 2018b)

[a] Rainwater utilisation: rainwater reuse + rainwater infiltration
[b] Rainwater infiltration: infiltration area x 751mm x 25% (efficiency)
[c] CO_2 reduction: rainwater utilisation x 0.332 (coefficient of CO_2 emission)
[d] Water rate saving: rainwater utilisation x 1,993 Won
[e] Water self-sufficiency: water self-supply / total water supply

In contrast, the *CSE* has taken a more internal monitoring structure mainly through the format of annual general meeting with all members of the organisation (SCSE-Social Cooperative). The operational directorate and the secretariat take in charge of preparing the annual monitoring report which includes organisational status including a statement of accounts/financial position/income, operational status of solar plants (Table 6.3) and related activities (education, public relations, cooperation), as well as audit results (SCSE-SC, 2018a). The purpose of the report is not only to share the current status with the members who are equally entitled to decide on financial and operational plans for the next year, but also to secure institutional and financial support of the Suwon Government (which is determined based on the performance as included in the government Primary Policy Tasks) (SG, 2018; U10). Developing interaction format for idea sharing and practical know-how management (regarding the knowledge and experience about how to operate the organisation (SC) and solar plant) have not been the priory task (except bi-monthly meeting of the directorate), mainly due to limited resources that have been primarily devoted to the construction/operation of solar plants (L5; SCSE-SC, 2018; U10). In this recognition, the directorate has recently set a goal of enhancing the members' capacity through providing a range of educational programs for their improved understanding about the organisation as well as the solar plant projects (SCSE-SC, 2018a).

Table 6.3 Status of solar plants operated by the SCSE-SC (2017)

	Number of solar plants	Generation capacity (kW)	Generation amount (kW)	Profit (Won; euro)	Accumulated generation amount (kW)
Total	**10**	**1,091**	**1,069,110**	**259.7 million; 0.2 million**	**2,165,322**
Citizens Solar Energy (CSE)	2	100	139,604	42.7 million; 32 thousand	304,779
Sharing Solar Energy (SSE)	7	973	905,339	210.5 million; 0.16 million	1,759,615
Resident Solar Energy (RSE)	1	18	24,167	6.5 million; 5 thousand	71,408

(Source: SCSE-SC, 2018, p. 10)

In summary, reflexivity of transformative activities has been improved through developing a methodical and practical tool for monitoring, such as evaluation indicators (for ecomobile environment and lifestyle, and Suwon SDGs) and quantification model (on impacts of rainwater facilities), as well as monitoring report (of government Primary Policy Tasks by

the GGC, and solar energy activities by the SCSE-SC). Reflexivity analysis has contributed to not only guiding follow-up activities, but also securing continued planning and implementation of the project (in terms of inclusion to institutional and financial mid-/long-term plan of the national/local government). In doing this, a multi-stakeholder interacting platform has been employed with an aim to critically question progress towards the vision, through GGC meetings (by which solutions for diagnosed challenges of sustainability-oriented projects are discussed) and resident open discussions (about how to continue ecomobile lifestyle in the neighbourhood). Additionally, efforts to manage practical know-how has been actively carried out, especially during the *EcoMobility Festival* which used various tools of documentation and recording (such as white paper, video documentary, museum exhibition) as a guidance for stakeholders and other cities to replicate ecomobility-related activities. In contrast, the *Rain-city* presents a more centralised interaction between the national and municipal public officials (with regard to reporting the performance for further project funding), and which, in result, has less contributed to social learning of stakeholders (especially citizens to reproduce rainwater-related practices, except within the NCR projects).

6.4   Conclusions

Drawing upon the empirical analyses (also summarised in the last paragraphs of Chapters 6.1–6.3, respectively), some findings were derived. First, the processes of (co-)producing transformative knowledge and of social learning were primarily developed by the urban-level public sector, and exceptionally by the leading members of a citizen organisation (the SCSE-SC). Second, likewise, they employed an inclusive approach in terms of sharing transformative knowledge with numerous stakeholders by launching diverse participatory learning platforms and programmes. Hence, the extent to which social learning occurs is contingent upon the degree of how inclusive and participatory governance is (as found in the cases of *EcoMobility* and the *CSE)*.

The overall analysis offers insights regarding both theoretical and policy aspects. First, for improved knowledge of systemic relations, it is necessary to consider *interrelations between systems* across domains, especially considering the characteristics of urban transformation, which involves the alignment of resources and actor constellations across systems within a given geographical setting (co-evolutionary, domain-transcending transformation), unlike a

domain-specific approach (Frantzeskaki *et al.*, 2017b). The *Eco-capital* has employed multiple systemic changes in eight different domains, while each systemic change process has continued to occur separately. Second, for reflexive monitoring to ultimately be implemented in urban transformation processes, reflexivity analysis (e.g. monitoring and evaluation results) should be directly applied to relevant planning and practices of *subsequent* transformative policy and programmes/projects. For example, Good Governance Committee (GGC) monitoring implementation has been utilised as a primary criterion for establishing the next administration's Primary Policy Tasks. Second, concerning the policy aspect, two conclusions can be drawn. First, while inclusive, participatory governance is essential, the case of the *CSE* shows that such an inclusive agency network does not ensure social learning amongst participating stakeholders, unless efforts to mobilise *practical know-how management* are explicitly exercised through educational programmes.

7. Community-based innovation and enabling environment for its acceleration

This Chapter explores diverse transformative actions and experiments in a range of action domains primarily led by various communities of practice, and also (the processes of developing) institutional environment to support and accelerate community-based innovation. The findings from the analysis have implications on policy direction for future urban development. They are considerably related to the critical role of the public sector in establishing and promoting inclusive institutional and organisational settings for community-based experiments. It gives special attention to the neighbourhood scale as a favourable geographical territory where communities of practice are nurtured and perform autonomous transformational experimentations.

7.1 Neighbourhood-scale activities by communities of practice

In compliance with one primary principle which calls upon active involvement of citizens and CSOs, the *Eco-capital* has pursued to establish a governance structure that encourages community-based activities in diverse action domains from diverse geographical scales (SG, 2012a). At the urban level, the Suwon Government adopted a citizen-led park management mechanism which is operated based on community networks, and primarily aims to preserve urban parks that were initially designated as a park site in planning document but would lose legal effectiveness if undeveloped and/or abandoned for a certain period (Ryu, 2013). The concern that Suwon Government's plan to buy and develop the park sites can only cover one fourth of the whole raised the need to find solutions besides public funds. Against this background, the Suwon Green Trust Foundation (SGTF) was established as a citizen-led organisation which has worked on developing and managing urban parks fully based on citizens' voluntary participation in areas of green space preservation and expansion (through urban farming, ecological walkway and tourism), citizen education and training, and fund-raising campaign for implementing such activities (SGTF, 2012). By extension, founded on intermediation of SCSD, related CSOs have been discussing on operation of Suwon National Trust (SNT) as a way to initiate a citizen movement of donation and grant to buy and develop

parks that are about to be lost to other development purposes such as building sites and roads (SCSD, 2018d). Additionally, the SCSD has also supported diverse sustainability-oriented CSOs whose activities are oriented to achieving 10 Suwon SDGs (see Figure 6.1 in Chapter 6.2) (SCSD, 2018c).

At the neighbourhood level, the Suwon Government has made an experimentation on ways of (re)developing neighbourhoods by initiating the long-term policy programme of Neighbourhood Community Renaissance (NCR). It was an ambitious attempt to depart from the country's conventional approach of repeating demolishment and reconstruction of spaces and buildings (houses) driven by the public sector, to a resident-led, integrated approach that addresses not only physical aspects but also socio-cultural and economic improvement (SG, 2011a). In fact, this new approach has been influenced by awareness of limitations of centralised system in urban development, which aroused grassroots movement aiming to restore and vitalise local community (Jeong, 2013). As a reaction, the national government (diverse ministries) has started a range of urban programmes/projects since the mid-2000s, such as 'Making a Livable City' oriented to bringing changes in urban development paradigm from growth-centred policy to prioritising the 'process of restoring cultural, environmental and historic urban identity', which, however, had limits in exclusion of participation of local governments and residents in policy design, and accordingly ended up with one-time implementation in the absence of urban-level regulatory and organisational establishment (MOLIT, 2008). This has accordingly invited the role of local government to provide a place-based support, particularly through the mechanism of 'intermediation' which is oriented to empower local community to take the initiative in deciding on the issues of their own neighbourhood (CNCR, 2017b).

Since 2011, the Suwon Government has pushed ahead with such transitional attempt by establishing an organisational structure (a task force on NCR under the Vice Mayor's office and Centre for NCR (CNCR) as an intermediary), as well as institutional and legal foundation (master plan and municipal ordinance on the NCR) (SG, 2010c, 2011a). The NCR is aimed at transforming neighbourhoods into a living space where local community is restored and developed to the extent that they autonomously find solutions to diverse problems of their own neighbourhoods (CNCR, 2016b). In order to build community capacity, the NCR is delivered based on voluntary application by a resident group (composed of more than 10 members), which deals with specific neighbourhood-related subjects oriented to either build up community network or improve neighbourhood spaces and facilities (details in Table 7.1).

All resident groups are qualified to apply once a year, and if selected, certain amount of funding (5-30 million Won; 0.4-2.3 million euro[48]) as well as a series of educational programs and counsels are provided for planning and conducting a 9 month-long project (CNCR, 2017b). Depending on respective neighbourhood environment and community interest, NCR projects are required to contribute to one of sustainability elements, including 'alley economy' (revitalising traditional markets), 'caring society' (marginalised group of residents), and 'low-carbon green community' (community gardening and farming, energy generation) (SG, 2011a). Since the beginning in 2011, 820 NCR projects have been delivered (as of 2017), and their outcome has been documented in NCR annual reports for knowledge and experience sharing among participating resident groups (CNCR, 2017; U6).

Table 7.1 Types of Neighbourhood Community Renaissance (NCR) programme

	Community building	Space and facility improvement
Subjects	• Neighbourhood plan (research on neighbourhood resources, environment, geography, etc.) • Community capacity building (educational programs on knowledge about neighbourhood) • Community network (co-parenting, group study, neighbourhood festivals and activities) • Thematic programs (neighbourhood newspaper/broadcast, cultural – choir/orchestra/theatre, environmental – car-free day/green market)	• Environment improvement (green wall, painting, pavement) • Space and facility in which residents can communicate and do activities oriented to enhance community building and develop neighbourhood • Space and facility related to neighbourhood resources and characteristics (e.g. Ecology Learning Park)

(Source: own compilation based on CNCR, 2017, pp. 21–33)

The institutional structure of NCR has laid down foundation for CoP experiments of diverse *Eco-capital* projects. A small-scale 'Rainwater Box' was launched targeting households which have a yard/rooftop to install and utilise rainwater facilities – size of 0.5-2 tons independently designed by the Water Quality Management Team of Suwon Government (Figure 7.1 and 7.2) (SG, 2017i). Initially, financial support (subsidy) was only provided for the

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[48] The 'Won' is the South Korean currency. In this thesis, 1,000 Won is converted to 0.75 euro.

household use based on related municipal ordinance (90% of installation cost not exceeding 10 million Won; 7.5 thousand euro per household) (SG, 2012, art. 15). Later on, it was extended to cover the neighbourhood use for public building and space if combined with the NCR projects in the form of rainwater-use community gardening, delivered by the NCR resident groups in cooperation with the neighbourhood-level government sector (Neighbourhood Community Service Centre, NCSC). In Haenggung-dong, neighbourhood community gardening has been exercised for vegetable and fruit growing, aiming to build up community network through experiences of working together for gardening and sharing its product with other neighbourhood residents (Figure 7.3) (NH2). The NCR resident group cooperated with the public sector (Centre for NCR, Water Quality Management Team of Suwon Government) for site selection and garden design using different types of rainwater facility (E3; NH2). Particularly, community gardening has been integrated with after-school activities for learning small-scale cultivation and resource circulation (*ibid.*).

Figure 7.1 Small-scale rainwater facility (rainwater storing pergola installed on the rooftop of the Suwon City Hall)

Figure 7.2 Cultivating the vegetation by using rainwater from the facility

Figure 7.3 Haenggung-dong community garden using rainwater facility

Another case is Hwaseo 1-dong who has been known for 'low-carbon green neighbourhood', largely influenced by the leadership of former general director who was a senior environmental official of Suwon Government (see Chapter 5.2). Built on close, trusted relationship between the neighbourhood-scale public officials and residents, as well as strong support for community practices, the resident committees (NCR Committee, Resident Autonomy Committee, Neighbourhood Women's Society) set a goal of transforming their deprived region into an ecological neighbourhood by making use of its housing style with a yard and rooftop, which is adequate for operating rainwater facilities (and solar energy plants, as will be described in the following paragraphs) (NH6; NH7). With the institutional support of the public sector (Neighbourhood Community Service Centre, NCSC), they opened a resident meeting to share such vision and provided information related to utilisation of household rainwater facilities (such as application process for financial support from the Suwon Government, utilisation of rainwater facility for household gardening (Figure 7.4), and reduction of water rate in accordance with reduced piped water use) (*ibid.;* NH8; NH9).

Figure 7.4 Hwaseo 1-dong household rooftop garden using rainwater utilisation facility

This community experiment has also been delivered in the area of solar energy in the household as well as neighbourhood public building of Hwaseo 1-dong. The NCR Committee came up with a plan to establish a neighbourhood-level, solar energy-related NCR project, named as the Resident Solar Energy (RSE). Combined with the technical and operational capacity of SCSE-SC (Social Cooperative), and institutional and financial support of Centre for NCR, a size of 18 kW solar panel was constructed (48 million Won; 36 thousand euro) on the rooftop of Neighbourhood Community Service Centre (Figure 7.5) (NCRC and SCSE-SC, 2014). This project was designated as the NCR best practice for its multi-dimensional contribution to not only environmental aspect of renewable energy generation and resultant GHG reduction,

but also economic benefit from operation (calculated as profit of 7 million Won; 5 thousand euro per year) which has been accumulated as the neighbourhood fund for green activities and social services (NH5; NH6; NH7; Jeong, 2014).

Figure 7.5 Resident Solar Energy (RSE) installed on the rooftop of Neighbourhood Community Service Centre of Hwaseo 1-dong

By extension, solar energy generation was replicated at the household level within the renewable energy policy of Suwon Government as well as of the national government ('One Million Green Home' program, as will be explained in detail in Chapter 7.2). In the same manner as the household-scale rainwater project was delivered, resident committees played a role of motivating utilisation of household-scale solar energy generator (a size of 3 kW), by which they aimed to develop Hwaseo 1-dong as the city's representative sustainable neighbourhood (Figure 7.6), following the practice of 'Vauban', a pioneering neighbourhood in Germany designed with ultra-low energy buildings including solar energy (NH6; NH7). This vision was set up according to the outcome of discussion process among resident committees and neighbourhood-scale public officials, based on the analysis of geographical and residential characteristics such as abundant sunshine and one/two-storeyed houses that are built facing the south (*ibid.*). One remarkable feature of the project model is that it has envisioned an alternative scenario of creating a promising economic activity of the local community by taking advantage of institutional system within which energy surplus is traded as profits: for example, one household started private business of utilising solar energy generator on the house rooftop (Figure 7.7) which made a monthly profit of around 1 million Won; 750 euro (and of which trade mechanism will be explained in Chapter 7.2) (NH6; NH7; NH9).

Figure 7.6 Household solar energy generators installed on the house rooftop in Hwaseo 1-dong

Figure 7.7 Household solar business on the house rooftop in Hwaseo 1-dong

Such influence on resident life was the motivation of a range of community-led activities of *EcoMobility Festival* and its follow-up neighbourhood projects. Strongly empowered by the public sector, the Resident Working Group (RWG) was established, serving as a platform through which a range of neighbourhood-based CoPs as well as individual residents (around 2,000 applied membership) autonomously designed and implemented a month-long project (Eun and Chung, 2014). Based on shared understanding among participating members about the project aim, the RWG set 10 work areas related to ideas of promoting the use of ecological transport as well as of providing overall knowledge about green lifestyle and its benefit to neighbourhood development (Table 7.2) (Hwang, 2013). One critical role of RWG was to conduct a place-based analysis on characteristics and advantages of the neighbourhood that can be integrated into project activities: for example, a neighbourhood tour program using ecological transportation vehicles along with historical and cultural sites (such as Hwaseong Fortress and Suwon Stream), and walking tour along specially designed alleys such as mural art and traditional shops/restaurants) (EOC, 2013a). In particular, these activities were considerably backed by onsite intermediation of EcoMobility Neighbourhood Centre through which residents communicate among themselves and also with the public sector with regard to solving problems from the preparation and implementation process (Koh, 2014).

Table 7.2 Resident Working Group (RWG) activities

Working areas	Activities	
	Before the Festival	During the Festival
Ecological transport	• Bike safety training (daily)	• Unique bike riding • Bike parade

Working areas	Activities	
	Before the Festival	During the Festival
	• Production of ecological transportation means • Bike parade (monthly)	• Bike taxi
Green lifestyle	• Lectures about environment (monthly) • Flea markets (second-used)	• Participation in the national SD conference • Photo exhibition (old-fashioned lifestyle)
Alley regeneration	• Designing of alley tour program • Tour commentator training	• Alley tour programs (thematic alleys)
Neighbourhood economy	• Designing of neighbourhood tour program • Tour commentator training	• Neighbourhood tour programs (historical and cultural sites)
Neighbourhood businesses	• Concept-making of Hwaseomoon street (shops/restaurants)	• Shops/restaurants with specialties (e.g. fair trade, organic, traditional)
Festival events	• Designing of programs	• Participatory programs (e.g. traditional games, concerts, arts, cooking, food trucks)
Alley academy	• Lectures about Haenggung-dong (history, culture)	• Lectures about Haenggung-dong (history, culture)
Conflict mediation	• Conflict mediation program • Community dance group	• Performance of community dance group
Public relation	• Neighbourhood magazine (monthly)	• Neighbourhood magazine (monthly) • EcoMobility PR centre/booths
Youth group	• Documentary production • Youth reporters • Youth newspaper (monthly) • EcoMobility party (3 days)	• EcoMobility Youth Forum (4 days) • Neighbourhood festival

(Source: Hwang, 2013)

Such RWG practices were closely collaborated with neighbourhood-based community activities by established resident committees/groups. Founded on infrastructural reformation by the public sector, they worked on improving pedestrians and alleys to be a more pleasant space for biking as well as walking. Additionally, a range of cultural programs were included for the purpose of alley recreation during the *Festival*, such as 'Haeng Show Market' (creative and recycled product making) by Alternative Space Noon (neighbourhood-based non-profit organisation launched in 1960 with an aim to revitalise the neighbourhood) and 'Haenggung Culture Market' (art learning courses for visitors) by local artists (EOC, 2013d; Noh, 2013). With regard to establishing an ecological lifestyle, a series of 'car-free days' were delivered

voluntarily by Suwon's CSO network, called Dorothy (referring to the abbreviation of 'Citizens Playing on the Street' in South Korean) which aimed to share the benefits of car-free streets by presenting a bike parade and dance performance (Figure 7.8) (EOC, 2013c, 2013f): for example, a hundred of Haenggung-dong residents rode a bike along one of the congested car roads (Jeongjo-ro) and exclaimed 'independence from cars' on South Korea's Independence Day (Figure 7.9) (EOC, 2013g).

Figure 7.8 Dorothy's dance performance on the street (Source: EOC, 2013)

Figure 7.9 Bike riding on the car-free road (Source: Onnuri49, 2013)

After the *Festival* ended, Haenggung-dong residents decided to continue the ecomobile practices according to the decision from the open discussion (as will be described in Chapter 6.3), and agreed on the plan to have a monthly car-free day mainly hosted by the EcoMobility Promotion Association and financially supported by the EcoMobility Team of Suwon Government. In order to provide ecological transportation vehicles, they cooperated with Suwon's bike-related businesses such as the Ecomobile Culture Cooperative (production and provision of different forms of bikes) and Yellow Bike (provision of bike education) (L1; L3). This event was aimed to not only establish and sustain ecomobile culture but also revitalise stagnant neighbourhood atmosphere through combining with resident participatory programs such as flea market and exhibition (Figure 7.12), while challenges of finding alternatives to car transportation by some shops/restaurants (e.g. beverage bottles, flours and grains) remained unsolved (Figure 7.13). Having recognised such challenges, one NCR project was designed with an objective to include excluded resident groups during the *Festival* through the scheme of improving neighbourhood environment, such as building a flower garden along the street (alley) where many shops/restaurants are located (Figure 7.14), so that ecomobility-related events can be a more inclusive community practice rather than the cause of conflict (CNCR, 2017a).

Figure 7.10 Unique bikes used for car-free day in Haenggung-dong

Figure 7.11 A resident carrying with a bike

Figure 7.12 Flea market during car-free day in Haenggung-dong

Figure 7.13 Transportation car restricted during car-free day in Haenggung-dong

Figure 7.14 NCR activities of street greening in Haenggung-dong

Such community-led car-free activity was implemented in 20 neighbourhoods (as of 2018) with institutional and financial support of the Suwon Government within the program of 'Ecomobile City', which includes management of administrative procedure for permission to use car roads (by the Police) and non-earmarked subsidy for each car-free day (5 million Won; 0.4 million euro each) within budget management of the Neighbourhood Community

Service Centre (Nam, 2017; SG, 2018; U5). One remarkable case is the 'Dreaming Bicycle' of Geumgok-dong that has actively delivered sustainability-oriented community practices, considerably enabled by devoted, competent resident leaders. Their bi-monthly car-free day and yearly bike cinema have clearly aimed to reduce CO_2 emissions by substituting car use with bike riding on the one hand, and the other hand, to create a platform for communication among resident groups as well as with residents (CNCR, 2017a). By virtue of relatively young residents (in their 30s-40s), creative ideas were applied to such events in order to attract interest and raise awareness, including radio broadcasting (sharing the purpose of the events, encouraging participation in environment-related activities such as carbon point program), movie screening with the electricity from bike riding (Figure 7.15), and oven cooking with solar energy (CNCR, 2017; Han, 2018; L4).

Figure 7.15 Movie screening using electricity generated from bike-riding in Geumgok-dong (Source: Han, 2018)

In summary, the established NCR resident groups and their knowledge and experiences learnt from yearly NCR projects have developed a solid foundation for community-based experiment in diverse action domains, including: household/community gardening using rainwater (*Rain-city*), neighbourhood-based car-free day (*EcoMobility*), household/community solar energy generation (*CSE*). Such CoP experimentations have addressed innovations in multiple dimensions, such as social inclusion and community formation (food growing and sharing through rainwater-use gardening), neighbourhood regeneration (revitalisation of neighbourhood shops/restaurants), and economic innovation (neighbourhood community fund in Hwaseo 1-dong, household business on solar energy generation). In addition, these solutions have helped not only environmental improvement (reduction of water and energy consumption and car use), but also social and economic development (community building and integration, creation of household/neighbourhood

business). In particular, support from diverse stakeholders has accelerated community activities, through arranging institutional and financial groundwork (Suwon Government responsible teams, Centre for NCR), as well as providing neighbourhood-level intermediation (Neighbourhood Community Service Centre of Haenggung-dong in 'car-free days', and of Hwaseo 1-dong for the Resident Solar Energy, and the EcoMobility Neighbourhood Centre in the *EcoMobility Festival*). Overall analysis, significantly, highlights the critical role of NCR in empowering diverse CoPs (including NCR resident groups in every neighbourhood) with a range of support for autonomous activities in diverse action domains, which helps complement the limit of government-led approach (*Rain-city*).

7.2   Supportive regulatory framework and inclusive planning for community-based activities

In accordance with the Eco-capital Declaration (SG, 2011c) to transform Suwon from grey city to green city, the Eco-capital Plan (SG, 2012a) was established and revised conceptually founded on environment-related regulatory frameworks (municipal framework ordinance on the Environment, SD, and LCGG (low carbon green growth) (SG, 2010b, 2015b, 2017m)), which command to build an ecological, low-carbon city based on citizen participation (Figure 7.16). Strongly backed by political will of the Yeom Administration, 'environment-friendly planning' was set as a primary planning principle of Suwon's 2030 Plan, which calls upon minimisation and/or optimisation of definite resources (water, land, energy), as well as conservation, expansion, maintenance of natural environment, ecological system, green space (SG, 2014g, p. 9). Furthermore, many strategic projects that were included in the revised Eco-capital Plan have been integrated into Primary Policy Tasks of Suwon Government (2010-14-18-22), which address diverse areas of green transportation (trams, public bikes, urban railway network, and pedestrian environment), resources (rainwater and waste management, renewable energy), and urban spaces (streams, urban forest, ecological parks, green building) (GGC, 2014, 2018; SG, 2019b).

Vision	A sustainable city where human and nature coexist : reduction of GHG emissions by 40 percent by 2030 compared with 2005 levels

Goals	Ecological city	Climate-safe, low-carbon city	Inclusive governance city

Strategies	• Resource circulation • Carbon sink • Urban ecological agriculture	• Sustainable urban space • Green transportation • Energy sufficiency	• Citizen participation • Environmental education • Green lifestyle

Figure 7.16 Eco-capital vision, goals, and strategies (2012)

(Source: SG, 2012a)

In delivering these projects, the Suwon Government strategically established a complex building where the city's sustainability-oriented organisations were brought to communicate and cooperate more closely in exchanging not only knowledge but also personnel, as reflected in its name, 'Together Park' (SG, 2016g). In 2016, the Park was renovated to accommodate organisations including the sustainable city foundation (SSCF), sustainability council (SCSD), policy research institute (SRI), as well as an international partner (ICLEI South Korea Office). They have conducted diverse forms of inter-organisational collaborative works, such as SRI-SSCF issue-driven planning on urban regeneration and NCR, SRI-ICLEI joint report on Suwon's SDG 11 implementation, and SRI-SCSD master plan on sustainability (on the process as of 2018). Furthermore, the Park has been openly used as a gathering place where traditionally marginalised stakeholders in urban development such as CSOs and citizens are encouraged to take part in diverse stages of policy making process (E2; I1; I3), through the format of knowledge sharing with the public sector and experts (e.g. Citizen Autonomy School by SRI), as well as capacity building for sustainability-related CoP experiments (e.g. CSO incubation by SCSD, sustainability study course by SSCF). In addition to the Park as a place of policy making, the Suwon DoDream Centre was launched in 2014 as a laboratory to translate such policy ideas into a range of experimentations, such as energy-saving architecture combining green wall and green roof system with renewable energy generation, as well as rainwater management (Figure 7.17) (DoDream, 2018; U12).

Figure 7.17 *Suwon DoDream Centre (aerial view; drawing)*
(Source: DoDream, 2018)

Among others, rainwater-related experimentation has been largely dependent on, and advancing along technical development, which therefore requires expertise and knowledge of policy makers and engineers. The *Rain-city* first started with a simple technology that stores rainwater for the purpose of watering, cleaning, and flushing in public buildings (Suwon Sports Complex) as well as houses (Figure 7.18). These practices were built on the enactment of the national Act on Promotion of and Support for Water Reuse (2011), and Municipal Ordinance on Water Circulation (2009)[49] and its Municipal Rule (2012) (Table 7.3). They aim to promote sustainable water management through building water circulation system, and accordingly provides subsidies on installation of rainwater management facility (small-scale) as well as on reduction on water rate to those who install such facility (SG, 2012, art. 15). Commanded by the ordinance, a master plan (2011) was established by the public sector and the Rainwater Research Centre, and furthermore, a series of rainwater-related researches have been conducted, for example, rainwater management for (ultra)fine dust (PM2.5/10) reduction in the school walkway as a 'living laboratory' designed by the SRI (D. Y. Kim, 2018).

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[49] The Municipal Ordinance on Water Circulation was enacted in 2009, based on the national Water Supply and Waterworks Installation Act (art. 14; 16), the Sewerage Act (art. 2), and the Groundwater Act (art. 2), and later revised in 2012, following the enactment of the national Act on Promotion of and Support for Water Reuse (2011).

| Fence | Box | Pot | Pergola | Connected system |

Figure 7.18 Types of small-scale rainwater storage (Source: SG, 2018)

Table 7.3 Overview of municipal ordinance (rule) on water circulation

Municipal Ordinance (rule) on Water Circulation	
Art. 1 Purpose	Establishing water circulation system through rainwater management
Art. 2 Definition	Rainwater management includes: utilisation (collection and use); storage (runoff control); infiltration
Art. 6 Mater plan	Every 10 year
Art. 8 Committee	Water Circulation Committee deliberating on related policy
Art. 10 Installation of rainwater utilisation facility	Advised to install rainwater utilisation facility in: 1) stadium, gym, public lavatory, commercial building; 2) house, public building (Rule: Art. 3/4 on installation/maintenance)
Art. 12 Installation of rainwater storage/infiltration facility	Advised to include rainwater storage/infiltration facility in: 1) tourist complex; 2) urban development; 3) industrial complex; 4) terminal complex; 5) housing development (Rule: Art. 3/4/5/6/7 on installation/maintenance)
Art. 15 Financial support	On installation of rainwater management facility, by: 1) reduction of water rate; 2) remission of floor area ratio; 3) provision of rainwater point (Rule: Art. 10/11/12)
Art. 17 R&D promotion	1) development and pilot project of related technology; 2) dissemination of rainwater management facility; 3) pilot project suggested by the business sector
Art. 19 International cooperation	Provision of institutional and financial support for related project/activity in cooperation with international organisations

(Source: own compilation based on SG, 2012a, 2012b)

In 2014, as the first rainwater pilot project of ME, the Jangan district office was renovated with a range of rainwater management facilities including storage tanks, and permeable ditch and pavements (blocks) (Figure 7.19), and as a result, of which operation contributed to increased rainwater infiltration (by 66%) and decreased rainwater runoff (by

50%) (SG, 2014b). As included in the Primary Policy Tasks of Suwon Government, the *Rain-city* was furthermore expanded in scale (increased budget from the Ministry of Environment, broaden range of engineers and experts), as well as in project areas (renovation of public buildings using low impact development (LID) and green infrastructure (GI) (Figure 7.20), road sprinkling system using rainwater for cleaning and cooling in summer, and in winter, snow removing with liquid de-icing material (Figure 7.21). Once again as the ME project ('Water Circulation Leading City'), an amount of 30 billion Won; 22.5 million euro was invested to establish an area applied with a range of rainwater facilities in open spaces (parks, forests), public buildings (art centre, Neighbourhood Community Service Centre, library), business district (traditional market, subway station), and housing district. With the coordination of Environment Policy Division of Suwon Government, engineers from diverse fields conducted analysis on soil and geology, landscape, water resource and quality, as well as preliminary and working design which is planned to bring benefits of reduced water rate, urban heat island, non-point pollutants, flood damage, and CO_2 emissions (SG, 2017d).

Figure 7.19 Permeable pavements (blocks) in Jangan district office (Source: SG, 2014)

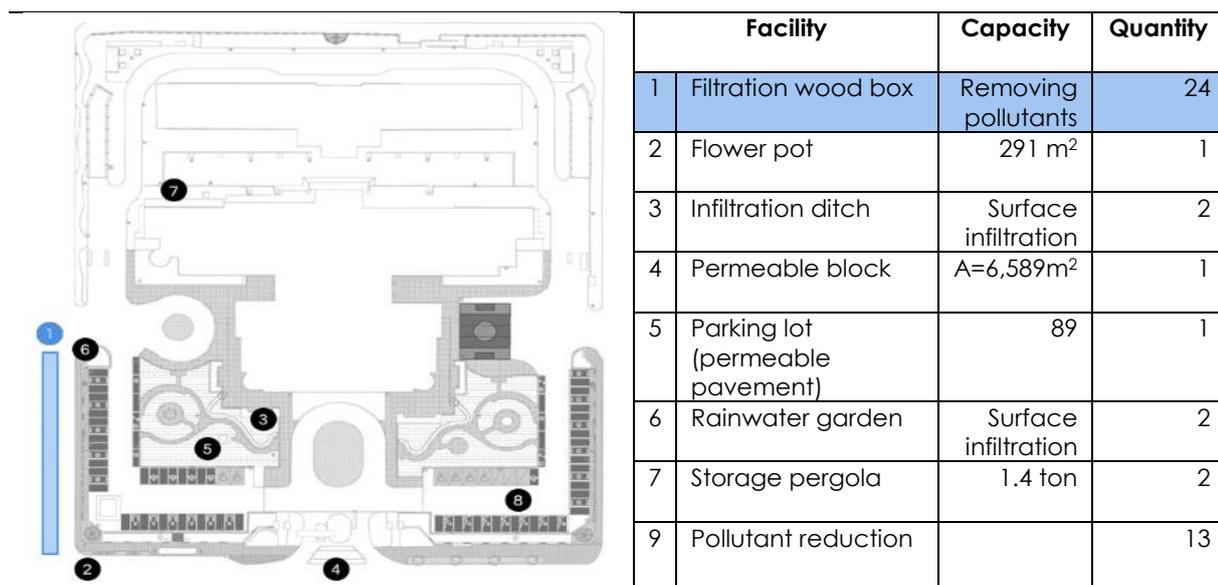|	Facility	Capacity	Quantity
1	Filtration wood box	Removing pollutants	24
2	Flower pot	291 m²	1
3	Infiltration ditch	Surface infiltration	2
4	Permeable block	A=6,589m²	1
5	Parking lot (permeable pavement)	89	1
6	Rainwater garden	Surface infiltration	2
7	Storage pergola	1.4 ton	2
9	Pollutant reduction		13

Figure 7.20 Overview of rainwater facilities in Suwon City Hall (Source: SG, 2018)

Figure 7.21 Road sprinkling system using rainwater (left) and liquid de-icing material (right) (Source: SG, 2018)

In line with the city's emerging strategic agenda that is set to build a 'smart city', the Suwon Government has made an experiment on innovative, creative rainwater management which is enabled by GIS-based big data collection, monitoring, and remote control combined with ICT/IoT[50] (Park, 2018). The basic idea of *Smart Rain-city* is to bring data of rainwater management facilities (storage and infiltration) in Suwon to one main system via internet for real-time monitoring and remote control via computer and smart phone (Figure 7.22). Utilising the established rainwater facilities, a road sprinkling system is connected to a sensor that measures road surface temperature and snowfall level based on which stored rainwater in the tank is automatically sprinkled on the road for cooling and de-icing, the respectively, and also in the same way, a standing sprinkler for air cleaning based on (ultra)fine dust density and air quality (Figure 7.23). Guided by goals of reducing GHG emissions (by 20% by 2020) and increasing water self-reliance (to 30% by 2020), a series of rainwater-utilising solutions are being designed in collaboration among the public sector, researchers, engineering companies, as well as rainwater-related international institutions, which include Rainwater Car Wash, Clean Road (rainwater channel in housing areas), Clean Air Mist (rainwater sprinkling for (ultra)fine dust removal), and City Tree (bio-tech filter to quantifiably improve air quality by absorbing CO_2) (Figure 7.24) (SG, 2018p). The overall *Rain-city* project is summarised in Table 7.4.

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[50] Internet of Things (IoT) refers to a network of computing devices, and in the broadest sense, connectedness of things to the internet.

Figure 7.22 Smart *Rain-city* design for Suwon City Hall based on data collection, monitoring, and remote control (Source: SG, 2018)
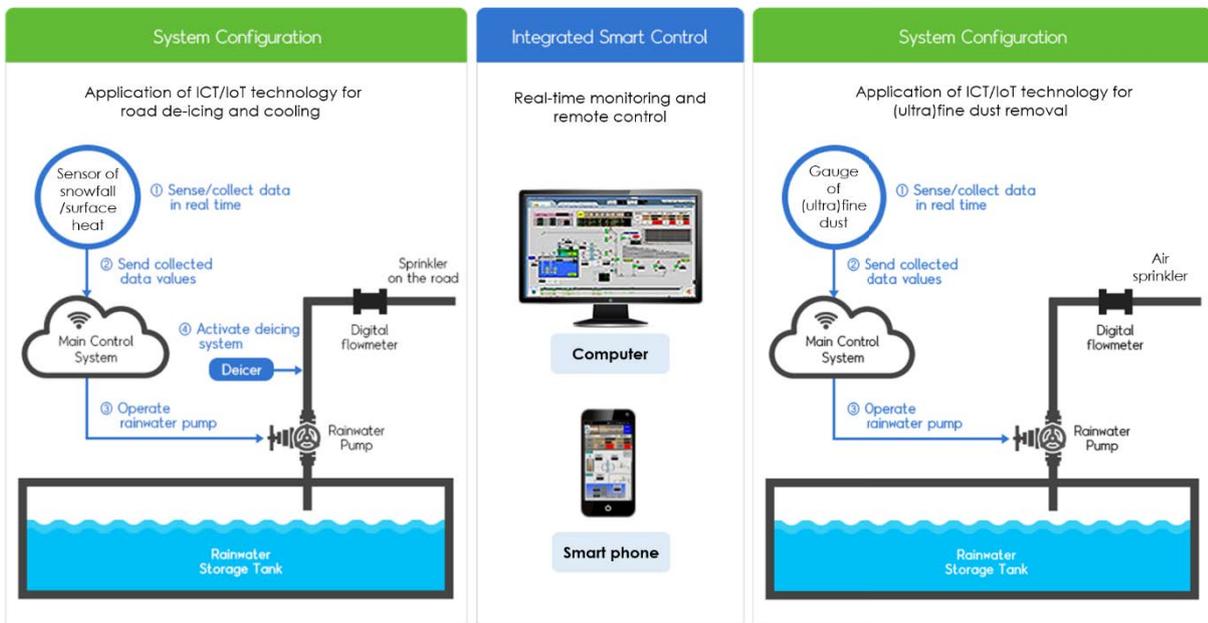

Figure 7.23 ICT-/IoT-based rainwater system for road de-icing and cooling (left) and (ultra)fine dust removal (right) via computer and smart phone (Source: SG, 2018)

Figure 7.24 City Tree design using rainwater (left) and its application (Smart Eco Station; right) (Source: SG, 2018)

Table 7.4 Overview of Rain-city season 1-4

	Project	Location	Finance	Facility
Season 1 (2009-14)	Rainwater storage	Suwon Sports Complex	5.4 billion Won; 4.06 million euro	Storage, infiltration ditc
	Green Rainwater Infrastructure	Jangan District Office	2 billion Won; 1.5 million euro	11 types of rainwater management facility
	Small-scale (0.5-2 tons) rainwater storage	Houses, public spaces	Subsidy on 90% of installation cost up to 10 million Won; 0.75 billion euro /house	93 facilities (2012-17)
Season 2 (2015-16)	LID and GI	Suwon World Cup Stadium, and around	1 billion Won; 0.75 million euro	6 types of rainwater management facility
		Suwon City Hall, and around	2 billion Won; 1.5 million euro	9 types of rainwater management facility
	Road sprinkling system	Gwanggyo New Town (GNT)	312 million Won; 0.23 million euro	302m, a capacity of 20 tons
Season 3 (2017-2020)	Water Circulation Leading City	Woncheoli Stream basin (five neighbourhoods)	30 billion Won; 22.5 million euro	Integrating rainwater management facilities; In progress
Season 4 (2018-)	Smart Rain City	Various (e.g. Gwanggyo New Town (GNT), Suwon World Cup Stadium)	5 billion Won; 3.75 million euro (confirmed) and expanding	ICT-/IoT-based rainwater solutions (road de-icing and cooling; air quality improvement and CO_2 reduction)

(Source: constructed by the author based on SG, 2014, 2017b, 2017a, 2018b, 2018a; KISD, 2017)

The *CSE* is another case that has been largely facilitated by the national institutional framework on renewable energy, in accordance with the changed policy direction of the new government to increase the country's proportion of generated renewable energy to 20% by 2030 (set within the 3020 Renewable Energy Implementation Plan, hereafter RE3020) (MOTIE, 2017b). This goal is to be achieved by transforming energy system particularly through

solar/wind energy generation by citizens [51]. It, accordingly, has encouraged different participatory models based on power exchange system (Figure 7.25), including household solar energy generator (a total of 2.4 GW generation from 1,560,000 plants by 2030)[52] in combination with the power exchange mechanism of SMP (system marginal price)[53] as well as regulatory improvement such as reimbursement of the amount of secondary power left from the consumption, and inclusion of apartment house (MOTIE, 2017b, pp. 1–5). In addition, another trade scheme of 'renewable portfolio standard (RPS)' was introduced in 2012 that obligates electricity supply companies [54] to produce a specified fraction (within 10%) of electricity generation from renewable energy sources (MOTIE, 2014a, art. 12.5, 2014b). This scheme is combined with the 'renewable energy certificate (REC)' purchased by the RPS-obliged companies as an alternative to their own power generation[55] (MOTIE, 2014, art. 12.7).
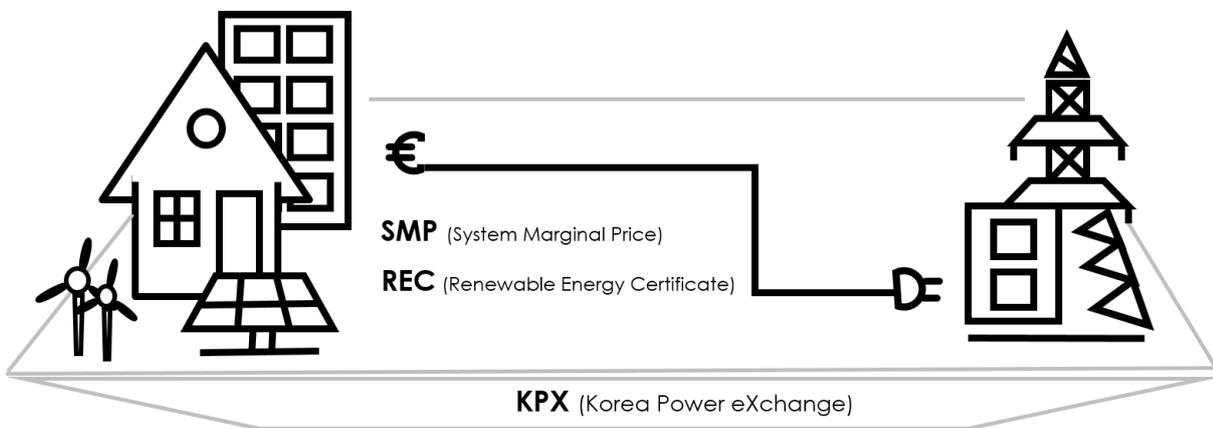
Figure 7.25 Illustration of renewable energy exchange between private/household plant and electricity supply company (Source: designed by the author)

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[51] As of 2016, three quarters of renewable energy were composed of waste (58%) and bio (16%) energy, and by 2030, solar and wind energy take up 95% of renewable energy generation (MOTIE, 2017b, p. 1).

[52] A unit of power equal to one billion (10^9) watts; 1 GW is the power generated by 3,125 million PV panels (size of 320 watts) (Mueller and Rumph, 2018).

[53] SMP (system marginal price) is the price of electricity power (generated from renewable energy sources) purchased by the South Korea Electric Power Corporation (KEPC) (MOTIE, 2009, art. 31.4.3); as of 2018, 1 kW is 95.16 won (KPX, 2019).

[54] As of 2018, 21 electricity supply companies who operate plants over the size of 0.5 million kW are obliged to follow the RPS (Government 24, 2018).

[55] The REC is issued by the South Korea Energy Agency (KEA) and traded within the South Korea Power Exchange (KPX); as of December, 2016, 16,890 members joined the REC, and 285,407 REC were traded at average standard price of 167,834 won (1 REC is 1,000 kW) (KPX, 2017).

In particular, this citizen-generating energy model has been coupled with the organisational form of 'cooperatives' which can be established with corporate personality by participation of minimum 5 members (MOEF, 2012). The corporative model is operated by investment and management of members on renewable energy generation, and of which profits are either distributed to the members in accordance with the investment, or fully returned to the operation of the corporative to fulfil the purpose (non-profitable type of corporative, 'social cooperative'), while all members have equal voting right independent of the amount of investment they make ('one person, one vote') (MOTIE, 2017b, p. 4). Considering the challenges of promising profit stabilisation, the RE3020 has introduced the system of FIT (Feed-In Tariffs) which guarantees a 20-year contract of small-scale (less than 30 kW) and cooperative (less than 100 kW) solar businesses with the 6 electricity supply companies without bidding and at a fixed price, as well as a weighting scheme that grants higher weight on the corporative model for the REC (higher chance for a successful bid in the power exchange market) (MOTIE, 2017b, 2018).

Table 7.5 Regulatory frameworks for citizen-generating renewable energy

	Legislation	Plan/Regulation
Renewable energy generation	• New and Renewable Energy Act/Enforcement Decree[56]	• The 4th Master Plan on New and Renewable Energy • 3020 Renewable Energy Implementation Plan - expansion of renewable energy generation to 20% by 2030
Renewable energy exchange	• Electric Utility Act (art. 31.4.3) • New and Renewable Energy Act/Enforcement Decree • Guidance on Power Exchange of Small-scale New and Renewable Energy Generation • Guidance on Management and Operation of Renewable Portfolio Standard (RPS)	• SMP (System Marginal Price) - power exchange between private/household plant and the South Korea Electric Power Corporation (KEPC) • RPS (Renewable Portfolio Standard) with REC (Renewable Energy Certificate) - power exchange between private/household plant and electricity supply companies • FIT (Feed-In Tariffs) with REC - guaranteed 20-year contract on power exchange at a fixed price

(Source: constructed by the author)

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[56] See Footnote 6 for differentiated definition of new and renewable energy.

This set of national regulatory frameworks has built a strong foundation for both the establishment of the SCSE-SC (non-profitable corporative) and its solar energy generation from operating a total of 10 solar plants (as of 2018) of which profits are earned with the combination of SMP and REC (SG, 2017k). Based on the yearly working plan of the SCSE-SC, the profits, then, are partly reinvested for the expansion of solar plants, and partly used for the purpose of social welfare such as paying the electricity charge of low-income households ('Sharing Solar Energy', Figure 7.26) and of neighbourhood development ('Resident Solar Energy', see Chapter 7.1 for more details). Founded on Suwon's energy master plan which envisions participatory energy system built on citizens' power plants (SG, 2017l, p. 139), and the government's Primary Policy Task of 'Transformative city' which calls upon household/private energy generation (SG, 2018j), the Suwon Government (New and Renewable Energy Team) has cooperated by providing sites for constructing solar plant, as well as supporting some fraction of operational cost by attracting the provincial and national finance and also by establishing a fund from the REC profits of the public power plants (SG, 2018, art. 36, 37). Furthermore, the Social Economy Centre (SEC) within the SSCF has provided the support of establishing an enabling environment for their operation and expansion (including the provision of workspace (office) for (social) cooperatives/enterprises for network), and by providing educational courses and counsels regarding administrative and operational matters (SSCF, 2018c).

Figure 7.26 Sharing Solar Energy plants built on the parking lot (left) and the rooftop (right)

(Source: SCSE-SC, 2017)

Whereas *Rain-city* and *CSE* have been largely developed in accordance with the national institutional framework with considerable financial investment (of the ME), the *EcoMobility* has been driven more independently by urban-level stakeholders. Built on ideas of visualising a neighbourhood with no cars (suggested by the ICLEI), the Suwon Government

worked on establishing an institutional and regulatory foundation which is oriented to address triangular objects of awareness-raising, infrastructural reformation, and lifestyle change (as discussed in Chapter 6.1). One year before the *Festival*, a household survey was conducted targeting 4,600 residents of Haenggung-dong, in order to understand their awareness of, and expectations from the *Festival*, as well as to investigate on residential environment and household travel, and of which results show that 'narrow sidewalks are problematic with parked cars (34.4%) and 'streets are unsafe for pedestrians (20%) (SG, 2012b). In parallel, a diversity of stakeholders joined in redesigning Haenggung-dong as a pedestrian-centred neighbourhood with the municipal investment of 94 billion Won; 71 million euro, through widening the sidewalk and narrowing the car road (in combination with laying utility poles underground) (Figure 7.27), refurbishing alleys with flower beds and façade improvement, and greening the street with community gardens and parks (SG, 2012d).

Figure 7.27 Redesigning Hwaseomoon-ro: before (left) and after (right)

(Source: SG, 2018)

Founded on the combination of survey result, neighbourhood redesigning plan, and resident opinions from a number of meetings and discussions, a master plan was established which specified the outline framework of the *Festival* (Table 7.6) and its concrete work plan, including design of the project area and streets (Figure 7.28), management of participatory programs in connection with cultural and historical heritage of the neighbourhood (Figure 7.29), the arrangement of financing and labour force (citizen/e-supporters, citizen volunteer group) (SG, 2012c). These practices were further developed by the enactment of the Municipal Ordinance on EcoMobility Neighbourhood (SG, 2013a), which enabled the creation of EcoMobility Team who is assigned to support not only establishment of ecomobile environment (infrastructure reconfiguration, vehicle provision), but also transformation of

urban transportation system (art. 5), and therefore to bring lifestyle change of citizens in the long-term continuing after the one-month project.

Table 7.6 Overview of master plan on *EcoMobility* pilot project

Master Plan on EcoMobility Pilot Project	
Background	Urban transportation challenges induced by car-centred system and culture (increase in car ownership by 5 times since 1980)
Outline	A global showcase of future mobility for governments, NGOs, businesses, researchers, cyclists and pedestrian associations throughout the month-long program containing conferences and forums, educational and informational activities, vehicle experiences, ecomobile neighbourhood tours
Purpose	• To present an image of the ecomobile future to other cities, urban planners, and policy makers as a bold departure from car-centric urban design • To let citizens be aware of the needs of ecomobile life, and motivated to continue the changed life as an ecomobile neighbourhood with the means of urban regeneration

Definition of ecomobile system	• A broad concept that encompasses:
	  - ecomobile transport means (walking, bike, electric vehicle, public transport, and combination and Intermodality of them)
	  - sharing of transportation (car, bike)
	  - ecomobile environment (infrastructure)

Area and period	• Area: Haenggung-dong (Jangan and Shinpoong)
	  - 0.34 km², 4,300 residents, 1,500 cars, 2,300 businesses
	  - various types of street (2-/4-lane expressway, side streets, alleys)
	  - flatland suitable for walking and ecomobile vehicles
	  - surrounded by historical and cultural heritage
	• Period: September 1 - 30, 2013

Budget	9 million euro

Program	• Ecomobile neighbourhood
	  - ecomobile vehicles (free rent of bicycles, electric scooters/bicycles; mail and parcel delivery by electric vehicles; a 24-hour emergency service via electric shuttles)
	  - reconstruction of streets and environment suitable for walking and ecomobile vehicle
	• Citizen participation
	  - cultural and tour programs led by resident groups (e.g. alley walking/wheel chair tour with cultural events, ecomobile vehicle tour around Hwaseong Fortress, concerts and performance, exhibition and art class)
	• Neighbourhood economy
	  - a coupon for neighbourhood shops/restaurants (200,000 euro in value)

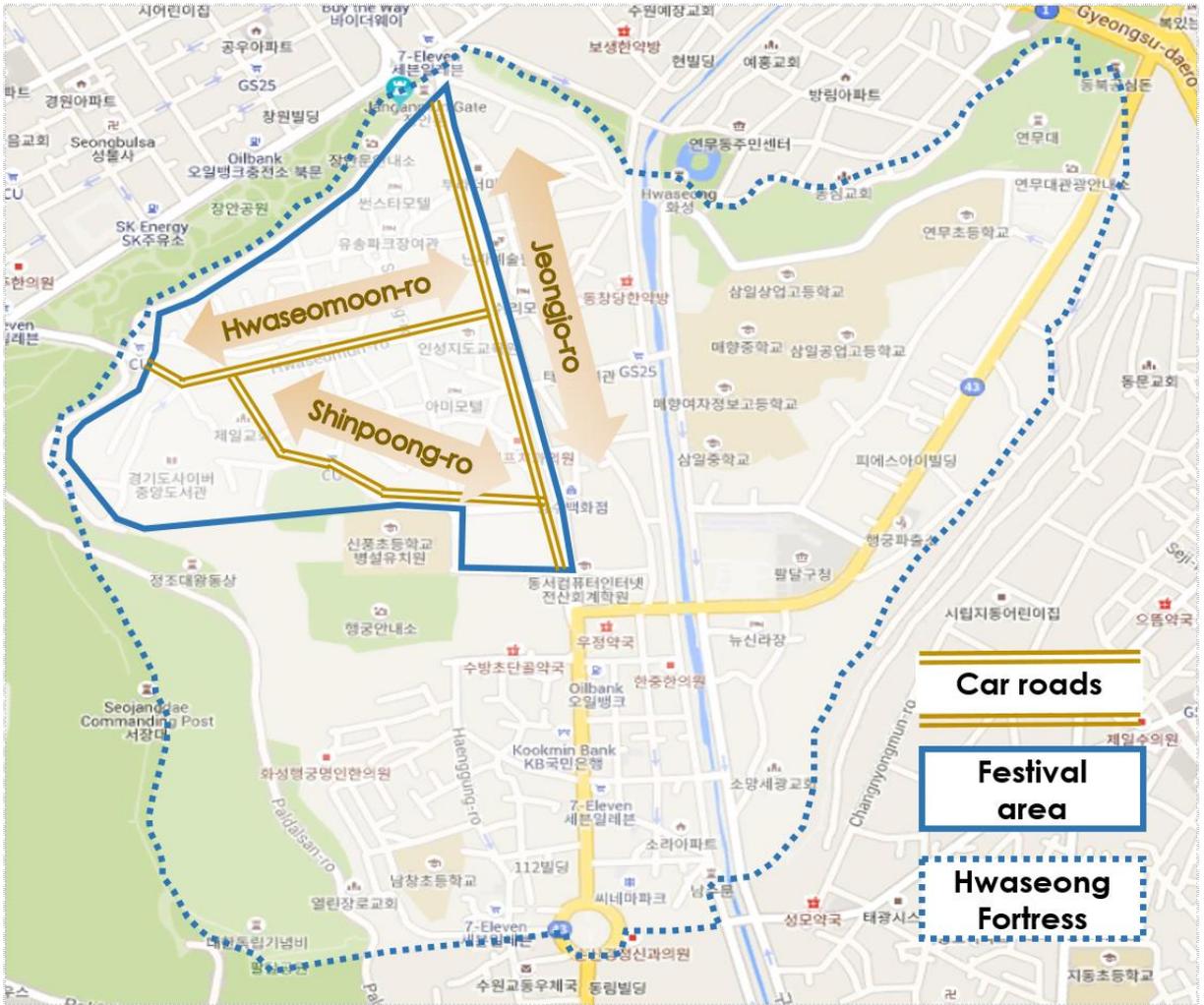(Source: own compilation based on SG, 2012)

Figure 7.28 The *EcoMobility Festival* area and streets within Hwaseong Fortress

(Source: designed by the author based on Imagery, Digital Globe, 2017; Map data, SK telecom, 2017)

Figure 7.29 Bike tour along the Hwaseong Fortress (left) and alley walking tour (right)

(Source: GTO, 2013)

The *Festival* has motivated the development of interconnected and intermodal transport system which increases interconnectedness among vehicles, especially between public transportation means (urban railway, subway, bus, and tram), and also with biking and walking (H. S. Park, 2013; Eun and Chung, 2014; Valmero, 2015; OECD, 2017b). Included in the 2030 Plan and the Primary Policy Tasks of the Yeom Administration (Table 7.7), a range of transportation projects have been planned and in progress, including: establishment of a grid railroad network connecting 5 operating lines and 7 lines that are included in the national railway plan to be opened or under consideration (Figure 7.30) (MOLIT, 2011; SG, 2014g, 2014d; MOLIT, 2016a; SG, 2018k, 2019a); operation of a tram (urban railway) in combination with a transit mall in order to connect 5 railway lines and a hundred of bus lines (Figure 7.31), enabled by coordination of the Urban Railway Team (Suwon Government) and Suwon Assembly in revising related national legislation (Table 7.8); construction of Suwon Transfer Centre (in operation since 2012) which integrates intra-/inter-city buses and railways, cars, and bicycles (SG, 2018h); and facilitation of bike riding through infrastructural improvement (bike road expansion, bike rack installation) and public bike sharing (station-free rent-a-bike based on GPS, Figure 7.32) (SG, 2014c, 2018i).

Table 7.7 Overview of projects oriented to interconnected transport system

Project	Plan	Legislation	Finance
Grid railway network	(National) • 2nd/3rd national railway network plan (Suwon) • 2030 Plan (2014) • The 6th/7th government Primary Policy Task (2014-22)	(National) • Railroad Construction Act (2005), article 4	5.8 trillion Won; 4.4 billion euro – national/provincial /municipal/private (spent on Sooin, New Suwon, New Boondang)
Urban railway (tram)	(National) • Gyeonggi Master Plan on Urban Railroad (2013) (Suwon) • 2030 Plan (2014) • The 5th/6th/7th government Primary Policy Task (2010-22)	(National) • Urban Railroad Act (2016; revision), art. 18.2 • Railroad Safety Act (2017; revision), art. 45 • Road Traffic Act (2018; revision), art. 2.17 • Enforcement Rule on Construction and Operation of Urban Railway (2018)	170 billion Won; 130 million euro – national/municipal /private

Project	Plan	Legislation	Finance
Transit mall		(National) • Urban Traffic Improvement Promotion Act/ Enforcement Decree (2013/2014; revision), art. 33.8/14.2 • Act on the support and promotion of utilisation of mass transit system (2008; revision), art. 12.5	20.4 billion Won; 15 million euro – national/municipal
Suwon Transfer Centre	(Suwon) • 2030 Plan (2014) • The 6th government Primary Policy Task (2014-18)	-	67 billion Won; 50 million euro – national/provincial /municipal
Bike	(Suwon) • 2030 Plan (2014) • The 5th/6th/7th government Primary Policy Task (2010-22)	(Suwon) • Municipal Ordinance on Facilitation of Bike Use (2015)	30.7 billion Won; 23 million euro - national/provincial /municipal/private

(Source: constructed by the author based on GGC, 2014, 2018; SG, 2014, 2019)

Table 7.8 The revision of national legislation related to the operation of trams

Legislation	Revision	Responsible ministry
Urban Railroad Act (rev. 2016)	(Article 18.2) Allowing the construction of rail track for trams on the road	MOLIT
Railroad Safety Act (rev. 2017)	(Article 45) Changing the 'safety range' (distance between the railway and passenger) from 30m to 10m	MOLIT
Road Traffic Act (rev. 2018)	(Article 2.17) Including trams in the range of road vehicles	National Police Agency

(Source: constructed by the author based on MOLIT, 2016, 2017; NPA, 2018)
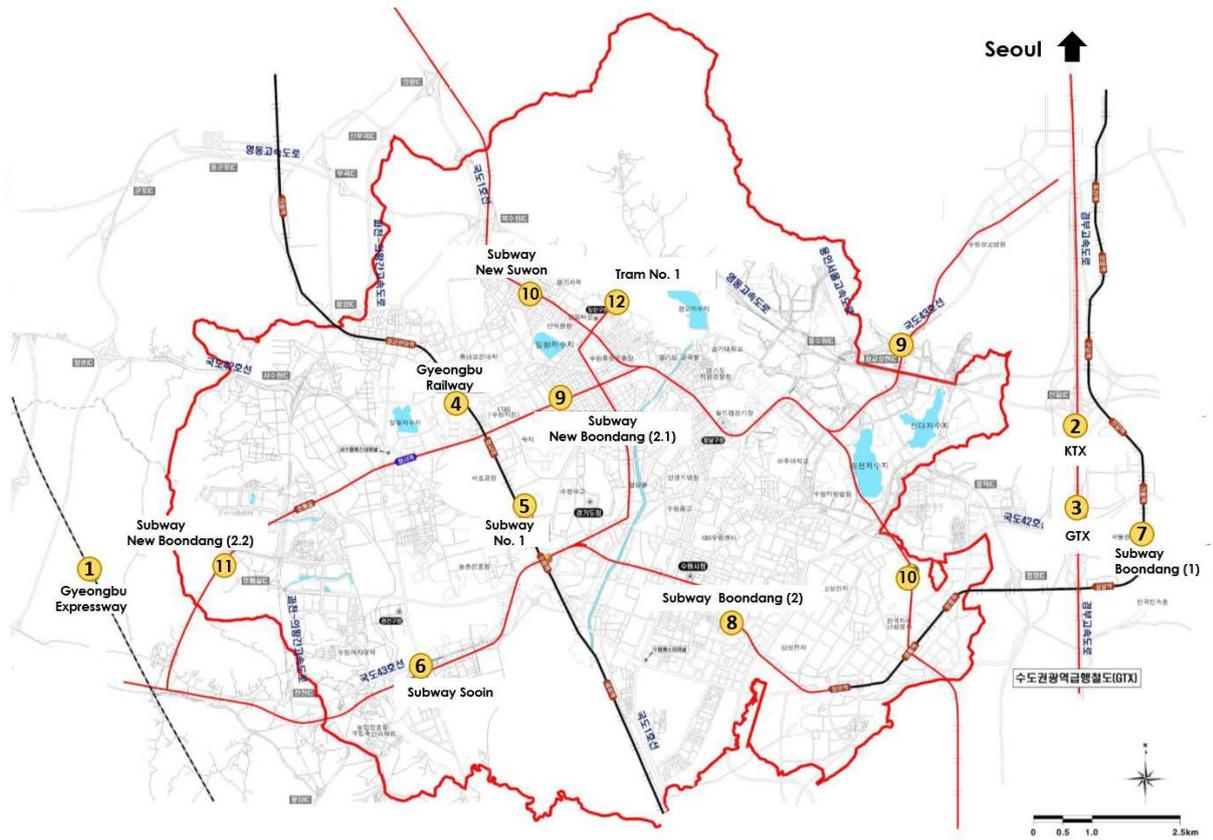
Line		Status (as of 2018)
Express railway	① Gyeongbu Express Railway	In operation
	② South Korea Train eXpress (KTX) (from Suwon)	Under construction
Intercity railway	③ Great Train eXpress (GTX)	Under construction
	④ Gyeongbu Railway	In operation
Railway (Subway)	⑤ Gyeongbu (No. 1)	In operation
	⑥ Sooin	Under construction
	⑦ Boondang (extension, phase 1)	In operation
	⑧ Boondang (extension, phase 2)	In operation
	⑨ New Boondang (extension, phase 2.1)	Under consideration
	⑩ New Suwon	Under contemplation
	⑪ New Boondang (extension, phase 2.2)	Under consideration
Urban railway	⑫ Tram No. 1	Under contemplation

Figure 7.30 Plan on establishing a grid railway network in Suwon

(Source: own compilation based on SG, 2014, p. 189, 2019)
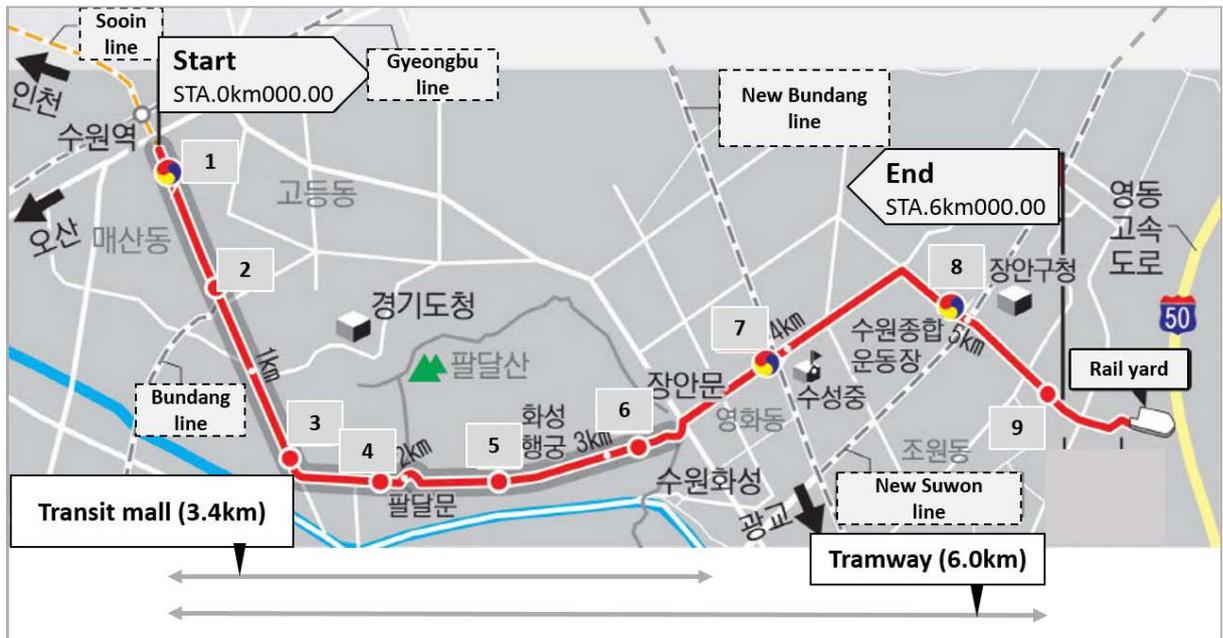
Figure 7.31 A design plan of tram line including a transit mall

(Source: own compilation based on SG, 2018)
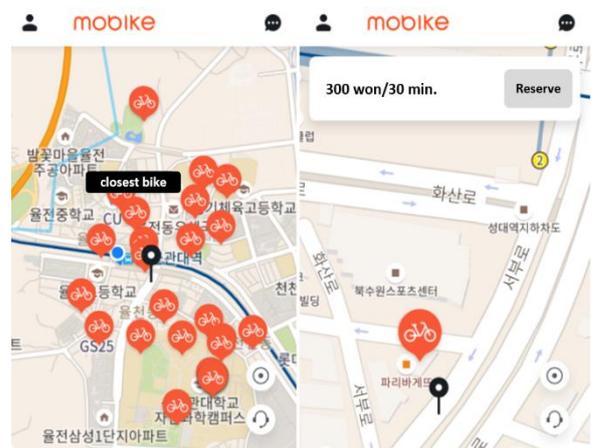
Figure 7.32 Public sharing bike parked in front of the Hwaseong Fortress (left) and screenshot of mobile rent-a-bike application (right) (Source: Suwonlove, 2018)

In summary, the government sector (national and urban government) has played a critical role in establishing regulatory frameworks by which stakeholders share and/or enable access to basic resources (human, knowledge, organisational, financial and technical) so as to support transformative actions and to remove innovation barriers. In particular, related legislation (national act and municipal ordnance) has laid a legal foundation to arrange concrete work plans (master plan, project design and implementation). This work, then,

contributed to establishing an enabling environment through: financial support for project expense (installation of rainwater management facility and solar plant, and neighbourhood-level infrastructural reform and CoP activities) and subsidy (household-scale rainwater/solar facility installation, water/electricity rate reduction); organisational support (Suwon Government teams responsible for respective projects); and institutional arrangements (national-level regulations on power exchange and incentive for household/corporative energy generation). Given the country's legal system which requires national legislation as a precondition for the enactment of municipal ordinance, interaction with the national government sector is key to enabling and facilitating urban and neighbourhood transformative actions, as will be mainly discussed in Chapter 8.

7.3   Conclusions

Drawing upon the empirical analyses (also summarised in the last paragraphs of Chapters 7.1–7.2, respectively), some findings were derived. Building up an *enabling environment* in terms of organisational/financial/institutional/legislative arrangements is largely dependent upon the degree of interaction with national entities. Therefore, urban-level actors have less influence in autonomously establishing a transformational institutional environment for community-based actions—even at the urban level. With regard to policy implications, community-led experimentations are considerably enabled by a strong commitment of *'the public sector'*, notably the local government and intermediary organisations. They not only empower CoPs in the process of formation, but also arrange for constructive regulatory, financial, and organisational foundations. They also provide practical (on-site) intermediation for activities. Such community-based, innovative actions have been primarily observed in the geographical territory of the *neighbourhood*, within which community members interact with less geographical distance and more emotional solidarity. The national government (and related ministries) has played a critical role in creating an enabling environment (particularly in terms of legislative and financial aspects) for urban transformative actions, and also in cooperating with local governments for place-specific adjustment (as will be discussed in Chapter 8).

8. Multi-dimensional processes of systems change

This Chapter is devoted to analysing multi-dimensional processes of transformations that occur through interactions across human agency levels (individuals, households, social groups, organisations, and networks), and political-administrative levels and geographical scales (inner-urban, urban, regional, national, and inter- and trans-national territories and spaces). The interactions have significance in that each level of agency has respective contributions to accelerating urban systemic change, and in a similar sense, each geographical scale and administrative boundary has different limitations as well as roles in delivering transformative actions. Particularly in the South Korean context which presents characteristics of strong national centralisation, the interaction with the national-scale actors/systems (especially the government sector) plays a critical role in laying (legislative, regulatory, technical) foundations for urban-/neighbourhood-scale innovations. Findings from the analysis have implications on policy direction for future urban development, which highlight contributions of urban-scale public organisations (intermediaries) in mobilising interactions for CoP formation and their experiments particularly at the neighbourhood level, and contributions of government leaders in promoting trans-urban network for collective actions. In particular, the findings indicate the close relation of actor network forms to the objective of agency interactions.

8.1   Diverse levels of agency with different contributions

In the process of establishing the urban development model of Suwon, different types of government-invested, sustainability-oriented organisations, particularly the SCSD (Suwon Council for SD), SSCF (Suwon Sustainable City Foundation), and SRI (Suwon Research Institute) have played a significant role in developing an enabling environment for a range of transformative activities of diverse stakeholder groups (individual citizens/residents, CSOs, public officials, businesses, as well as other organisations). The Suwon Government has not only provided a legal basis of the organisations by enacting the respective municipal ordinance on their establishment including the financial support on operation, but also has arranged an integrated work space for the organisations ('Together Park') to facilitate improved interaction and collaboration among them (for example, they have launched an interaction format where the city's intermediary organisations (by the leadership of the three mentioned above)

regularly meet for discussion about partnership development to support issue-driven community activities) (Park, 2019).

The Suwon Council for SD (SCSD) has developed an interaction format where its committee members (co-chaired by CSO representatives, and composed of a diversity of public officials, researchers, CSOs as well as individual citizens) are entitled to share ideas and experiences about the tasks of establishing the Suwon SDGs as well as monitoring on their implementation based on the indicators (of which results are published in an annual 'Suwon Sustainability Report'). For doing such tasks, a range of periodical discussion meetings and workshops were arranged (by the respective sectional committee devoted to the environment, economy, and society), with an aim to strengthen the systems awareness ('which are the areas to bring changes?') and also to set the desired future pathways ('which is the direction of the changes?') (SCSD, 2017c; SG, 2018o). This effort has been collaborated with the SRI in establishing the master plan on SD (combined with a capacity building program for public officials) which addresses the policy direction for each Suwon SDG, and accordingly assigns related government teams to develop concrete work plans and strategies for implementation (Kang, 2018; SG, 2018c).

In order to translate them into action, the SCSD has provided the incubating service for newly launched (social) cooperatives/enterprises and CSOs whose activities are oriented to facilitating sustainability (particularly 10 areas of Suwon SDGs), with institutional/financial support as well as counsels concerning related regulations for the foundation and practical knowledge for practices (I1; L1; U12; SCSD, 2018). In addition, active intermediation between CSOs was a significant role of the SCSD to help build close cooperation among them in forms of forums and joint project in order to produce collaborative contribution to Suwon's urban sustainability in various areas of environment, economy and culture (SFEM, 2018b).

This role of intermediation has been expanded through the foundation of the Sustainable Suwon City Foundation (SSCF), of which aim is to accelerate sustainability-oriented actions in a more integrated and participatory manner, combining existing and newly established institutions the respectively devoted to ecological system (water supply and stream management), inclusive economy (social economy, start-up assistance), social inclusion (housing welfare, school feeding), and urban development (urban regeneration, community building) (SSCF, 2018b). Commissioned to establish a collaborative governance platform, on the one hand, the respective SSCF centres have closely cooperated with related government teams (some of which were newly organised such as Sustainability Division, Urban

Regeneration teams) as practical approaches for coalition building and decision making procedures that enable planning and mainstreaming transformative actions.

On the other hand, the platform has necessitated the development of specific measures (formats) to integrate the citizen opinions into the planning and monitoring process of the actions (Ahn, 2018). In particular, the SSCF has focused to support the formation of community groups such as the NCRC and resident group network (Neighbourhood Community Conversation), as well as (social) cooperatives/enterprises, and furthermore, to empower them by taking diverse actions to enhance the level of autonomy and feeling of self-determination such as autonomous management of one-year around NCR project across the entire process of problem finding, planning and implementation, and monitoring. Such support, however, has less addressed the knowledge management regarding systems change and desirable future directions (excluding few cases that are committed to nurture individuals as 'sustainability activist' and 'NCR coordinator'), as well as reflexivity analysis and know-how sharing among stakeholders (except the administrative report for the Suwon Government).

In contrast, the Suwon Research Institute (SRI) has significantly contributed to managing the knowledge about urban systems (including degrees of obduracy/changeability as well as systemic relations within and between systems) and about future desirable urban development, and also sharing such knowledge as open source, all of which is based on comprehensive analysis of urban spaces/development/environment/policy by the respective research teams. Such analysis is published as a range of place-based, issue-driven research/policy reports with an aim to present public policy makers a mid-/long-term future vision as well as policy direction to trigger radical departure from the current state and development path of multiple systems, and by extension, share them with multiple stakeholders (through open access to publications, public seminars, academic symposium) (SRI, 2018b). This knowledge, then, has been reflected in related government policies and work plans with institutional/financial/legislative arrangements through diverse interaction formats including discussion meetings with the Suwon Assembly concerning establishing regulatory frameworks.

In particular, the processes involved in such innovation embedding have been accompanied by actions to empower citizens and communities with enhanced knowledge and skills to autonomously solve urban challenges (through Citizens Autonomy School), and additionally, to establish an participatory platform to motivate active participation of a broad

range of stakeholders (experts, practitioners, CSOs and community groups, citizens) in delivering various joint research projects that involves the cycle of problem recognition and investigation, provision of policy recommendation, production of social service and technology) (SRI, 2018a). Moreover, the SRI researchers (by areas of expertise) have played a role of advisor to citizen-/community-driven activities (including NCR projects) based on established formal and informal (personal) networks (E2; E3). With regard to enabling the reflexivity of the city's sustainability-oriented efforts, the ICLEI South Korea Office has cooperated to develop the Suwon Implementation Report on SDG 11 for HLPF[57] as the first urban-level monitoring in South Korea, which includes reviews on 7 different targets with future plans (Table 8.1) (Lee *et al.*, 2018).

Table 8.1 Implementation status on SDG 11 in Suwon

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable		
Target	Status	Recommendation
1. Safe and affordable housing	- 5.4% of households living below the minimum housing standard - Regional disparity of residential condition (by district)	- Reducing the economic burden of housing expenses - Improvement of the residential environment of those living in dilapidated housing
2. Affordable and sustainable transport system	- 61.4% of the area is covered by bus services - Special Transport Service vehicles for disabled users (exceeding the legal standard) - Blind spots in terms of time and space	- Expansion of operation time (late-night) and area (outskirt) of bus services - Adoption of demand-responsive bus service (reservation system for overcrowded routes
3. Inclusive and sustainable urbanisation	- Considerable increase of population, building sites and roads (comparing to 1990) - Diverse channels for direct participation of civil society in urban planning and management	- Accelerating transformation of policy direction from growth-oriented to sustainable urban development - Development of evaluation indicators on citizen participation
4. Protect the world's cultural and natural heritage	- 12 regulations related to heritage conservation	- Development of citizen-participatory model for heritage protection

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[57] The High-level Political Forum on Sustainable Development (HLPF) is a subsidiary body of both the UN General Assembly and the UN Economic and Social Council, as the UN central platform for follow-up and review of the progress of the *2030 Agenda* and the SDGs by the full and effective participation of all states members of the UN (UN, 2018).

Target	Status	Recommendation
5. Reduce the adverse effects of natural disasters	- Considerable decrease of number of people affected by heavy rain - Increase of number of vulnerable group (elderly people aged 65 and over) - Establishment of related master plan	- Development of evaluation indicators on both status and policy response - Development of practical action plans and strategies (budget, infrastructure, institutional/organisational arrangements)
6. Reduce the environmental impact of cities	- Relatively lower increase rate of solid waste to the one of population - Relatively higher level of particulate matter to other cities - Improved water quality of 4 local streams	- Providing information to citizens about waste collection methods - Continuation of political efforts to reduce particulate matter, including enhanced cooperation with neighbouring cities, and with the (inter-)national level
7. Safe and inclusive green and public spaces	- 13.5% of total areas allocated for the creation of parks - Relatively lower crime rate to the national average	- Increase of green and public spaces

(Source: own compilation based on Lee *et al.*, 2018)

Basically, the *CSE* has been founded by citizen leadership and a membership-based network in which individual members are both requested to contribute to financial and operational establishment of the SCSE-SC (through making the contract on investment), and accordingly, entitled to make autonomous decision on organisational issues (e.g. selection of the directorate, consent on the expenditure) as well as project activities (e.g. solar plant construction/operation, development/provision of educational programs, cooperation with other related social groups/organisations). In addition to the leadership/membership development, the SCSE-SC has put efforts to raise citizens' awareness of current problematic energy system, and accordingly to enable them to act on bringing changes to such system to be more environment-friendly and self-reliant. With an aim to build a 'solar society' particularly of the coming future, educational programs have been conducted targeting the young generation based on close cooperation with an renewable energy-related educating organisation ('Eco Long-long') and primary schools (located in Suwon and surrounding cities) in opening a 'Visiting Energy School' program (97 schools in 2018) (SCSE-SC, 2019).

The program is oriented to provide the knowledge about current challenging status of energy system and alternatives to change the system, through delivering lectures (with a

textbook) that explain the overview of the country's (renewable) energy system (including related regulation/legislation), reviving renewable energy industries and related jobs, and options to save as well as generate energy in a daily life (especially household-scale/small-scale solar energy generation and related government support), and also experience study with solar energy related experimentations (such as solar-based, small-scale car/toy/cell). For the expansion of the activity, a training course was organised to foster citizens to work as an educator of the program (48 educators fostered and 43 working in 2018) (SCSE-SC, 2019). Furthermore, a competition for primary school students (in Gyeonggi-do) was held on ideas of responding to the future energy change through raising awareness (particularly of the youth through writings, posters and video clips) and developing a simple experiment on renewable energy generation and utilisation (SCSE-SC, 2018b).

In addition, the SCSE-SC has collaborated with neighbourhood-based community activities including the NCR, delivering renewable energy-related participatory programs such as 'energy market' that sells solar-based household items, 'energy counsel centre' for information provision about government support program (regulations on operating household-scale and small-scale solar energy generator, as well as running a private solar business), and 'energy-reliant (saving) neighbourhood' through co-producing a place-based implementation plan with interested neighbourhood groups (SCSE-SC, 2017). Such educational programs are oriented to motivating the installation of solar energy generator at the household scale, on the rooftop of single-household house (see Chapter 7.1), and on the household veranda rail (small-scale of 150-300 W) in the case of multi-household house. In facilitating the process, the Suwon Government has provided subsidises for the installation of the generator (within a range of 43-61% of installation cost depending on the size of generator and the household number of joint application), and which was developed by a private company ('Microps') who simplified the procedure of both installation (removable) and operation (with a mini, plug-in inverter that directly transfers the generated power to selected electronic products), and also adjusted the generator size fit into multi-household apartment structure (Figure 8.1) (H. S. Choi, 2017; Microps, 2018).

Figure 8.1 Small-scale solar energy generator installed on the veranda rail in two rows (left) and between floors (right)

(Source: Microps, 2018)

In contrast to the *CSE*'s focus on the critical role of individuals (households) and social groups (neighbourhood), the *Rain-city* has been developed with more dependence on the institutional and technical knowledge/skills of the public sector as well as academic/research organisations. Above all, the Water Circulation Team of Suwon Government and its devoted, competent public officials have introduced the idea of rainwater management to the policy realm as an alternative to the current centralised water supply system of the city (which is more expensive and energy-consuming, see Chapter 6.1). Over the decade, in collaboration with the national and urban scientific/technical experts, the team has not only worked on developing a science-based simulation which presents environmental and socio-economic benefits from rainwater management as a way to bring a paradigm shift of related public officials and assembly members, but also established an enabling environment (in terms of access to resources, regulatory frameworks) to initiate an unprecedented experiment throughout the process of designing, implementing and monitoring a range of rainwater-related innovative practices. For example, the team officials hold a patent (by the South Korean Intellectual Property Office) on a rainwater utilisation facility (10-1340799) which is specialised with functions of excluding incipient polluted rainwater and drip-watering plants (Figure 8.2) (KIPRIS, 2013). Such rainwater-use experiments have been shared with diverse stakeholders (more than 40 different groups of national/municipal policy makers as well as scientific and technical institutions of South Korea and the world) through their visits to the facilities accompanied with the sharing of established know-hows (regulations, technologies, human networks) (Park, 2018; U9).
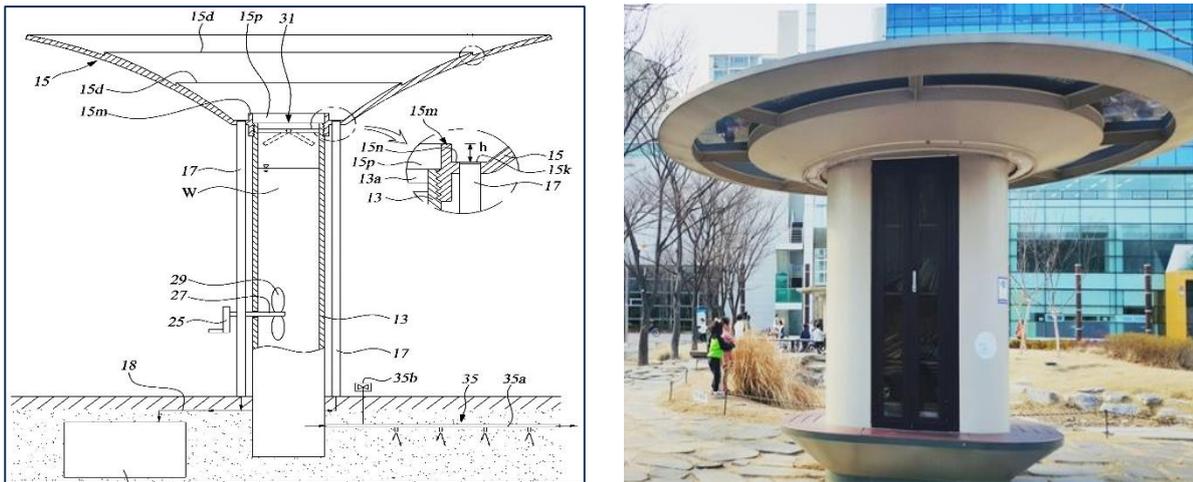
Figure 8.2 A drawing (left) of patented rainwater utilisation facility and its construction (right) in front of the Suwon City Hall

(Source: KIPRIS, 2013)

On the other hand, individual citizens have been rarely encouraged to participate in such process of innovation development, except the limited opportunity in a daily life to use the rainwater facilities installed in public buildings and spaces (e.g. road sprinkling, permeable road block) but with few awareness and information about the facilities. One another exception is the opening of an idea competition about good practices of rainwater management, one of which suggested the reuse of abandoned water tank (obligated to be installed on the rooftop of four and more-story buildings by law) as a rainwater storage facility (SG, 2017i). At the household scale, the policy program of supporting the installation cost of small-scale rainwater facility has been introduced for the household use of cleaning and roof gardening (see Chapter 7.1). This program, then, has been integrated into the neighbourhood-based activities by interested community groups (including NCRC), such as rainwater-use community gardening which aims to provide knowledge and experience about rainwater utilisation and then mobilise household-scale facility operation.

In delivering the *EcoMobility*, a great endeavour has been made to enhance the capacity of various agency levels, from individual residents/citizens to the ecomobile society at the international level. On account of the recognition that individual citizens' understanding about ecomobile life is a prerequisite of practicing the world's first experiment (U4; U5; U12), a broad range of participatory programs were designed, aiming to raise awareness of impacts of current car-centred transport system (climate change film festival and education hall), and to provide opportunities to have a real-life experience of ecomobile transportation (ecomobile

vehicle test-track, bi-modal tram exhibition). Special attention was given to young generation for their improved knowledge about establishing an ecomobility-driven urban model through conducting analysis on challenges of transport system, and discussion to produce youth-centred ecomobile vision, rationale and principles as well as proposals regarding infrastructure and regulation as the 'Youth Declaration' (ICLEI, 2013f). Particularly to promote the involvement of Haenggung-dong residents, the EcoMobility TF and Neighbourhood Centre (located in the neighbourhood area) were devoted to sharing the vision of the project (through a variety of interaction formats with the public sector, ICLEI and experts, as well as periodical magazines which share opinions and stories of citizen participants/volunteers/supporters), and also to discussing the roles/contributions of citizens in achieving ecomobile transportation ('Ecomobile Forums' with international references such as car-free streets and their impacts on cities).

Individual residents, by extension, are encouraged to mobilise diverse working groups who became entitled to plan and implement community-driven activities for the purpose of promoting ecomobile lifestyle and culture (through delivering monthly car-free days, annual *EcoMobility Festivals*, and tour programs using ecomobile vehicles in the neighbourhood). Such activities are delivered in cooperation with sustainability-oriented social groups, such as (social) cooperatives and enterprises for the provision of ecomobile vehicles and also education on bike riding (e.g. through Yellow Bike, Ecomobile Culture Cooperative), as well as the ecomobile social network committed to organising car-free practices at the urban scale (named 'Dorothy' composed of individual citizens and CSOs). The public sector (responsible government teams and organisations, and research institutes) played a role of enabling and supporting the community activities by providing access to resources (financial, legislative, counsels), and also of establishing the interaction formats with the public (e.g. resident open discussion, annual ecomobile culture forum) to discuss measures to continue and vitalise ecomobile culture and lifestyle in the neighbourhood. At the international level, the Suwon Government and ICLEI contributed to mainstreaming the ecomobile discourse and disseminating transformative thinking among policy makers and scientists from urban planning, transport, and environment (37 countries, 93 cities) by holding a series of conferences (EcoMobility Suwon Congress, East Asia Low-carbon Cities Forum, Suwon International Forum), and as a result, to reaching the agreement to take immediate leadership in transforming their cities by establishing transport system built on the principles of EcoMobility which is articulated in the 'Suwon 2013 EcoMobility Impulse' (ICLEI, 2013a,

2013d). Additionally, the *Festival* provided national and international ecomobile firms a space for the showcase of their ecomobile vehicles (a total of 35 types, Figure 8.3) to more than one million participants (Eun and Chung, 2014).

Figure 8.3 Ecomobile vehicles used for test track during the *EcoMobility Festival*: stroller bike, folding bike, walker, and trailer bike (clockwise from the top left)

(Source: ICLEI, 2013)

In summary, sustainability-oriented public organisations (Sustainable Council on SD, Suwon Sustainable City Foundation, Suwon Research Institute) have played a role to enable and promote transformative activities of diverse levels of agency, in terms of: empowering and entitling individual agency to be directly involved in decision-making process (for example, as a committee member of Sustainable Council on SD for the development of Suwon SDGs); mobilising innovative experiments (of sustainability-oriented social groups) by providing financial, organisational and institutional support (for example, neighbourhood-based car-free days); and sharing knowledge and experience required to exercise transformative actions (for example, know-how sharing with rainwater-related policy makers and experts, dissemination of ecomobile thinking to urban-level leaders). One critical finding from the analysis indicates that 'actor network form' has a role in determining the interaction degree as well as objective among diverse agency levels.

8.2   Trans-scale and cross-scale dynamics

Diverse forms of interaction that occur not only across different political-administrative levels and geographical scales but also across the same levels/scales, have served as a driving force of speeding up the pace of, as well as enlarging the spectrum of transformative actions. Above all, the most active interactions have occurred among urban territories of the country as well as of the world, primarily through the trans-urban network and partnership. The SCSD, within the network of the Local Sustainability Alliance of South Korea (LSAK)[58], has communicated with other local councils and also related public officials through the format of the annual 'SD Conference' since 1999, with an aim to share sustainability-oriented local practices (through presentations of selected cases, one of which was the participatory process of establishing Suwon SDGs, followed by field study to selected neighbourhood-based community activities), to draw collective tasks by SDGs (through round table discussion which included the diagnosis of current status and formulation of visions/implementation plans), as well as to strengthen the partnership with the public sector (local governments) for accelerating local-level institutional and regulatory measures (SDNC, 2018).

Especially with the focus on the role of transformative leadership, Mayor Yeom, as the member of East Asia Regional/Global Executive Committee of ICLEI, has invited the local government leaders (ICLEI member government) to the annual meetings, taking it as an opportunity to improve their collective understanding about urban-level SD by sharing experienced challenges and learnt lessons, and furthermore, to agree on the '7 Promises for Local SD' by 50 participating government leaders (Table 8.2) (ICLEI, 2018a). In addition, the SRI has served as the secretariat of the 'Local Government Council for SD' which was built up in 2017 based on the agreement of local leadership in order to enhance the network among local governments for the mainstreaming of sustainability-oriented legislative and regulatory frameworks (ICLEI, 2018c).

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[58] The LSAK was established in 2000 by the voluntary association of local councils for SD, and received the UN ECOSOC Special Consultative Status. As of 2016, 230 councils have been established out of 245 (metropolitan) local governments (LSAK, 2016).

Table 8.2 The 7 Promises for Local SD 2016-18 by ICLEI member governments of South Korea

Background	We, ICLEI member governments of South Korea, recognise sustainable urban development as the essence of the planetary SD, and the leading role of local governments in this is increasingly expected by the international society.
Meaning	The 7 Promises for Local SD 2016-2018 is the Primary Policy Task of ICLEI member governments of South Korea, in connection with the UN SDGs, UN-HABITAT 3, and Paris Agreement.
Promises	1. Sustainable city 2. Inclusive city for all 3. Climate city with energy transition 4. Disaster resilient city 5. Urban biodiversity 6. Ecomobile city 7. Sustainable urban circular economy
Principle on implementation	Multi-stakeholder participation, including citizens Trans-urban alliance and cooperation International society-national government-local government alliance and cooperation
Leadership	The Promises shall be implemented at the political and policy level based on determined and strong leadership of local governments.

(Source: own translation based on ICLEI, 2018)

The trans-urban interaction has been expanded to the international realm, particularly through a range of trans-local government network and partnership. Suwon has joined the regional (Asia-Pacific) alliance of the 'CityNet' as a full member to build up city-to-city cooperation for urban sustainability, especially among the Mayors of the member governments in sharing ideas about how to localise the SDGs for implementation (Baek, 2017). Mayor Yeom has, particularly, asserted the necessity of establishing a trans-city network platform through a range of high-level, multilateral discussions, including the Tripartite Meeting of the Environment Ministers (South Korea, China and Japan), as well as the Kyoto Conference on the Global Environment 2017 (Kyoto+20) (D. H. Choi, 2017b; Juhong Kim, 2017). Furthermore, as a leading city of Asia, Suwon association of sustainability-oriented organisations (SCSD, SSCF, SRI, and ICLEI South Korea) has launched annual forum on 'Asian Human City' as a platform to disseminate Suwon's political will on SD to the leaders of Asian cities with which regional trans-urban activities are to be developed, founded on the 'Suwon Declaration on Human City':

> '[…] Asian cities, the most dominant place of industrialization and urbanization on Earth, are raising the awareness and the voices on the inevitable trends of resilient and sustainable city

focusing on human value through critical reflection on conspicuous urbanization having neglected the value of inclusiveness, distribution, and environmental sustainability in the past. […] we support the human city initiative led by Suwon […] through active exchanges and networking on policies and experience on sustainable urban development […].' (SG, 2017a, p. 45)*.*

Regarding the issue of community building as one of the Primary Policy Tasks, Mayor Yeom has worked as the chairperson of the 'Local Government Council for Neighbourhood Community Building' which was established as a platform to cooperate with 55 local government members in not only advocating the enactment of national regulatory frameworks (such as Neighbourhood Community Framework Act which can establish integrated and comprehensive enabling environment for urban-level community activities), but also developing a range of joint projects that build up communication and mutual learning among responsible public officials of different local governments (Lee, 2015). At the neighbourhood level, the community members (including, of NCRC) have been encouraged to take part in the trans-neighbourhood interaction through diverse networks both within Suwon (such as community-driven discussion and research meeting) and across neighbourhoods of the country (through the national and Gyeonggi 'Neighbourhood Community Building Network (NCBN)' and its annual conference and monthly discussion meeting with residents as well as public officials and scientists) (NCBN, 2018). These interaction formats have been used to provide CoPs as well as individual residents an open opportunity to participate as an equal status (regardless of social/organisational position) in the process of seeking for solutions to common and different challenges of their neighbourhoods through mutual learning (knowledge and experiences) and alliance building in a more informal setting.

The interaction between urban and regional/national territories has been considerably affected by the country's political system which imposes 'top-down', centralised relationship among the national and (metropolitan) local governments[59]. With regard to the financial relationship, the ratio of tax collection between the national and (metropolitan) local government is 80% and 20% while the ratio of tax use is 40% and 60% (Lee, 2016), so the gap is to be covered by the distribution of the national government to the (metropolitan) local governments in the form of tax revenue and subsidies (and of the metropolitan governments

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[59] Refer to Appendix 2 for the overview of South Korea's administrative structure.

to the local governments in the form of adjusted and compensatory grants) (Koh, 2012). Similarly, the local legislation (such as municipal ordinance) is only be enacted with the legal basis on its superordinate national one (Moon, 2012). Under this system, the national-level regulatory framework serves as the prerequisite of the urban-level planning (and its programs, projects, and strategies). Against this background, Suwon's sustainability-oriented policy (including the *Eco-capital* initiative) has been established with a considerable influence of the national-level legislative and institutional enforcement on SD and LCGG (low carbon green growth), in terms of setting the direction of urban development (low-carbon growth, resource-efficiency/-saving), and of enabling as well as sharing the access to resources to achieve this development at the urban scale (provision of national urban programs/projects to the local government by application, accompanied with the screening/monitoring on the plan and implementation by the superordinate metropolitan government and designated institutes by the national government, as in the case of the *Rain-city*).

At the same time, such national centralisation has often constrained the autonomous planning of the local governments, due to their limited legislative and administrative power, as well as limited autonomous organising and financing[60], as it is reflected in the designation as 'local body' (of the national government) rather than 'local government' (K. Kim, 2018). In particular, it is more problematic when there is a contrary response of the local government to the existing national system: for example, the national policy on establishing centralised energy system (including water supply and electricity) has been contrary to the local-level experiment on building self-reliant energy system (in the case of Suwon, by managing rainwater and generating solar energy at the local level as a supplementary resource to the centralised water and electricity supply. In addition, relatively inexpensive water/electricity rate of the centralised provision has played an adverse role in relation to rendering an (economic) motivation to citizens as well as local policy makers to seek for locally-driven alternative options (E1; U8; U9).

The *Rain-city* is the case which has been delivered as the national urban projects of the ME and related national institutions (e.g. Green Rainwater Infrastructure, Water Circulation

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[60] Especially, current grant system has been criticised for its lack of fiscal continuity and predictability, which has hindered the local governments from planning for a long-term investment with stability (OECD, 2017b). Despite of the enactment and several revisions of the Local Finance Act to enhance fiscal decentralisation, the fiscal independence rate of local governments has continually decreased (as of 2018, 37.9% of municipal-level local governments) (KOSIS, 2018b).

Leading City), through the interaction with responsible national actors in tasks of arranging related legislation/regulation and required finance, of examining the locally adjusted plans (design of rainwater management facility, budget management, modelling and estimated outcome), and of monitoring the operation/performance of the installed facility. In this process, another layer of 'contract screening' is conducted by the Gyeonggi government for efficient budget management on the areas of cost accounting, engineering method, and construction design (Gyeonggi-do, 2016), while it has been criticised for inducing delayed project delivery and excessive budget reduction (M. Choi, 2018). One another important interaction has been made with the national/regional/urban media (documentary, newscast and newspaper), in disseminating the rainwater-based innovative ideas and experiments (season 1-4), so as to generate changed recognition of rainwater as a valuable water resource, and to introduce a practical solution for efficient water resource management (e.g. reduced water use through road sprinkling system for cleaning and de-icing by the SBS newscast, rainwater utilisation facility as a solution for drought by the MBC newscast) (SG, 2017i).

The mechanism of applying for the national urban project, however, has imposed a competitive relationship among local governments rather than cooperation due to limited finance to be distributed to all applicants (Kim and Hong, 2016). On that account, more interaction is made at the international level not only with the local government (through the agreement of sisterhood relationship with the Freiburg government of Germany in sharing the policy idea such as 'Clean Road' (rainwater channel in housing areas)), but also with international business for the adoption of rainwater-use technology and its adjustment to the local context ('City Tree' by the Green City Solution) and organisations for the sharing and dissemination of the acquired rainwater management skills (the International Rainwater Harvesting Alliance, Energy Globe Award) (Energy Globe, 2018; SG, 2017; U9). On the other hand, the urban and neighbourhood territories have been used as an experimental space for translating the gained knowledge into a practice in a daily life of citizens/residents, for example, through the cooperation between urban actors (the SRI and the primary school located in Suwon) in establishing a participatory model of 'living laboratory' to experiment on rainwater sprinkling system for (ultra)fine dust reduction in the school walkway, and through interaction among community (neighbourhood) groups in experimenting on community-/household-scale rainwater utilisation for community/household gardening.

Similar to the *Rain-city* in the sense of its close interaction with the national systems, the *CSE* has been considerably enabled and established by changed landscape at the national

level, particularly in terms of providing an enabling environment for solar energy-oriented CoP experiments. The new national government (the Moon Administration since 2017) has reshaped the country's energy policy direction from coal-/nuclear-dependent to environment-friendly energy system (the 8th Master Plan on Electricity Demand and Supply, 2017-31), and accordingly declared to incrementally increase the proportion of renewable energy by 20% by 2030 (the 3020 Renewable Energy Implementation Plan)[61] (see Chapter 7.2). In particular, as the primary means of implementation, a citizen-participatory energy generation model has been developed in the format of urban household-scale solar energy generation as well as (social) cooperatives and enterprise-owned solar plant, which are established on the power exchange regulations such as the SMP, RPS, FIT (see Table 7.5 and Figure 7.25 in Chapter 7.2). The example is the Ministry of Environment pilot project on 'resident-participatory solar energy generation' in seven municipal cites which have been collaborated with the respective 'Citizens Solar Energy-Social Cooperatives (CSE-SC)' (ME, 2018). This participatory model is basically founded on the organisational form of '(social) cooperatives' which is entitled as a corporate body if composed of more than 5 members, and whose motivation focuses on the public value and responsibility rather than capitalistic profit (Lee, 2012).

In addition to the foundational regulatory frameworks, the *CSE* has been selected as the local-level model of the national (MOTIE) and regional (Gyeonggi) government-funded renewable energy projects, of which financial contribution (2 billion Won; 1.5 million euro) is invested on the construction of the 7th/8th SSE plants (SG, 2016f). Especially with regard to the household-scale generation, the national program of 'One Million Green Home' (by the South Korea Energy Agency under the MOTIE), which subsidises the installation of renewable energy-facilities (including solar photovoltaic/thermal power, geothermal power, small-scale wind power) to multi-/single-household houses (in the case of solar photovoltaic power, up to the size of 3 kW) (KEA, 2018), and which is combined with additional subsidies of the Gyeonggi and Suwon Government[62]. This household-scale subsidy program has been primarily delivered in the neighbourhood territories, particularly which have the majority of

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[61] At the same time, such de-coal, de-nuclear decision has been criticised for its less consideration on economic feasibility and expected increase of social cost, as well as less participatory process involved in the communication with the industry sector (H. Choi, 2018).

[62] By the 2017 standard, for 3 kW solar photovoltaic power plant installed in Suwon territory by Suwon citizen is eligible to apply for the subsidies up to 5.01 million Won; 0.4 million euro (national government (3.51 million Won) + Suwon Government (1 million Won) + Gyeonggi government (0.5 million Won)) (SG, 2017e).

one/two storeyed-houses rather than multi-household apartments. In the process of applying for the program (in the case of Hwaseo 1-dong), the neighbourhood-level public sector (Neighbourhood Community Service Centre) and community groups have played a role in providing administrative advice as well as mobilising the participation through established relationship among residents in sharing their experiences on the use of facility (NH6; NH8).

The urban-level interactions have played a role of adjusting and applying the national framework to the local context. For example, the joint research project between the SCSE-SC and SRI worked on drawing policy suggestions for establishing favourable and effective system for (household-scale) solar facility operation, which include introduction and revision of related regulations (such as obligating development of an operation plan for monitoring, introducing standard contract to indicate minimum hours of operation, providing public building spaces for solar facility installation, and adjusting a national support system according to Suwon's geographical and social environment (relatively less amount of sunlight due to compact urban system, and higher rent for house) to guarantee the minimum profit of solar facility) (Choi *et al.*, 2014). In particular, as the pioneer, the SCSE-SC has contributed to mobilising the citizen-led, urban-scale solar energy society, established as 'Citizens Solar Energy Social Cooperative (CSE-SC)' in different cities, within which SCs share practical know-how for solar experiments. Additionally, Mayor Yeom has been serving as the chairperson of the trans-urban network of 'Local Government Council for Energy Policy Transition', especially aiming to establish a multi-stakeholder (the public sector, civil society, academia and industry) network for renewable energy transition, and ultimately achieve 'energy self-sufficiency' at the local level (Kim, 2019). Particularly within Suwon, 8 CSOs (including SCSE-SC) has partnered with the SCSD and DoDream as the 'Suwon Climate Action Network' to encourage citizen-participatory activities oriented to energy transition, including the co-production of implementation plan for '2021 Suwon Energy' and '120 Million Citizens Solar Facility' (J. Kim, 2018; SCSE-SC, 2019).

Such trans-urban network has been actively occurred also in the case of the *EcoMobility* both at the international and national realm. The 'EcoMobility Alliance' was organised at the 1st Congress in 2011, composed of 23 cities around the world (including Suwon) together with a group of partners from international business, transport, and governmental sectors (EcoMobility, 2018). The Alliance has served as an interacting platform where its member cities share experiences of implementing the vision of car-free urban life: for example, Suwon's experience of holding the *Festival* has been shared to the following host cities (Johannesburg

of South Africa and Kaohsiung of Taiwan) through the (on-site) interaction among not only public officials but residents of project neighbourhoods in visualising the ecomobile urban future in a real city (Chun-seong Kim, 2017; Nam, 2017a). Especially, Suwon has closely cooperated with another South Korean city member (Changwon) among Mayors, public officials, and municipal research institutes in mainstreaming the ecomobile culture through joint seminars and forums on developing policy-level strategies to promote public transportation, biking and walking (Woojin Kim, 2017; DCSD, 2018). In particular with the introduction of urban railways (tram), Suwon has led the discussion with other local governments to seek for solving legislative and regulatory obstacles, such as revision of related legislation (see Table 7.8 in Chapter 7.2), and of investment appraisal system (Preliminary Feasibility Study, PFS) to consider the benefit from operating trams (improved accessibility and decreased emissions comparing to other urban vehicles) (SG, 2015c, 2017h).

Herein lies the critical role of national actors in arranging such enabling environment, particularly of the National Assembly for legislation in cooperation with the MOLIT (responsible for transportation system) and National Police Agency (urban transport and railroad), as well as the MOSF for the PFS. By extension, the MOLIT has initiated the national project on 'wireless low-floor tram'[63] where the South Korea Railroad Research Institute (KRRI) took charge of research and development (R&D) in partnership with related private businesses ('Kokam' for batteries and 'Hyundai Rotem' for manufacturing of trams), and in 2012, the tram had its first public trial ride which runs 35 km by one charge (15 minutes) (Figure 8.4) (KRRI, 2018). Founded on legislative and technological establishment, the city of Busan was selected as the first city to run the tram, while the construction of tram lines in Suwon was included in the Master Plan on Urban Railroad of Gyeonggi-do including of 8 other cities (Yeo, 2019). In addition to the operation of ecomobile vehicle, the MOLIT has launched an interaction format where local governments voluntarily join to showcase their urban transport policies and share practical know-how for the establishment of sustainability-oriented transport system (N2; MOLIT, 2015).

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[63] Construction cost of tram is 1/8 of the one of underground railway (metro), and 1/3 of elevated light railway (KRRI, 2018).

Figure 8.4 A trial ride of the KRRI wireless low-floor tram

(Source: KRRI, 2018)

In summary, interactions across political levels and geographical scales have occurred in different 'forms' (cross-scale, trans-scale) as well as with different 'objectives'. The neighbourhood-scale community groups have made formal and informal communications for mutual learning about CoP experiments, not only within the same neighbourhood boundary mainly through diverse Neighbourhood Community Renaissance projects, but also with other neighbourhoods of Suwon and the country through nation-wide neighbourhood networks. The trans-urban network (mostly among government leaders) is the most active form of interaction both at the national and international territories, with an aim to co-produce knowledge about desirable urban future based on collective recognition of problematic current systems, and mainstream and disseminate transformative knowledge for cooperative actions. Particularly placed in the centralised political system, the national government (related ministries) plays a critical role in not only establishing legislative and regulatory frameworks and developing technologies (for instance, R&D on wireless tram and legislation, regulation on household-/cooperative-led solar energy generation and exchange), but also providing a project package for interested local governments to implement in their urban territories (for instance, a range of rainwater management facilities introduced by the Ministry of Environment). On the contrary, such centralisation has induced limited legislative and administrative power of the local government for autonomous planning and practice, often resulting in delayed implementation due to duplicated national/regional government screening. Lastly, interaction with the international actors (businesses, organisations) provides opportunity to learn innovative knowledge and advanced technology for local adaptation, such as rainwater-use (fine) dust reduction ('City Tree').

8.3   Conclusions

This chapter analysed multi-dimensional transformation processes, drawing on the understanding of each agency level's contribution, as well as of geographical scales. Derived from a set of findings (also summarised in the last paragraphs of Chapter 8.1–8.2, respectively), the analysis reached some conclusions. First, interactions with *public intermediaries* (by directly participating in their decision-making and/or in training and educational programmes) helped to empower individual citizens/residents, as well as CoPs, in exercising autonomous, transformative actions. One critical finding indicates that the form of the actor network plays a role in determining the degree of interaction, as well as objectives, amongst diverse agency levels. For example, interactions amongst public officials (the national and urban governments) and technical experts within the hierarchical governance of the *Rain-city* focused on arranging financial and technological resources for innovative experiments, such as the operation of an ICT-/IoT-based rainwater system for road de-icing and cooling. By contrast, inclusive interactions amongst the citizen group members (SCSE-SC) (*CSE*), and between public organisations and resident groups (*EcoMobility*), served to mobilise stakeholder participation in establishing renewable energy systems. This occurred by uniting the members of the solar-related cooperative and operating household-scale solar facility (*CSE*), as well as forming CoPs for neighbourhood-based ecomobile activities, including car-free days (*EcoMobility*).

Second, interactions occurred not only across different geographical scale levels (inter-scale), but also more distinctly at the same scale level (*trans-scale*). The most common form was the 'trans-urban network', which was primarily developed through interactions amongst government leaders. This contributed to the mainstreaming of sustainability-oriented urban activities at the policy level through collective work to create an urban-level enabling environment. Such joint work includes legislative, regulatory, and organisational arrangements (especially altering unfavourable national systems concerning national centralisation), as well as cooperative activities amongst related local government teams and public organisations (local councils on SD, urban-level research institutes). These inter-scale and trans-scale interactions were uniquely shaped according to different objectives of urban transformation; for example, community-led, inter-/trans-neighbourhood interactions for improved CoP experiments, and government leader-driven, trans-urban interactions for the mainstreaming and dissemination of transformative policy.

The findings provide a set of policy implications that can be divided into four areas. First, there should be substantial considerations given to interactions at the '*same administrative scale level*', in addition to across different scales. Actors at the same scale level have similar motives to form partnerships (for example, a local government association to facilitate the revision of national legislation to enable tram operations in urban areas), as well as a similar level of institutional and organisational capacity for cooperating on transformational actions (for example, the mainstreaming of sustainability-oriented urban policies through collaboration amongst related organisations, such as government teams, intermediaries, and research institutes). Second, a *'wider political structure'*—within which actors from diverse political-administrative scales interact—should be taken into account as an influencing factor. Situated in a centralised political system, interactions between the national and local governments are essential, oriented toward building an enabling environment for urban actions; for example, by enacting national, superordinate legislation as a precondition for municipal ordinances. Such cases include the *CSE*, which has been largely enabled by newly founded national frameworks (e.g. a new national government programme on cooperative-/household-owned solar energy generation), whereas tram operations have long been postponed due to delayed revisions to relevant national legislation.

Third, CoPs' formation and experiments can be significantly facilitated through interactions with *'urban-scale public organisations'*. The format of an interaction helps people to share and co-produce knowledge on a desirable urban future. For example, individual citizens/residents conducted joint research with the Suwon Research Institute to build a solar energy system. Sustainability-oriented public organisations play a crucial role in empowering citizens/residents by supporting CoP formation (for example, Neighbourhood Community Renaissance committees and [social] cooperatives/enterprises) and by providing access to resources for their autonomous activities. Fourth, interactions at the *'neighbourhood level'* can increase the potential for CoP experiments via the territory in which residents seek to realise collective values through face-to-face interactions, which are founded on social ties amongst neighbours, as well as a sense of community (social cohesion) (Anderson and Milligan, 2006; Schuck and Rosenbaum, 2006). Examples include the Neighbourhood Community Renaissance project for rainwater use and community/household gardening (*Rain-city*); neighbourhood/household-scale solar energy generation (*CSE*); and neighbourhood-based (monthly) car-free days for promoting an ecomobile culture (*EcoMobility*).

9. Conclusions

This research started with a recognition of sustainability challenges that South Korean cities have faced, largely induced by carbon-intensive urban development pathways. The research focused on the role of agency in changing unsustainable systems by exploring capacity factors that agency should encompass in order to bring about urban sustainability transformations. Founded on conceptual understanding, the research sought to draw implications in terms of how capacity factors help to trigger systemic change, especially with regard to *the extent to which governance characteristics influence the urban transformation processes.* For this purpose, a real-world urban study approach was adopted with the case of the *Eco-capital* (and its three selected projects), which started as an ambitious policy decision to shift the direction of urban development from industry-driven growth to an environmentally-sustainable system in multiple domains. The case study aimed to examine capacity factors that have the potential to influence transformation dynamics in the urban context by exploring the interrelations that emerge between the factors. The research question was precisely answered by analysing capacity factors employed in the *Eco-capital (*and its three sub-projects) and their respective roles in initiating and performing transformative actions. Consequently, the primary finding was obtained: *1) 'Inclusive governance' encompasses collaborative actor networks and partnerships; and 2) Intermediaries working across different domains and scale levels condition the emergence and characteristics of agency-related factors for urban transformations.*

The overall process of the study made a set of contributions, not only to research on urban transformation, but also to the policies and practices of urban governance and planning. First, the research generated theoretical contributions, gained by exploring a real-world case characterised as a multi-stakeholder, participatory governance model of pursuing sustainability-oriented urban development (Huh, 2012). Scrutinising such a case helps us to examine 'a wide range of forms of interplay' amongst diverse stakeholders from different sectors (especially from the public sector, and civil society, and local communities) and across political-administrative levels (not only in the neighbourhood and urban areas, but also in national territories). Additionally, the analytical design of the three different sub-cases—which were selected based on different agency roles—displayed diverse (and divergent) dynamics of transformation. Consequently, the study design helped to diversify the analytical spectrum to investigate the interrelations between capacity factors in terms of unique sectors, scale levels, and domains in the same geographical setting.

Second, the research made contributions to the discourse on transformative capacity. Relevant studies (Wolfram, Borgstroem and Farrelly, 2019) have begun to explore transformative capacity in practice, covering numerous empirical contexts with a complementary (theoretical and policy) focus (including examination of interventions for improved operationalisation, and of strategies for enhancing capacity factors) (see Appendix 4 for more details). This research shares some common factors with the above-mentioned studies in terms of subject (sustainability-oriented urban policies and initiatives), orientation (analysis of capacity components/factors, the identification of drivers of/barriers to developing transformative capacity), and methodology (a qualitative case study). However, this case study also created additional values compared to other past studies regarding the multiplicity of transformational actions that simultaneously occur in the same urban territory, active interactions within a broader context (a centralised national system in East Asia, versus a decentralised national system in Northern Europe in Borgstroem, 2019), and the role of integrated transformation policy (an umbrella policy comprised of multiple domain-based projects, versus an individual policy on respective domains in Wolfram, 2018b, 2018a).

Third, regarding the framework of urban transformative capacity (which was elaborated very recently), the research provides empirical evidence to examine arguments that are claimed to be the essence of transformative capacity development. Findings from the case analysis verified the asserted significance of agency, as well as the governance perspectives employed in the pre-development/re-organisation phase of urban transformation, as preconditions for transformative capacity development. However, the findings challenge a related argument, which claims that unbalanced attention and uneven support given to selected capacity components will undermine overall transformative capacity. The rationale to oppose this claim is founded on the main conclusion of this research, which argues that there are critical components that should receive prior attention and support, as they condition the emergence of transformation. This perspective is similarly emphasised in a study on global sustainability initiatives (Castán Broto *et al.*, 2019), whose findings suggest strategies that prioritise certain components in order to foster joint transformative capacity.

Fourth, the research bolsters the argument for the vital role of place and scale, which has received growing attention by transformation scholars (Coenen and Truffer, 2012; Caprotti and Harmer, 2017). The case analysis fully confirms how embedded contexts—where urban transformation occurs—determine interventions to tackle sustainability challenges by utilising embedded assets (e.g. cultures, governance practices, the built environment, etc.). However,

place-specific assets do not automatically generate contributions unless there are policy-level measures to nurture them. For example, Suwon has an established civil society and strong public interest as inherent assets, but the absence of policy measures aimed at CoP formation and empowerment can result in low citizen participation, as shown in the case of the household-scale rainwater project. In addition, the research explains the considerations given to cross-scale relations, particularly when located in a centralised political system (which increases their importance), as well as diverse forms of interaction with national-level entities (national ministries, related government organisations, and research institutes). The examples from the case analysis display how the national government's changed policy on renewable energy has accelerated CoP experiments regarding solar energy generation and business by (social) cooperatives, while, conversely, national existing legislation has delayed the operation of urban trams.

The overall research has several advantages in terms of the design and methods. A qualitative approach involving document analysis and semi-structured, in-depth interviews was appropriate given the characteristics of the South Korean government culture, as well as the research design. First, the South Korean government's efforts to promote transparency in sharing policy information with the public have helped to improve access to data. Open access to various policy documents/reports available online—including internal reporting materials (mostly concrete, detailed current status and future plans), white papers (mostly comprehensive information), and monitoring reports (objective and subjective evaluations and assessments)—has substantially helped to expand the spectrum of the study and to overcome the limitations of conducting research in a foreign country. Online accessibility was further extended, especially in Suwon, as many key informants (both public and non-public) actively use social media ('Facebook') to share diverse kinds of information about projects. This helps people to stay informed on the policy status of different initiatives (e.g. progress on ongoing projects, announcements of newly launched programmes, workshops, and seminars, etc.). Furthermore, informal information was useful in understanding process-related elements, such as stakeholders' motivation to take part in projects and individual feelings from participation. This not only complemented the information derived from formal documents but also, by extension, contributed to analysing abstract factors such as feelings of empowerment and autonomy.

In addition to the open culture of the South Korean government, a close relationship amongst public sector officials played a role in providing diverse connections to a wide range

of informants. A key informant of the Suwon Research Institute (the in-text reference is E2) offered immense contributions in terms of recommending appropriate informants (such as those who played significant roles in initiating a project, compared to a newly-assigned official whose knowledge and experience were relatively limited, or community group leaders who could have been overlooked by the author's constraints of information). Further, this person provided ties to informants from diverse sectors (the Suwon Government, intermediary organisations, community groups). However, it is important to bear in mind that the selection of informants, entirely relying on suggestions, could induce a one-sided view (as the author found by interviewing different informants with two different views about the government's role in respective projects). Post-fieldwork document collection and interviews by phone/email were enabled largely through established networks during fieldwork. Separately, some phone/email interviews could be conducted thanks to officials who were devoted to publicising the projects (for example, newly developed rainwater facilities and the introduction of trams).

Second, face-to-face interviews were essential to facilitating a better understanding of informants' views regarding questions about 'abstract' capacity factors. During the interviews, interviewees asked that unfamiliar, abstract terms be translated into more practical, clearer forms; such translations were used for the next interviews. Examples include: 'What policies/strategies are employed to raise public awareness of problems embedded in current lifestyles?' rather than 'How much are you aware of *systemic relations* between ways of thinking, organising and doing?' and 'What policies and/or strategies are employed to alter existing regulations/institutions/values/infrastructures that may hinder changes to the current system(s) in moving towards sustainability?' rather than 'How much do you recognise *obduracy/changeability* within the current system?' Additionally, interviews in which the author was involved (compared to surveys) allowed for the ability to ask follow-up questions.

Policy recommendations

The findings described above converge on the comprehensive conclusion that *inclusiveness* — employed in governance modes and actor networks — plays a decisive role in facilitating urban transformation processes. The *public sector* (the Suwon government, intermediary organisations, and research institutes) plays a crucial role in enhancing this inclusive aspect of transformation, with particular attention on CoPs at the urban and neighbourhood levels by providing institutional support (e.g. a government programme of the Neighbourhood

Community Renaissance) and organisational (administrative and knowledge intermediation) support. This endeavour aimed to empower CoPs to the extent that they independently and autonomously initiate and perform activities—even outside of the government programme sphere. They are enabled not only by gaining knowledge, experiences, and building networks (with the public sector and amongst CoPs), but are also motivated by feelings of pride and ownership towards their activities. However, as identified during an interview with a citizen leader (L4), who has initiated diverse urban-/neighbourhood-level community activities since 2012, community-driven experiments that are expanded beyond the sphere of government programmes are often discouraged due to financial barriers to carrying out the experiments.

In this vein, one very pivotal policy recommendation is that the public sector empower CoPs and their autonomous activities, accompanied by policy measures to help establish a sound *financial tool* of CoPs. These are to be produced based on the CoPs' own independent activities, rather than programme-bound, subsidy-type government support. Good examples include (social) cooperatives/enterprises, which are entitled to independently earn profits from their own activities in diverse areas, and then (entirely or partly) reinvest such profits to continue and expand follow-up activities. One case is the Suwon Citizens' Solar Energy Social Cooperative, whose profits from solar plant generation have been reinvested for additional solar plant construction, and used for related activities such as educational awareness programmes for renewable energy. Here, considering the centralised national political system—which authorises the national-level policy framework as a prerequisite to any policy measures—the national government (and related ministries) plays a critical role in arranging for the necessary enabling conditions to nurture diverse types of financial tools for independent community activities. The empirical evidence for this argument refers to a series of processes regarding how the passage of the national-level Cooperatives Act has triggered and accelerated the nation-wide emergence of solar energy-oriented (social) cooperatives in South Korea (see Chapter 8.2). Such independent and autonomous CoP activities are less influenced by potential changes in government policies, which revert to the old, unsustainable system, and whose priority is less oriented towards promoting community practices. On that account, ensuring that CoPs have sound financial tools carries a significant implication for transformative government leaders, who seek solutions to continue transformative policies beyond their term in office. Recommendations on urban policy and governance in South Korea (and beyond) can be summarised into three aspects:

- Building *collaborative partnerships* with stakeholders from diverse sectors and scale levels, and establishing *intermediaries* to bridge possible gaps that could hinder joint action;

- Paying attention to *neighbourhoods* as vital spatial units for community formation and activities in multiple domains, as well as utilising established social relationships/networks amongst residents to create collective (but transformative) values and visions; and

- Devising/adopting *community-operated finance mechanisms* for community-led experiments, e.g. (social) cooperatives, and moving from programme-bound community formation/activities (operated through government support/subsidies) to autonomous, long-term community-led innovations.

Future studies

Drawing on two distinct characteristics of the case city, Suwon—which includes its location within a centralised national system and its long history as a city—two comparative studies would be worth conducting, with the purpose of analysing how the concept of place conditions transformation dynamics. First, a comparative study on a city located in a *decentralised* (e.g. federal) system could reveal the different dynamics of agency interactions across political-administrative scales (notably amongst national ministries/assemblies) and amongst regional and local governments/councils in delivering transformative activities (e.g. different processes in the legislation of municipal ordinances and the mobilisation of project funding). Hence, this could help us to understand the different roles played by the national/regional/local governments in transformation processes. Second, a comparative study on a *newly built city* could offer insight into the role of established networks amongst citizens/residents in creating willingness and self-motivation to organise CoPs, and to take part in community activities. For this comparative study, the South Korean city Sejong could be considered. Built in the 2000s as the country's government city, it accommodates most ministries and related institutes, with an emphasis on ensuring environmental sustainability. The reason for this is coupled with the distinct characteristics of its citizens; they are primarily government officials and researchers who are directly involved in policy-making while being less connected to each other as citizens. Studying these unique cases could highlight the roles of well-founded networks in the process of urban transformations.

Appendix 1

Summary of interviewees

Level	Organisations	Details of interviewees (45)		In-text reference
National	Ministry of Land, Infrastructure and Transport (MLIT)	Transport Policy Coordination Division	Deputy Director (in charge of sustainable transportation policy)	N1
	South Korea Transport Institute (KTI)	Road Transport Division	Research Fellow (in charge of Sustainable Transportation City)	N2
	Ministry of the Interior and Safety (MOIS)	Local Community Division	Director (in charge of Neighbourhood Community Building)	N3
	National Assembly		Member (partly involved in Framework Act on Neighbourhood Community Building)	N4
Urban	Suwon Government (City Hall)		Mayor	U1
			Former Vice Mayor	U2
		Urban Planning Division	Director	U3
		Sustainability Division	Director	U4
			EcoMobility Team, Chief Officer	U5
			Neighbourhood Community Renaissance Team, Officer	U6
		Environment Policy Division	Environment Policy Team, Officer	U7
			Water Quality Management Team (in charge of Rain-city), Chief Officer/Officer	U8/U9
		Climate and Atmosphere Division	New and Renewable Energy Team (in charge of Citizens Solar Energy), Officer	U10
		Urban Transportation Division	Officer	U11

Level	Organisations	Details of interviewees (45)		In-text reference
Urban	Suwon Climate Change Education Centre		Director, and former Secretary General of SCSD	U12
Neigh-bour-hood (dong)	Haenggung-dong	Neighbourhood Community Service Centre (NCSC)	Officer	NH1
		EcoMobility Community Centre (ECC)	Manager/ 2 Volunteers (residents)	NH2/ NH3, NH4
	Hwaseo 1-dong	Neighbourhood Community Service Centre (NCSC)	General Director	NH5
			Former General Director, and former officer in charge of Rain-city	NH6
		Neighbourhood Community Renaissance Committee (NCRC)	Leader	NH7
		Neighbourhood Women's Society	Leader	NH8
		Resident Autonomy Committee (RAC)	Leader	NH9
Inter-mediary	Suwon Council for Sustainable Development (SCSD)	Secretariat	Secretary General	I1
	Suwon Sustainable City Foundation (SSCF)	Secretariat	Secretary General	I2
		Centre for Neighbourhood Community Renaissance (CNCR)	Chief Officer/ 4 Coordinators (residents)	I3/ I4, I5, I6, I7
Local Comm-unity	Ecomobile Culture Cooperative		Executive Director	L1
			Technical Director	L2
			Member	L3

Level	Organisations	Details of interviewees (45)		In-text reference
Local Comm-unity	Neighbour-hood Community Renaissance Citizens Research Meeting/ Dreaming Bicycle		Leader	L4
	Suwon Citizens Solar Energy Social Cooperative (SCSE-SC)		Executive Director	L5
Urban – Inter national	ICLEI – Local Governments for Sustainability	South Korea Office	Director General	UI1
Experts	Seoul National University	Dept. of Civil and Environmental Engineering	Professor, closely involved in Rain-city	E1
	Suwon Research Institute (SRI)	Urban Planning and Design Division	Research Fellow (urban planning and governance)	E2
			Research Fellow (Neighbourhood Community Renaissance)	E3
		Urban Safety and Environment Division	Director (Ecomobility, sustainable transportation)	E4
			Research Fellow (eco-friendly neighbourhood)	E5
			Research Fellow (climate change)	E6
			Research Fellow (environmental policy)	E7

(Source: constructed by the author)

* The interviewees' organisations and positions are of the time of interviews.

Appendix 2
South Korea's local government system (as of 2018)
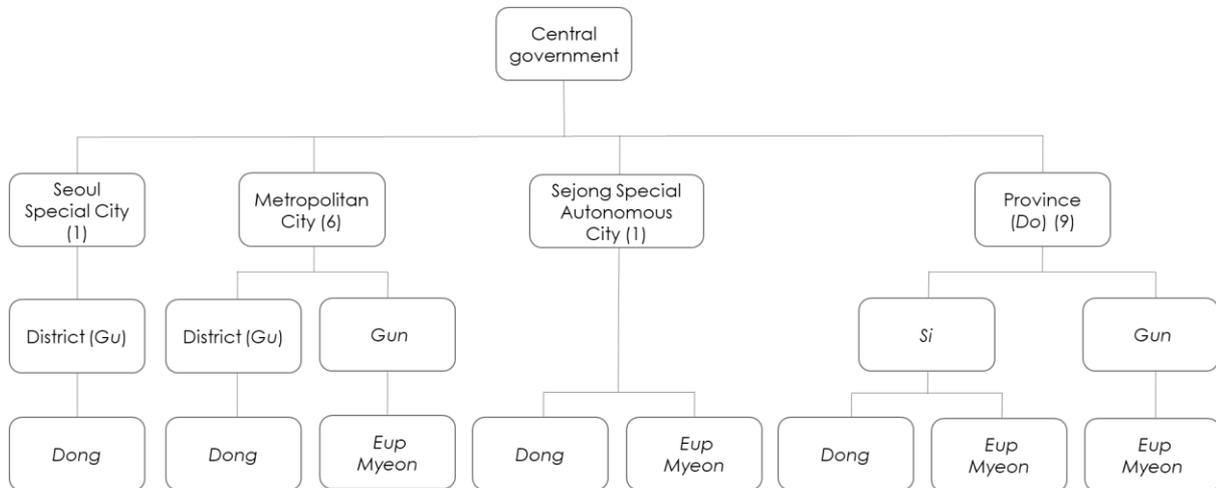
(Source: MIS, 2018)

Notes: the words in italic refer to the names in South Korean; '*Si*' refers to municipal-level city;

Jeju special autonomous province is included in the Province (*Do*) category.

Appendix 3

Overview of participatory programmes of Suwon

Category	Programme	Role	Status	Operation
Policy suggestion	Good Governance Committee (GGC)	Monitoring of Primary Policy Tasks	Governance system founded on the municipal ordinance	Regular operation
	Citizen Idea Competition	Suggestion about policies	Voluntary participation	Annual operation
	500 Citizens Round Table	Decision-making about urban policies	Application-based, one-time participation	Annual operation
Budget system	Citizen Participatory Budget System	Partial budget allocation by citizens	Governance system founded on the municipal ordinance	Annual operation
Urban planning and implementation	Citizens Planning Group (CPG)	Participation in 2030 Plan	Governance system founded on the municipal ordinance	Annual operation
	Neighbourhood Planning Groups (NPGs)	Participation in each neighbourhood planning	Project groups composed of interested residents	2013, 2015
	Neighbourhood Community Renaissance (NCR)	Resident-led neighbourhood activities	Governance system founded on the municipal ordinance	All year around operation by respective NCR resident groups
Conflict management	Citizen Juries	Mediation of public-citizen, citizen-citizen conflicts	Governance system founded on the municipal ordinance	Annual operation

(Source: Lee *et al.*, 2018)

Appendix 4

Studies on urban transformative capacity

	Topic	Geographical setting	Method	Results/ contributions
Castán Broto *et al.*	Sustainability initiatives (multiple disciplines)	Global (225 cities)	Database analysis	Need to prioritise social learning and reflexive action to foster other components
Borgström	Local sustainability initiatives (LSIs) (multiple disciplines)	Stockholm, Sweden (decentralised setting)	Qualitative, trans-disciplinary case study	Need of flexible spaces to foster community self-organisation, and of long-term cooperation/ coordination structures (e.g. intermediaries)
Wolfram	Regeneration, energy, grass-root movement	3 cities, South Korea (centralised setting)	Qualitative, comparative case study	Deficits: systems thinking, sustainability foresight, social learning Drivers: collective visioning, community empowerment, intermediation, reposition of local science actors
Ziervogel	Climate and risk governance	2 cities, South Africa	Qualitative case study	Inclusion of the urban poor in planning and policy for inclusive governance
Nordström and Wales	Urban planning	Sweden	Qualitative analysis	Significant role of children's environmental experiences and their participation in urban planning processes
Glaas *et al.*	Climate transition	3 cities, Sweden	Literature analysis	Development of tailored assessment framework (visualization) by the cooperative work between municipal leaders and researchers
Withycombe Keeler *et al.*	Sustainability transformation projects	2 cities, USA	Qualitative case study	Role of city-university partnerships for actor-centric transformative capacity

(Source: own compilation based on Borgstroem, 2019; Castán Broto *et al.*, 2019; Glaas *et al.*, 2019; Nordstroem and Wales, 2019; Withycombe Keeler *et al.*, 2019; Wolfram, 2019; Ziervogel, 2019)

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