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FROM GARDEN CITY TO SPONGE CITY: URBAN GREEN INFRASTRUCTURE POLICY DEVELOPMENT

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**FROM GARDEN CITY TO SPONGE CITY:
URBAN GREEN INFRASTRUCTURE POLICY DEVELOPMENT**

By
Hongmei Lu

A DISSERTATION

Submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

In Environmental and Energy Policy

MICHIGAN TECHNOLOGICAL UNIVERSITY

2020

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This dissertation has been approved in partial fulfillment of the requirements for the Degree of DOCTOR OF PHILOSOPHY in Environmental and Energy Policy.

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Author contribution statement

This dissertation is a collection of four manuscripts that are either published, under review, or have been prepared for publication. They are formatted to conform to a single style, but otherwise appear as published or as prepared for submission. The first manuscript, Chapter 1 of this dissertation “Can the dual identity of policy entrepreneur and policy implementer promote successful policy adoption? Vertical greening policymaking in Shanghai, China” has been published in the *Journal of Asian Public Policy* in Jan. 2020. As the primary author, I was responsible for collecting data in the field, transcribing, coding, and analyzing qualitative data. As lead author on this manuscript, I identified the themes within the paper and prepared the manuscript. My advisor Dr. Mayer and other committee members of Dr. Wellstead and Dr. Zhou reviewed the drafts and gave comments. Dr. Mayer also edited the drafts.

The second manuscript, Chapter 2 of this dissertation “For-profit sustainability: The policy gaps and potential of a club-good approach to shopping mall roof garden development”. I was responsible for research design, collecting data in the field, and analyzing the data. As the single author on this manuscript, I also identified the themes within the paper and prepared the manuscript with guidance from my advisor and other committee members. Dr. Mayer commented on previous versions and assisted in editing the manuscript that appears in this dissertation.

The third manuscript, Chapter 3 of this dissertation “Unveiling the Quasi-Public-Private Partnership (QPPP): Evidence from China’s environmental service sector” was submitted to the *Journal of Environmental Policy & Planning* in Jan. 2020, revised, and resubmitted in Jun. 2020. As the primary author, I established the private partner's dataset, interviewed key informants, analyzed qualitative data, and prepared the manuscript with guidance from Dr. Mayer, Dr. Zhou, and Dr. Wellstead. Dr. Mayer also edited the different versions of the manuscripts.

For the fourth manuscript, Chapter 4 of this dissertation “How does policy goal ambiguity influence policy implementation outcomes? Sponge-City Program implementation in old

neighborhoods”, I was responsible for research design, data collecting and analyzing. I identified the themes within the paper and prepared the manuscript with guidance from both my advisor and my committee. My Advisor Dr. Mayer also assisted in editing the manuscript that appears in this dissertation.

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I would like to thank my committee, Dr. Adam Wellstead, Dr. Shan Zhou, and Dr. Robert Ryan for providing inspiration and constructive comments for my proposals, paper drafts, and dissertation; for recommending good papers and books; and for helping me build my professional networks.

Thanks to the Department of Social Sciences, for giving me this opportunity to pursue my Ph.D. degree. I learned about what a high-quality education and academic rigor mean. Thanks also to the Graduate School, the Ecosystem Science Center, Great Lake Research Center, and Graduate Student Government, for their generous financial support, which allowed me to completely focus on my study without distraction, attend conferences, and publicize my research.

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List of abbreviations

GI:	Green Infrastructure
VG:	Vertical Greening
SMRG:	Shopping Mall Roof Garden
RG:	Roof Garden
POPS:	Privately-Owned Public Space
LID:	Low Impact Development
SCP:	Sponge City Program
PPP:	Public Private Partnership
QPPP:	Quasi Public Private Partnership
SOE:	State-Owned Enterprise
CICA:	Conference on Interaction and Confidence-Building Measures in Asia
FAR:	Floor Area Ratio
SGC:	Shanghai Greening Committee
SAGCA:	Shanghai Administration of Greening and City Appearance
SCDR:	Shanghai Committee of Development & Reform
OLE:	Orient Landscape & Environment Co. Ltd

Abstract

With rapid urbanization, environmental problems like green space shortage and urban flooding become prevalent. Identifying effective policymaking and implementation is critical in order to solve these problems. This dissertation addresses four theoretical topics in the context of urban green infrastructure: policy entrepreneur, institutional response to club goods, quasi-public-private partnership, and policy goal ambiguity. Each is exemplified by a causal case study. Data were collected through participant observation, field trips, semi-structured interviews, and crowdsourcing.

Chapter 1 takes a longitudinal perspective and examines the dual role of policy entrepreneur and policy implementer in reaching the final policy goal of mandating vertical greening in the law in Shanghai (1992-2016). Usually, policy implementer and policy entrepreneur are two distinct identities and studied separately. This paper provides an unusual counterexample, exploring how the two intertwined identities may influence the entrepreneurial strategies and further influence the incremental policymaking process.

Chapter 2 illustrates how government involvement may facilitate club-good development by investigating the nascent for-profit shopping mall roof garden (SMRG) development. SMRGs, established by developers to provide an amenity to mall customers, are in nature club goods. Although the government appreciates SMRGs given their positive externalities (e.g., recreation, stormwater mitigation), existing public policies fail to respond to SMRGs' cross-sector nature, leaving significant financial, legitimacy, and oversight gaps unattended. The research suggests that government involvement can better facilitate club-goods' sustainable development by creating an enabling institutional environment, which includes optimized policy design and coordinated cross-department collaboration.

Chapter 3 focuses on the rarely studied phenomenon of the Quasi-Public Private Partnership (QPPP) in non-liberal societies. This work offers a general definition of Quasi-PPPs and identifies factors that influence the PPP to QPPP transition. In the case of eco-environmental service provision, the PPP-QPPP transition occurred in two stages. First, the eco-environmental service partnerships, initially established as PPPs, became

inoperable with inexperienced partners and unsupportive markets. Second, with financial bailouts from the government, the private partner became a subordinated partner in a consortium between private partners and State-Owned Enterprises, and PPPs transitioned to QPPPs. In a non-liberal society, when the three critical PPP assumptions are violated (competent partners, supportive market, and horizontal partner structure), PPPs are more likely to transition to QPPPs.

Chapter 4 examines how policy goal ambiguity influences policy implementation outcomes, exemplified by the Sponge City Program (SCP) implementation. SCP is a centrally-initiated program, requiring mainly the use of green instead of gray infrastructure to manage urban stormwater. When implemented top-down, three cross-level, layered goals of sustainability, stormwater management, and resident satisfaction became incoherent and vague in terms of priority and measurement. The research demonstrates that in a program with multiple policy goals, the goal priority ambiguity allows implementers the discretion to decide the order of goals to manage interest conflicts. Moreover, the goal measurement ambiguity allows implementers to decide the degree of their commitment to each goal, and to interpret the desired performance of a goal. Such ambiguity-caused discretions drastically inhibit the achievement of the sustainability policy goal.

Keywords: policy development, green infrastructure, policy entrepreneur, club goods, quasi-public-private partnership, policy goal ambiguity

Research background

By 2050, about 70% of the world population will live in cities, which points to the importance of sustainable city development (Dixon, Eames, Hunt, & Lannon, 2014). Urban green infrastructure (GI), an interconnected network of open green space including parks, green corridors, urban woodlands, community gardens, and roof greening, are regarded as a valuable natural resource contributing to sustainable cities (Benedict & McMahon, 2002; Hunter & Luck, 2015; Tzoulas et al., 2007). GI plays a critical role in addressing many urban environmental problems such as improving air quality, mitigating the greenhouse effect, managing urban stormwater, and providing recreational spaces for residents. In this dissertation, the term GI refers to all urban green spaces as differentiated from the gray infrastructure (sewer and stormwater lines, treatment plants, and roads). In China, rapid urbanization over recent decades has increased the agglomeration and compactness of urban land use (Mu, Mayer, He, & Tian, 2016), creating a shortage of green space shortage and increased urban flooding. For instance, despite continuous efforts of the local greening administration, the public green space per capita in Shanghai remains extremely low; only 4.6 m² in 2000 (Hu, 2001). In addition, with the dual effects of climate change and the increasing percentage of impervious surfaces, urban flooding has become more frequent and more extreme (Hallegatte, Green, Nicholls, & Corfee-Morlot, 2013). For example, in 2012, Beijing was hit with one of the heaviest rainstorms in the past 60 years, resulting in 79 deaths, crippling the transportation network, and leaving thousands of homes flooded (Xu, 2015).

This research focuses specifically on how to use GI to solve these urban environmental problems, especially urban greenspace shortage and urban flooding. To deal with them, the Chinese central government enacted two milestone programs. The first is the 1992 ‘National Garden City’ campaign launched by the Ministry of Construction to encourage cities to improve urban ecosystems and build livable cities (Jin, Chen, & Ma, 2015). Accordingly, many cities, like Beijing, Nanjing, Hefei, etc., have taken stock of their existing urban GI and tried to increase their urban green space to meet the Garden City standards (Huang, Yan, & Wu, 2016). Cities with severe land-use conflicts, including

Shanghai, have resorted to new forms of above-ground vertical greening, including green roofs and green walls. Vertical greening can be an effective supplementary approach to increase urban greening where land values are at a premium.

The second program is the 2014 Sponge City program, which proposes to use GI to sustainably manage urban stormwater and reduce the dependency on gray infrastructure, by increasing infiltration of rainwater and preserve water resources during times of drought (Li, Ding, Ren, Li, & Wang, 2017). Greening measures promoted under this program include green roofs, rain gardens, and bio-retention swales. GI, in addition to the recognized recreational function, is thus supposed to play a role in urban stormwater management. This new form and the new role of GI leads to challenges in both ideology and empirical practice.

Environment-friendly city development can be expensive and challenging. For instance, the Sponge City program requires an investment as high as 100-150 million CNY/km², which is a considerable financial burden for local governments (Li et al., 2017). Moreover, GI development in cities always involves severe land-use conflict, as many GI projects are installed on non-public lands (Chini, Canning, Schreiber, Peschel, & Stillwell, 2017; Ryan, Fábos, & Allan, 2006). For this reason, the central government launched a Public-Private Partnership (PPP) policy in 2014 to encourage the private sector to engage and invest in the nation's sustainable city initiatives (Tan & Zhao, 2019).

This dissertation examines the local-level policymaking and policy implementation pertaining to these initiatives. In the four substantial chapters, each chapter addresses one theoretical topic: policy entrepreneur, institutional response to club goods, quasi-public-private partnership, and policy goal ambiguity. Each is exemplified by a causal case study. The first chapter addresses how the policy implementer acted as a policy entrepreneur dedicating to green roof policy change in Shanghai. The second chapter examines how institutional response may improve the club good (shopping mall roof garden) provision when the private sector is engaged in club-based green space provision. The third chapter investigates how a PPP policy transitioned to a Quasi-PPP when three basic PPP

assumptions were violated and failed to reap the PPP benefits. The fourth chapter focuses on how policy goal ambiguity influences the policy outcome in the top-down Sponge City program implementation.

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Can the dual identity of policy entrepreneur and policy implementer promote successful policy adoption? Vertical greening policymaking in Shanghai

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Abstract

Both the policy entrepreneur and policy implementer play critical roles in the policy process. Policy entrepreneurs have been regarded as a main driver of agenda-setting and policy change. Policy implementers are decisive in spotting problems associated with implementation and ensuring policy-goal attainment. Yet, little attention has been devoted to how the overlap of these two identities may influence agenda-setting and policy adoption. This paper addresses this gap using a qualitative case study approach and explores the vertical greening (VG) policymaking process in Shanghai (1992-2016), China. In this case, the head of the Shanghai Greening Committee (SGC, the municipal greenspace-policy implementer) acted as a de facto policy entrepreneur, and skillfully employed incremental strategies to advance the VG policy agenda forward through three phases. This paper advances three conclusions. (1) The identity of policy implementer prompts the entrepreneurial tactics by detecting the barriers in implementation and motivates the policy entrepreneur to remove these barriers. (2) The discrepancy in perception of the policy-goal ambiguity between the policy implementer and policymaker may compromise policy adoption. (3) The dual identity does not prevent the policy entrepreneur from maintaining a flexible attitude to accept compromises in order to have the policy passed.

Keywords: policy entrepreneur; policy implementer; dual role; vertical greening policy; Shanghai; China

1.1 Introduction

Policy entrepreneurship is often regarded as a causal mechanism of agenda-setting (Hopkins, 2016) and driver of policy change (Mintrom & Norman, 2009). Entrepreneurs are often at the center of U.S. environmental policy innovation, building coalitions to advance their cause using a variety of resources (Rabe, 1999). Another important actor in the policy process is the policy implementer, who carries out the established public policies. Their skills and commitment, and capability to adapt the policy to local conditions, enable policy goal attainment (Matland, 1995). Given the local implementers' deep understanding and knowledge of on-the-ground problems, they are often in a better position to initiate purposeful policy.

Here we examine how policy adoption is affected by a policy implementer's experience combined with a policy entrepreneur's strategies, in an in-depth case study of urban vertical greening (VG) in Shanghai, China. Although in practice, policy implementers initiating and advocating for specific policies is not uncommon, theoretical exploration of this situation has not been given equal attention. Bakir (2009) examines how the policy entrepreneur's multiple high-profile identities as decision-maker, theorist, framer, and mediator (plus a considerable influence in transnational and domestic policy communities) enables the entrepreneur to operate in different ideational realms towards desirable institutional change. Frisch-Aviram, Cohen, and Beerli (2018) found that the low-level bureaucrats who implement the policy can influence the shaping of policy through their professional knowledge and understanding the needs of the public; yet their research focused more on how the governance regime affects the ability of these bureaucrats to act as policy entrepreneurs. We contribute to the literature by investigating how the identity as a local policy implementer may influence the entrepreneurial efforts towards the policy change of an esoteric issue in a centralized political regime. This paper argues that this dual identity has both pros and cons, but does not prevent the policy entrepreneur from making progress in the specific political context. For the following parts, first, we review the literature on both policy entrepreneur and policy implementer, followed by the methodology. We then identify the problem and the policy entrepreneur, detailing the

policy entrepreneur's strategies in the three-phase VG policymaking process in Shanghai. Finally, we discuss and summarize our main findings.

1.2 Policy entrepreneur and policy implementer

The concept of policy entrepreneur is well defined (Kingdon, 1995) as are their strategies (Cairney, 2018; Faling, Biesbroek, Karlsson-Vinkhuyzen, & Termeer, 2018; Mintrom & Norman, 2009). Mintrom and Norman (2009) use a four-element framework which includes problem defining, social acuity displaying, team building, and leading by example, to identify policy entrepreneurs and analyze their strategies. In a similar vein, Faling et al. (2018) identify five categories of frequently-adopted entrepreneurial strategies: issue promotion, issue framing, coalition building, manipulating institutions, and leading by example. These entrepreneurial strategies are well elaborated in case studies. For instance, Meijerink and Huitema (2010) examine how policy entrepreneurs use smaller-scale implementation to gain experience with proposed policies.

Although the concept of policy entrepreneur originated in democratic political systems, it has proved to be applicable to non-democratic regimes like China (Hammond, 2013). He (2018) finds that personal traits, political capital, network position, and institutional framework influence the entrepreneurial activities in the medical system reform in Sanming, China. Zhu (2008) explores how policy entrepreneurs used the strategy of technical infeasibility to push policy change for urban vagrants and beggars in China. However, Hammond (2013) finds that existing frameworks do not completely explain the Chinese minimum living guarantee policy process, and advocates for more research on the applicability of policy entrepreneur frameworks to determine whether modifications are necessary in the Chinese context.

Compared to the policy entrepreneurs, less attention is devoted to policy implementers (Kingdon, 1995; Zahariadis, 2014). Policy implementation usually depends on civil servants and administrative officials to enact the policy, though other non-government actors may also be involved (Howlett, Ramesh, & Perl, 2009). Here we highlight two

factors that may influence implementation: policy-goal ambiguity and public support for the policy.

According to Noordegraaf (2010), policy formation implies intricate politico-administrative interactions between politicians and policy administrators. The former, including the policymaker, contributes interests and values; the latter, including policy implementers, focuses on facts and knowledge. It is expected that high-rank decision-makers will provide implementers with clear policy goals and directions, which is not always the case (Howlett et al., 2009). Cairney and Kwiatkowski (2017) maintain that many policymakers do not fully understand the policy problems they must address. They may also choose ambiguous solutions to ill-defined problems to take advantage of a policy window (Cairney, 2018).

Public support for a policy can influence both policy adoption (Cairney, 2018) and policy implementation (Howlett et al., 2009). Sometimes the government may want to keep the issue esoteric or simply to transfer it from a political debate into a more technical concern in order to ease the public concern or reduce opposition (Bakir, 2005). While in other cases, either the government or the advocates may try to make the esoteric issue more public, meanwhile to promote their pet solution (Faling et al., 2018). In Philadelphia, Madden (2010) found that the policy entrepreneur advocated for the use of green infrastructure for urban stormwater mitigation through the media. Similarly, in Cleveland, officials found that media attention on an unsuccessful stormwater mitigation project resulted in a bad relationship with the public, making it difficult to justify the project expenditures and further impeded policy implementation (Keeley et al., 2013). In China, the media is usually employed as an instrument to propagate political ideology and public policies (Pan, 2000). The way the mass media prioritizes certain issues influences the public's judgment and acceptance (Wang, 2008).

There are increasing appeals for more interaction between policymaking and policy implementation. Nakamura and Smallwood (1980) argued that the policy-formation process provides implementers critical clues about the intensity of demands, and the size, stability, and degree of consensus among those demanding change. Winter (1986) found

that many implementation barriers occur at the initial stages of the policymaking process, especially policy formulation. It is often more effective for policy-makers to deliberate the implementation challenges and response ex-ante instead of ex-post (Linder & Peters, 1990). Matland (1995) suggests that local policy implementers can propose new policies given their knowledge of policy problems and context. Given our current understanding of the role of policy entrepreneurial activities and policy implementation feedbacks, it would be prudent to examine these roles from an integrated perspective.

1.3 Methodology

We employ a case-study approach to analyze the VG policymaking process in Shanghai, which is the first city in China to mandate VG. Our focus on Shanghai is due to its pioneering performance in VG policymaking, and because the lead author has professional experience in Shanghai's landscape industry and thus has developed good interpersonal networks allowing for relatively easier access to the potential key informants and data. This privileged access enables the author to achieve a greater depth of knowledge than available from superficial official accounts, and better understand the perception and motivation of the key protagonists (Rhodes & Noordegraaf, 2007).

The empirical data are collected from both primary and secondary sources. In order to better understand elite behavior and avoid getting non-neutral and biased answers, we collected first-hand data through participant observations/shading managers and semi-structured interviews (Noordegraaf, 2014). Between 2008-2016, the author attended the annual Shanghai International Vertical Greening and Building Greening Exhibitions to observe the public and market response to VG. Field trips to the VG projects in the Expo 2010 Shanghai, as well as engagement in the program of 2016 Top-100 VG projects ranking, demonstrated how the SGC tried to arouse public interest in VG through mass media. Other observing opportunities include listening to Li's speech or luncheon conversations with Li at some meetings etc.

Key-informant interviews at both city and district levels were conducted. In January 2016, the lead author conducted in-depth interviews with the key protagonist, the director

of SGC (Li Li), as well as the vice director (Guoqiang Sun), in the office of Shanghai Administration of Greening and City Appearance (SAGCA). Interview questions include why they were interested in VG, what kind of strategies were used to advance the policy agenda, how important city events may have influenced the VG policy, and why they wanted to mandate VG in the law. Another critical city-level interviewee is Xiangmao Li, municipal VG project supervisor of the Shanghai Station of Landscape Management, who is in charge of the quality and financial incentive of VG projects and has close contact with district implementers. Questions concerning the compilations and implementation of technical standards and the evaluation of the financial incentive plan were asked. Though VG is proposed city-wide, usually it is more popular in the densely-populated urban center. To have a comprehensive picture of the VG implementation, the lead author also interviewed district-level SGC officials from both urban districts of Jing'an, Zhabei, Changning, Yangpu and suburban districts of Minhang, Chongming and Fengxian. Questions about the challenges for districts when each is assigned the heavy annual task of VG area-development and about the entrepreneurial efforts of Li Li were asked. These district-level interviewees are frontline policy implementers. They have the best knowledge about VG policy implementation, and they report directly to municipal SGC, or Li.

We collected secondary data from open sources including official documents and government websites. This included annual data for the VG area from the *Yearbook of Shanghai Greening and City Appearance* and presented in Figure 1.1, and VG technical standards from official documents including policy booklets and white papers, as well as the official website of SAGCA and displayed in Table 1.1. We gathered data about the VG public education and awareness-raising activities from mass media, including *Xinmin Evening News*, *Jiefang Daily*, and the internet media of *Sina.com.cn* and *Eastday.com* and showed in Table 1.2.

The interviews were recorded and transcribed. Since the research involves information spanning over two decades, sometimes the interviewees could only provide the name or keywords of an event. Therefore, to verify the accuracy and to probe further into the details, we often turned back to the documents. The respondents were allowed to

confirm the transcripts. We also triangulated all the data collected from observation, interview, and document review for validity.

1.4 Severe urban greenspace shortage and identifying the policy entrepreneur

The compact-city urbanization model in China has led to intense land-use conflict, which squeezes out necessary urban greenspace. In response, the Chinese Ministry of Construction launched a ‘National Garden City’ campaign in 1992 (Jin, Chen, & Ma, 2015). One criterion of the campaign requires that a candidate city’s ground-level public greenspace area reaches at least 5 m² per capita; while in 1993, Shanghai’s was only 1.15 m² (Hu, 1994). In the following years, the Shanghai Garden Administration, especially its in-house department of Shanghai Greening Committee (SGC, responsible for municipal greenspace development), together with SGC’s branches in each district, worked to increase urban greenspace to meet the ‘Garden City’ target. Besides ground-level greenspaces, VG (which includes green walls, green roofs, and other forms of above-ground greening measures) was proposed to address the urban greenspace shortage.

After a decade’s efforts, in 2003, Shanghai was finally entitled ‘Garden City’ when the greenspace reached 7.6 m² per capita (Jin et al., 2015). The Garden City criteria were not only an indicator of the city’s greenspace shortage, but a reminder of how difficult and expensive ground-level green space development could be in urban areas. For instance, to develop the Yanzhong greenspace, which covered an area of 28 ha in the city center, the government relocated over 10,000 households and 400 enterprises. The cost of land acquisition alone was as high as 120 million Yuan/ha (Hu, 2018). The financial challenges further inspired SGC to try out VG, which saved land-acquisition costs. At that time, VG was an esoteric topic and the central government neither paid much attention to nor included it in the national Garden City criteria. Thus, VG policymaking was at the discretion of the local government and left the potential policy entrepreneur space to operate.

Macro political setting may indirectly influence agenda setting through the emergence of policy entrepreneurs. Araral and Amri found that in non-liberal democracies, “policy actors like think tanks, interest groups and media may not play similarly important roles in shaping the policy agenda as in mature liberal democracies” (2016, p. 80) and the exclusion of outside actors potentially inhibits outside policy entrepreneurs. This is largely true in China (Zhu, 2008), though in recent years the rise of the internet has made popular pressure a strong force in agenda setting (Wang, 2008). However, for VG, as a kind of public good with largely indirect and chronic economic or social benefits, there are rarely outside interest groups or lobbyists involved.

Nevertheless, in the following policy development process, a proactive insider, the head of the SGC, Li Li, was a key actor. She devoted considerable time and energy to continuously influence policymaking towards its desirable outcome: *legitimizing the VG in the municipal greening law*. Li, a native of Shanghai was a horticultural specialist, who worked in the Shanghai Botanical Garden and the Shanghai Station of Landscape Management for years before she was promoted to work for the then Shanghai Garden Administration in 1998 until her retirement in 2016. In almost two decades, she strategically maneuvered the VG development and policy agenda, from VG policy experimentation to institutionalize VG in the law. Her efforts to promote VG included giving speeches at important conferences, organizing demonstration-site field trips to familiarize the district-level officials with VG, inviting researchers including the lead author of this paper to conduct studies on foreign VG policies, and compiling brochures as propaganda material to educate the public.

Her work-related identity transition from a technical expert to a public manager implied new managerial knowledge and skill learning. When Li became head of SGC, she paid a great deal of attention to team building. During the interview with Li, she invited SGC’s deputy director to join her and emphasized several times that if there is any achievement in Shanghai’s VG development, it was attributable to the efforts of the whole team instead of herself alone. Though challenging, Li was persistent and always kept encouraging her team. This was particularly the case during the World Expo 2010 Shanghai. There, she urged SGC members to get out of the office to visit and study the

Expo VG as much as possible. When mentioning that more professionals are now engaged in VG research and development, Li said: ‘compared with our initial stumbling years to introduce VG in the city, the situation becomes much better now.’ Many other interviewees determined that without Li, VG development and policymaking in Shanghai may have never materialized. Thus, Li can, according to Kingdon’s definition (1995), be considered as a policy entrepreneur of the Shanghai VG policy. Her entrepreneurial efforts can be divided into three phases.

Phase 1: Policy experimentation and feedback from pilot projects

When promoting new technologies or new concepts, policy entrepreneurs usually conduct small-scale experimentation to gain experience (Faling et al., 2018; Mintrom & Norman, 2009). Li started VG by establishing pilot projects and policy experimentation at the district level. Jing’an, a district in the city center with a high population density, had the strongest motivation to install VG to partially mitigate land-use conflicts. Since 2001, Li worked with Jing’an SGC to build 47 VG demonstration sites. Most pilot projects were implemented on public buildings, particularly governmental buildings. Li also directed the Jing’an SGC in institutionalizing roof greening. In 2002, the first VG policy at the district level, the *Implementation Opinion on Roof Greening of Jing’an District, Shanghai (Trial)* (People's Government of Jing’an District, 2002) was formulated and put into effect. This policy incentivizes all new buildings or feasible retrofitting projects for green roofs at 10 Yuan/m², making it eligible for the award of ‘Advanced Unit in Greening’.

Working models for proposed changes can help provide important information about program effectiveness and practicality (Mintrom & Norman, 2009). The pilot projects and the trial policy in Jing’an brought both positive and negative feedback to SGC. On the positive side, the demonstrations encouraged several districts to mimic the efforts, though still in small scales (H. M. Lu, 2016). By October 2004, there was about 12 ha of rooftop greened in Shanghai (Yang, Zhang, & Nie, 2008). The trials also enriched SGC’s experiences and made Li more confident in VG development. Nevertheless, these positive influences on insiders do not necessarily ease the prevailing public concerns.

Barriers arising from policy experimentation

Several barriers were identified during the policy experimentation phase. *The first involved legal support.* Although VG occurs above ground level, it does require usage rights of structures including roofs or walls. For example, when proposing VG projects, SGC officials first have to persuade the occupants/developers to allow the roof or wall to be greened. Usage rights involve different parties, including developers, property management companies, and occupants. Most of these parties are not from the greening sector and are not knowledgeable about VG. *The second barrier is technical in nature.* Occupants worry about the load-bearing potential of the building, the plant root penetration, mosquitoes and insects, and how to keep the roof greenings safe during typhoon seasons. *The third regards funding,* specifically responsibility for installation and management costs. While ground-level greenspace projects are usually included in annual government budgets, VG installations are not. Ignoring land acquisition costs, VG's installation and maintenance costs are higher than ground-level greenspaces (Claus & Rousseau, 2012). *The fourth is an assumed low social-environmental value.* Many of the pilot green roofs are not open to the public and are not designed for recreation. Their inaccessibility and invisibility made roof greening less attractive to the public. Some professionals also doubted the ecological benefits of roof greening, which at that time usually contained only light-weight sedums and grasses (R. Li, 2007).

Phase 2: Policy amendment to encourage VG in the municipal law

Li realized the above-mentioned concerns may directly or indirectly impede VG development. Meanwhile, she was also eager to upgrade the district-level policy to the city level to legalize VG and spark a VG trend in the city. From an implementer's perspective, representing VG in the law will make the VG policy implementation more legitimate. However, before Li had time to solve these problems, she identified an unexpected policy window from the agency merger.

Seize the first policy window without solving the implementation barriers

Rapid urbanization brought about not only greenspace shortage, but also greenspace administrative challenges in Shanghai. Successful green space policy often requires the integration of regional governmental units that oversee greening and urban planning (Ma, 2007). In 2004, the two greening authorities, the Shanghai Gardening Administration (for urban areas) and the Shanghai Agriculture and Forestry Administration (for rural areas) merged and became the ‘Shanghai Greening Administration’. Soon after, the greening law *Shanghai Regulations of Planting and Greening* (which did not mention VG at all) was proposed for amendment to adapt to the post-merging administration. This unintentionally created an opportunity for a VG policy window.

In 2005, the new Shanghai Greening Administration set out to amend the greening law. Li saw a great opportunity to put VG on the institutional agenda. Given the above-mentioned implementation barriers, she proposed two modest clauses about VGs for the amendment: (1) to encourage VG in the city; (2) to require that new public buildings with feasible structures undergo roof greening. As to the second clause, this city-level law is not as strict as the Jing’an policy, which requires all new roofs to be greened. SGC’s proposal was accepted and in 2007 the old regulation, which had been in effect for 20 years, was amended and renamed ‘*Shanghai Greening Regulations*’. This is the first time that VG was represented in the municipal law.

Nevertheless, the law ‘to encourage’ VG development was rather weak (Feng, 2012). For instance, both the technical instructor in the Shanghai Station of Landscape Management and district SGC officials stated that the building developer/occupants usually did not have the intention to green their roofs. When the officials visited them in person and informed them of the new law as well as the governmental encouragement, their focus was on the direct benefits to the developer. Hence, the modest term ‘encouragement’ created a second policy window.

Phase 3: Reducing implementation barriers and the second policy-window

For Li, the 2007 VG amendment was the first step of mandating VG in the law. To implementers, mandating is like an implementing order with the highest authority

(Hammond, 2013), which can reduce implementing difficulty. Li realized that only when the policy became feasible and acceptable to enough policy actors, would such a radical policy change become possible. In the following years, she committed to removing or reducing these barriers, with specific attention to establishing technical standards, funding, and acceptability. The upcoming big city event of World Expo 2010 Shanghai was a good opportunity to do so.

Reframing the issue and turning the tide via the World Expo 2010 Shanghai

Howlett et al. (2009) argue that both political and economic factors are important determinants and can influence the timing and content of specific policy initiatives. The World Expo 2010 Shanghai was an important ‘political and economic event’ and Li’s social acuity enabled her to seize this opportunity. *First was substantial VG-project-development framing.* To welcome the Expo, the municipality used all resources to retrofit and beautify the city. Meanwhile, in 2008, the Shanghai Greening Administration was again merged with the Shanghai Administration of City Appearance and Sanitation and renamed as ‘Shanghai Administration of Greening and City Appearance’ (SAGCA). Besides greening, the new authority’s purview expanded to city appearance and urban management. Expo-oriented city retrofitting became the top concern of SAGCA. Li proposed to vertically beautify the city by establishing greening on the roofs, the walls, the trellises, and the balconies. In the following three years (2008-2010), many VG projects were successfully completed. *The second was the increased-public-awareness framing.* To Li, more encouraging was that this Expo was a multinational showcase of building-greening designs and technologies. Almost half of the 289 pavilions were equipped with roof or wall greening (L. Li, 2010). Li recognized that such a high VG rate was a strong indicator: “We (SGC) want to let people know that VG is not the single-minded goal of the Shanghai authority, rather it has already become a worldwide trend, which is manifest in this Expo” (L. Li, 2010).

SGC collaborated with the SAGCA-sponsored *Garden* magazine and published three special issues of ‘Expo Vertical Greening’ and a book entitled *Pavilion Greenings of Expo 2010 Shanghai, China*, both with the focus on VG technologies. SGC also organized many

field trips and workshops in the Expo Park to inform governmental officials, professionals, and citizens about the eco-benefits as well as the aesthetic value of VG. Expo 2010 became a turning point in VG development in Shanghai (Sun & You, 2012).

Post-Expo: reducing implementation barriers through institutional networking

Before the Expo, Li largely operated within the greening administration. The Expo mobilized almost every sector to collaborate and commit to the shared city goal. This suggested that there were more outside resources could be used and Li began to identify cross-sectoral resources through institutional networking.

Establishing technical standards

The first step was to make technical standards to improve the safety of VG projects. As shown in Table 1.1, the first two specifications were made right after the 2007 amendment, yet all others were made after the Expo. Although all these standards were initiated and established by SGC, they were usually co-issued by SAGCA and other related institutions. Alliances with other more powerful institutions imply not only the increased authority of these standards, which is conducive to compliance, but also promote roof acquisition for VG installation because the planning or housing agencies are responsible for the roof regulations. As more VG projects were implemented and inspected following these standards, the public and property owner/occupants’ worries about technical issues like leakage and safety decreased.

Table 1.1 Technical standards made under the direction of SGC

Year	Title	Issued by
2008	Technical Specifications for Roof Greening (Trial)	SGA
2009	Technical Manual for Green Walls	SGA, SSLM
2014	Technical Specifications for Green Building Planting	SAGCA, SAPLR
2015	Technical Guide for the Viaduct Pier Greening Construction	SAGCA, SSLM

2015	Provisional Regulations for the Management of Viaduct Pier Greening Project	SAGCA, STC
2015	Operating Procedure of New Building Vertical Greening Planning Control	SAGCA, SAPLR, SCURC

Source: Compilation of Shanghai Vertical Greening Documents (SAGCA & Shanghai Station of Landscape Management, 2015)

Note: SGA: Shanghai Greening Administration

STC: Shanghai Transportation Committee

SAPLR: Shanghai Administration of Planning and Land Resource

SCURC: Shanghai Committee of Urban-Rural Construction

SSLM: Shanghai Station of Landscape Management

Issue promotion and public-support mobilization through media

Li understood that both the media and the public were critical policy actors, and capitalized on the media resources to make the VG more acceptable to the public. Since most green roofs were not open to the public, Li made full-range ‘watching, listening, and touching’ plans to soften up the public. The mobilization work involved three types (Table 1.2): online ranking for top VG projects in the city; persuading the SAGCA director to speak on the radio about VG; and organizing citizen field trips to VG projects. Li and her team members usually acted as an on-site interpreter. The pilot projects constructed in the early 2000s have been proven safe and cost-efficient, encouraging more development. For each event, the media were always invited and involved. For example, the large-scale ‘Ranking for Shanghai’s Top 100 VG Projects’ in 2015 lasted for three months and most of the local media were invited for full coverage. These public participation activities familiarized citizens with VG and created a supportive atmosphere, which was beneficial for policy adoption and implementation.

Table 1.2 Publicity for VG through media resources

Year	Publicity	Media engaged
2011	-Rating top 10 VG projects in Shanghai through www. sina.com	
2012	-March 12 th ‘Arbor Day’ Propaganda of greenspace and VG	<i>Xinmin Evening News</i> <i>Jiefang Daily</i>
2013	-March 12 th ‘Arbor Day’ Propaganda of greenspace and VG	Wenhui Po www.sina.com
2014	- ‘Cooling Summer’: to organize citizens for site-visiting of VG projects -SAGCA head spoke on a radio program about VGs in Shanghai	www.eastdaily.com <i>Garden magazine</i> <i>Shanghai Greening and City Appearance</i>
2015	-Rating top 100 VG projects in Shanghai -To organize citizens for site-visiting of VG projects -March 12 th ‘Citizen’s Greening Day’ Propaganda of greenspace and VG	Shanghai TV Shanghai People’s Broadcast
2016	-March 12 th ‘Citizen’s Greening Day’ Propaganda of greenspace and VG	

Source: authors compiled according to the local media coverage, SAGCA websites etc.

To increase the VG area and reach out for funding

To increase the VG area was the ultimate objective of the VG policies. Before the Expo, voluntary VG installation resulted in 98 ha of VG in the city. In 2011, Li proposed a total of 150 ha of VG in the municipal 12th Five-year Plan (2011-2015), which was assigned to each district’s annual plan. In 2014, another important city event, the Conference on Interaction and Confidence-Building Measures in Asia (CICA) was held in Shanghai. To welcome CICA, Li added an extra 10 ha of VG to the annual plan of 2014 (H. M. Lu,

2016), which exceeded the targets of the 12th Five-year VG Plan, and boosted the benchmark of the annual city plan from 30 ha to 40 ha in the 13th Five-Year plan.

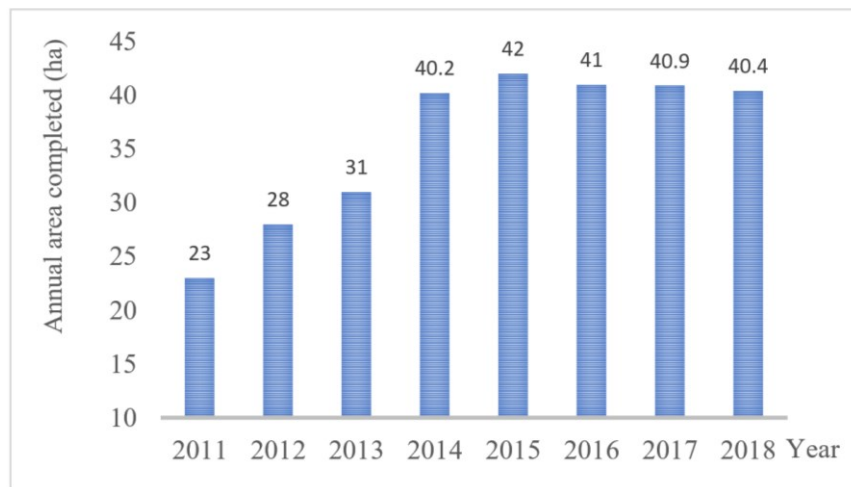


Figure 1.1 Annual installation area of vertical greening in Shanghai during 2011-2018*

*Data sourced from *Yearbook of Shanghai Greening and City Appearance*.

To advocate for a policy without any financial support is risky (Hammond, 2013). The annual plan can be made by the greening agency alone, yet to acquire funding entails cross-agency negotiation. Given the fragmented bureaucracy in China, the greenspace funding involved institutions like the Shanghai Financial Bureau, Shanghai Commission of Development & Reform, Shanghai Administration of Planning and Land Resource, and the Shanghai Environmental Protection Bureau. After lengthy and difficult negotiations, in 2012, the VG program was added to the municipal building energy-saving program (2012-2015) with dedicated funding support. In these three years, about 28% of the new VG area was subsidized (SAGCA, 2017). The incentive varied between 50-200 Yuan/m² according to the VG type, which was much higher than the 10 Yuan/m² in the Jing'an's pilot policy. Nevertheless, given the rising prices, this 50-200 Yuan subsidy covered only around 20-30% of the construction costs.

Li soon realized that this incentive policy's size limit was too restrictive, requiring a minimum VG area of 1,000 m². Given the small-scale and scattered nature of VG projects, the criteria greatly constrained the number of qualified projects. Also, 20-30% of

construction cost coverage was too low. So, in the second three-year (2016-2019) program, she appealed to the Shanghai Committee of Development & Reform (SCDR) to lower the size threshold and to increase per square meter funding, yet did not succeed. The SCDR responded that all other sectors' funding criteria improve year by year, there was no reason to lower only the greening sector's threshold.

Second policy amendment: 'mandating vertical greening' in the law

All of Li's political, technical, and publicity efforts were focused on streamlining the VG policy implementation. As an implementer, she understood the challenge to each district for fulfilling those annual plans. Many of these problems arose from the interaction of a policy with the street-level institutional context, and implementers who are often required to respond even when resources are insufficient (Shonkoff, 2000). As one district SGC official claimed, 'We often find insufficient authorities and powers when negotiating with building owners/developers'. Li determined that legislation would be the most efficient solution to these challenges and would greatly relieve the pressure on the district-level SGC implementers. In 2014, Li again proposed the amendment of the *Shanghai Greening Regulations* (SAGCA, 2015). Given the hitherto elaborate preparations, Li was confident enough to propose two mandatory clauses: (1) all new public buildings in Shanghai no higher than 50 m must be greened and (2) cover at least 30% of roof area (SAGCA, 2015). However, in the legislative process, the '30%' was removed and replaced by 'the percentage is to be decided by the government'. The new amendment was put into effect on 1st October 2015. This compulsory stipulation of VGs on public buildings was novel in China and set an example for other cities (H. Li, 2015). For instance, Shenzhen, another Chinese metropolis, also amended its greening regulation by adding similar clauses in 2016.

1.5 Discussion and conclusions

Bakir and Jarvis (2017) have suggested contextualizing policy entrepreneurship by the interaction of various factors at multi-level contexts: structural, or the broader material and cultural contexts; institutional, i.e. both formal and informal rules; and agency levels, the

agent's social position or multiple identities in the same agency. In the case of VG in Shanghai, we can better understand the entrepreneurial strategies and tactics from both the agency and political regime contexts.

Looking from the agent or individual level, we found that Li was very skilled in using the entrepreneurial strategies presented in Mintrom and Norman's (2009) four-element framework, where the element of 'problem definition' is replaced by the 'issue promotion through media'. (1) Li conducted *policy experimentation* in the Jing'an district, which paved the way for "encouraging VG" in the law. (2) Through the exhibition window of Expo 2010 Shanghai, she *reframed the VG issue* as a world trend and this 'world trend' enabled her to propose annual VG targets in the city-wide 12th Five-year plan. (3) Her *social acuity* also allowed her to reach out and to improve the authority and legitimacy of this VG initiative, by networking with horizontal administrations to issue the technical standards, or by persuading the upper-tier director-general of SAGCA to speak on the radio for VG. While as a horticultural expert, Li could have publicized the effort, she realized that the involvement of higher-rank officials would increase political authority for VG (He, 2018). As to the fourth strategy of problem-definition in the Mintrom-Norman framework, the problem was already defined here, since the 'problem' is urban greenspace shortage manifested by the indicator of greenspace per capita.

What we want to highlight is another strategy beyond this framework: (4) issue promotion through mass media. Successful policy change requires widespread support from the public (Wang, 2008). Exoteric issues that involve the redistribution of a city's limited resources, like the college matriculation policy for migrant workers' children, easily generate extensive public debates and automatically move onto the policy agenda (Zhou & Feng, 2014). Conversely, VG's esoteric nature caused it to be overlooked by the government and almost invisible to the media and the general public.

To better understand Li's last strategy, it is necessary to take a broader perspective. Embedded in a Chinese centralized context, the implications of VG's low-profile nature are twofold for a policy entrepreneur. On the one hand, a topic high on the central government's agenda means top-town regulation may happen, which will save local

entrepreneurial efforts. For the severe urban flooding problem, which can cause tremendous direct loss, the central government implemented the nationwide Sponge City program to deal with it (Zhang, Li, & Wang, 2016). However, this is not the case for VG and the convenient door was closed. Li had to expand the issue and advance the policy agenda through her own efforts. Conversely, the centralized political regime still opened a window for her to capitalize on the media resources. The relationship between the Chinese government and the media is like supervisor-subordinate (Wang, 2008). This enabled Li to readily levy almost all the possible media resources, including TV, broadcast, website, and social media to make the VG issue exoteric and publicize the VG solution in a positive way.

At the agency level, the identity overlap of entrepreneur-implementer has both advantages and disadvantages towards policy adoption. The advantage allowed Li to spot problems associated with implementation. Through frequent interactions, including routine quarterly meetings with the district SGC officials, Li received feedback directly from frontline implementers and used it while she advanced the policy agenda. Cairney (2018) argues that policy entrepreneurs usually have a solution ready to chase a problem. As an implementer, Li understood the policy problem and figured out the policy solution. As a result, Li's entrepreneurial tactics were especially implementation-oriented, like establishing technical standards, ensuring funding, increasing public acceptance, and promoting annual plans. When she found that the installation costs of VGs were higher than ground-level installation, she pursued financial support, although was not successful in lowering qualification requirements for funding. Her efforts reduced implementation barriers and made the policy more acceptable to policymakers.

The disadvantage lies with the discrepancy in perception of the policy-goal ambiguity between the policy implementer and policymaker. For policymakers, sufficient language ambiguity allows different stakeholders to interpret the same policy differently and is an inevitable part of the political process (Baier, March, & Saetren, 1986; Berman, 1978). Oftentimes ambiguity is a prerequisite for getting new policies passed at the legitimation stage, with problems that cannot be immediately addressed buried in an ambiguous text to wait for later solutions (Matland, 1995). However, implementers are pragmatic and action-

oriented (Shonkoff, 2000). Goal ambiguity results in substantial misunderstanding and uncertainty and is often culpable for implementation failure (Matland, 1995). As an implementer, Li preferred clear and operational policy goals like a minimum of 30% greening coverage, which made implementation and monitoring easier. However, from a policymaker's perspective, such a clear goal would be too risky. In this sense, identity as an implementer does not necessarily benefit policy adoption. This differs from Bakir's (2009) finding that policy innovation becomes more possible when the policy entrepreneur has multiple identities in both domestic and international policy communities, and where s/he can coordinate ideas and discourse in those communities. In this research, different perceptions of policy goals between the policymakers and administrators were not able to be removed by the policy implementer.

Nevertheless, a resolute and action-oriented implementer's identity did not prevent Li from keeping a flexible mindset. Usually, policy entrepreneurs seek to reduce potential risks to decision-makers (Mintrom & Norman, 2009). In the last phase, with all the technical, financial, and mobilization preparations made, Li's identity as a policy-implementer allowed her to prescribe a 30% greening percentage, which was denied. An effective policy entrepreneur is flexible and ready to make compromises (He, 2018). Li was a senior official and knew when to step up and when to step back. The flexibility of an effective policy entrepreneur enables her to accept compromises to get the policy passed. This echoes Noordegraaf's (2000) observation that public managers may not do what is "best", but what is regarded as "appropriate". We may still expect a third amendment in which the roof greening percentage would be added. However, now that the policy entrepreneur has retired, will such a policy change happen?

Finally, we want to address the internal and external validity of this research. Flyvbjerg (2006) suggested that a single case study can provide valid research outcomes when the case in question is supposed to be sufficient and illustrative enough. Given our research work conducted and the data collected, we believe that Shanghai presents such a case. VG is too 'trivial' a topic to automatically attract the attention of interest groups, the public, or the media; in this sense, entrepreneurship as an internal driver does contribute to overall policy change though some compromises have to be made. Nevertheless, such an

effort works in the landscape greening sector involving less political and interest conflicts. For other sectors, like healthcare reform, with various political and vested interest stakeholders opposing policy change, it would be expected that other entrepreneurial strategies like to earn political capital (He, 2018) are needed towards the desirable policy change.

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For-profit sustainability: The policy gaps and potential of a club-good approach to shopping mall roof garden development

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Abstract

Green space as a public good is usually provided by the government. However, in high-density city centers, governments struggle to fulfill this responsibility given severe land-use conflicts. The club-good approach emerges as a potential market solution to this problem. Club good is a subcategory of public goods that are provided by private or social organizations to club members, featuring excludability and nonrivalry. Drawing on insights from field investigations and interviews, this paper examines how better institutional response may facilitate club-good's sustainable development exemplified by the nascent for-profit shopping mall roof garden (SMRG) development in Shanghai, China. SMRGs, established by developers to serve mainly the mall customers, are in nature club goods. This research finds that though the government appreciates SMRG's positive externalities, existing public policies are insufficient to support SMRG's sustainability because they fail to respond to SMRG's positive externality and cross-sectoral nature, and cause financial, legitimacy, and oversight gaps. This paper argues that appropriate institutional response can better facilitate club-goods' development by (1) optimizing policy design to internalize club-goods' external benefits and helping developers recover production costs; (2) interdepartmental collaboration as a response to SMRG's cross-sectoral nature to facilitate conducive policy making and implementation.

Keywords: Club good; for-profit; SMRG; institutional response; sustainability

2.1 Introduction

As an important element in city life, urban green space becomes indispensable during a crisis like the COVID-19 pandemic; people want to seek recreation and solace in nearby parks when indoor recreational places become inaccessible (Kleinschroth & Kowarik, 2020). Green space development and management are usually regarded as the responsibilities of governments (Azadi, Ho, Hafni, Zarafshani, & Witlox, 2011). In metropolises, these responsibilities become great challenges for governments given the severe land-resource shortage. New Public Management suggests that complex social problems like urban green space shortage can be addressed through public-private collaboration (Azadi et al., 2011; Pincetl, 2003). When the private sector is engaged in providing public goods, it may adopt a club-good approach (Prakash & Potoski, 2007), which is a market solution to public good provision. A club-good approach means, by securing private rights and restricting access, developers provide and manage the club goods by forming a club of user homogeneity (Warner, 2011). In contrast to public goods being accessible to everybody, access to club goods is usually limited to club members. Club goods are typically excludable and non-rival. Examples of club goods include private parks, toll roads, and cinemas (Turner, 2000; Warner, 2011). The advantages of a club good approach lie with the potential of being more effective, innovative, and spontaneous than government management and delivery. It can also relieve the government of implementation concerns (Prakash & Potoski, 2007). Although the club-good approach is efficient in matching club users' interests with service delivery, it is criticized for its exclusiveness and small scale, and may not be sufficient to support a sustainable city in the long term (Warner, 2011). Webster and Lai (2003) question a club good approach for its democratic legitimacy as it always privileges property-owner and business interests.

In densely populated cities, green spaces are often squeezed out, given a low priority, and replaced by high-rises or other development. Residents then suffer an "urban penalty" by being surrounded by impervious surfaces. As a remedy, many cities have instituted policies and programs to increase green roofs, which are usually first encouraged on public buildings (Carter & Fowler, 2008). In recent years, shopping malls have become a new

source of green roof development. In Japan, roof gardens have been an indispensable component of department store retrofitting plans since the Taisho period (Moeran, 2013). Shopping Mall Roof Gardens (SMRGs) are established by mall developers to serve the mall customers or by rooftop renters to serve specific groups (members). SMRGs are in nature club goods, featuring both private ownership (excludable) and non-rivalrous use (before congestion). In Shanghai, under the effect of fierce market competition, some pioneering shopping malls started to establish roof gardens in the past decade.

SMRGs as club goods have two important features: positive externality and cross-sectoral nature. Although the developers establish SMRGs largely for the economic benefits, including increasing customer base and top-floor marketing (Carter & Fowler, 2008), SMRGs have positive externalities including ecological and social benefits that are desired by both the government and the public. Usually covering thousands of square meters, SMRGs are oases in city centers with obvious ecological benefits, such as reducing urban flooding risks, mitigating air pollution, and increasing urban biodiversity (Carter & Fowler, 2008; Claus & Rousseau, 2012), and become an important component of the urban ecosystem. SMRGs also have prominent social benefits. Rahman, Ahmad, Mohammad, and Rosley (2015) suggest that 47% of customers like to visit SMRG when they visit the shopping mall. In Chinese urban neighborhoods, the limited public spaces are often insufficient to offer landscaping, children's playgrounds, or other amenities (X. Lu, 2018). Communities without good access to ground-level gardens favor these SMRGs. In this sense, SMRGs could be regarded as a type of voluntary environmental program, where institutions could incentivize private companies to produce environmental goods beyond legal requirements (Prakash & Potoski, 2012).

Meanwhile, although SMRGs are voluntary programs, they feature a cross-sectoral nature and are subject to regulations by different municipal agencies. For example, as elevated gardens, they are considered urban green spaces and are overseen by the greening department. Second, when established on the top of buildings, they have building safety concerns. Their construction design needs to be approved by the planning department. Third, as the SMRG is a component of the business place, they undergo routine inspections

from the fire department.

Preliminary studies show that many SMRGs have a sustainability problem. Dempsey and Burton (2012) describe sustainable green spaces as those valued by users “who want to visit them again and again” (P13). In this research, SMRG’s sustainability refers to *(1) the roof garden’s good status, including sufficient vegetation coverage, maintenance level, and persistent upkeep; (2) increasing numbers of developers motivated and willing to install roof gardens.* Azadi et al. (2011) argue that green spaces’ sustainable provision is premised on three conditions: physical environment support, socio-political support, and financial support. Specifically, funding, management, oversight, evaluation, and appropriate partnerships contribute to green spaces’ long-term existence (Fors, Molin, Murphy, & van den Bosch, 2015).

SMRGs make a good case that the private sector provides a source of innovation to solve problems of public goods provision and management (Webster & Lai, 2003). However, Warner (2011) also suggests that club goods are not just spontaneous responses to urban problems. They need legal and financial support from the government to sustain. For policymakers, a voluntary SMRG program has two main goals. One is to induce the private sector to produce good quality roof gardens (positive environmental externalities) and ensure their adherence to program obligations; the other is to attract more private actors to participate in the program. Exemplified by the SMRG development in Shanghai, this research identifies the policy gaps and explores how to improve institutional design for the sustainable development of club goods, which means more developers are motivated to install and maintain good-quality SMRGs. The paper is structured as follows. The next two sections are the literature review and methodology, followed by the gaps in the existing policies that constrain SMRG’s sustainable development and the negative impacts of an uncoordinated administrative system on SMRG’s development. The potential of an enabling institutional environment is then analyzed.

2.2 Literature review

The private sector has increasingly joined the government to collaboratively provide green space as a public service (Fors et al., 2015). Some of these collaborative provisions adopt a club good approach. In New York City, given the heavy competition for land, the municipal government developed many incentive policies to encourage developers to provide Privately-Owned Public Space (POPS) for the public's use, which becomes an important component of urban public spaces (Kayden, 2000). In a broad sense, POPSes are club goods when they are owned and managed by private developers and the access is somehow limited. Others may use a multiproduct approach, namely a mix of pure public goods and club goods (McNutt, 1999). Turner (2000) suggests that the national park is a good case of a multiproduct approach: it provides both public goods (wilderness conservation) and club goods (recreational activities) for visitors; he modeled the optimality conditions for the mixed public good provision by park managers. In California, private developers engaging in the state or national park management use the revenues from the developed recreational facilities or other fee items for the parks' daily maintenance and management (Gilroy, Kenny, & Morris, 2013). When well organized, the private sector can use its resources and contribute to all aspects of green space development, including lobbying, funding, marketing, and labor input for club goods (Rosol, 2010).

In a club-good approach, as in most public-private collaborations, potential interest conflict between the public and the private actors can create a great divergence between the two parties and cause the private sector's noncompliance (Prakash & Potoski, 2007). The government wants to shape the service sector according to the interests of society as a whole, while the private sector is more attentive to a specific group's interests. Of course, sometimes developers also want to create a green image through environment-friendly activities like installing non-profit green roofs (Miller, 2014). But the private actors' interests in engagement are mostly economic benefits from service/good development and management (Azadi et al., 2011). Brunner (2011) finds that in Wisconsin, developers are willing to convert brownfields into green space given the potential profits due to site

location, as many brownfields are in urban areas and have good proximity to population centers, transportation, and other resources. The government's interests in brownfield development include eliminating blight, removing eyesores, gentrifying neighborhoods, increasing employment and tax revenue, and controlling urban sprawl by attracting the commercial entities to urban cores (Wernstedt, Crooks, & Hersh, 2003). Prakash and Potoski (2007) find that to maximize self-interest, the private actors may practice free riding and shirking in collective action when a club approach is used in environmental governance. Given these interest conflicts, the government needs to design policy tools to guide the club-good provision towards a more sustainable direction. A club-good approach can fail if some regulatory or supporting policies are absent (Prakash & Potoski, 2007). Warner (2011) explores the club goods provision in the US, including urban amenity infrastructure and waste management, and suggests that club-good production is usually supported by the government in aspects of legal and administrative framework or finance provisions.

The government also needs to intervene to optimize the club good's provision when club goods have externalities. The existence of an externality implies that the goods' costs and benefits are not fully internalized. Accordingly, governments may step in to regulate to minimize negative impacts like pollution, while incentivizing more production of goods with positive externalities (Prakash & Potoski, 2007). When the goods provision has negative externalities, governments may step in to regulate to minimize negative impacts like pollution or toxic release, The government may use regulations, standards, or sanctions to urge the private sector to ensure the quality services/good (Prakash & Potoski, 2007). The government can set standards to curb negative environmental externalities. Public regulations are fair because governments respond to public interests instead of private interests. Governments also have the capability to estimate the cost of externalities, design, and enforce regulations to urge companies to internalize the negative costs.

For public/club goods with positive externalities, it is necessary to provide incentives to internalize the external benefits, which will attract more private investors. A club-good approach is in nature a public-private collaboration. Collaboration always needs to offer

private investors something of material, social, or normative value in order to meet investors' interests or recover the costs (Verschuere, Brandsen, & Pestoff, 2012). In New York City, if a POPS is provided by private developers, government designed incentives can cover at least the costs incurred in providing the POPS. For example, the government could allow the developer to build a taller building by increasing the Floor Area Ratio (FAR). The private provision of one unit of POPS can acquire 2-14 units of bonus floor area (Kayden, 2000).

Green roofs as club goods have many well-recognized positive externalities, as previously mentioned. Thus, this FAR policy is also a very popular tool in encouraging green roof establishment on private buildings (Carter & Fowler, 2008). In cities like Chicago or Portland, Oregon, the FAR bonus is a popular indirect financial incentive. In Chicago, the FAR bonus is decided based on the following formula (Carter & Fowler, 2008, p. 7):

$$\text{Bonus FAR} = (\text{area of green roof over 50\% of net roof area} \div \text{lot area}) * 0.3 * \text{Base FAR.}$$

The most prominent positive externalities from green roofs stem from stormwater management (Claus & Rousseau, 2012). In many countries, the stormwater tax is implemented by local governments as the main incentive of private building's green roof establishment and upkeep, which produce stormwater tax credits (Miller, 2014). In other cases, given the potential restriction of applying public funds to private properties, the government may use alternative indirect financial policy tools like green building awards or honoring demonstration sites to increase the private sector's returns (Carter & Fowler, 2008). To support the service/goods sustainable provision, the private investor's interests/costs need to be sufficiently presented and discussed at the beginning of collaboration (Chris Ansell & Gash, 2008).

Green roof as a subcategory of green space has been extensively studied from technological, policy tool, or life-cycle analysis perspectives (Carter & Fowler, 2008; Claus & Rousseau, 2012). However, it has seldom been studied from a club-good production perspective. SMRG is still an untapped research topic that received very limited

academic attention. Moreover, to what extent a club-good approach can help governments optimally provide public goods remains a challenge (McNutt, 1999). This research will bridge the gap by exploring an enabling institutional environment to a club-good approach to the green space shortage problem in high-density cities.

2.3 Methodology

2.3.1 Study site

Shanghai is one of the metropolises in China at the forefront of SMRG development. Shopping malls are often integrated into a city complex, which covers large lot areas (X. Lu, 2018). Shopping malls boomed along with the big city event of World EXPO 2010 Shanghai, which brought great business opportunities to the city. As shown in Figure 2.1, since 2010, every year there were dozens of malls established in the city. Booming mall development intensified commercial competition. Meanwhile, online shopping threatened to substitute city center shopping (Miller, 2014). To survive, new shopping malls are designed to be one-stop city complexes by highlighting experience-economy development. In addition to traditional stores and services, roof gardens are integrated into mall development. Developers established SMRGs as a new tool to differentiate from their competitors and take a bigger market share (Miller, 2014). A roof garden's perceivable benefits can motivate developers to voluntarily establish them, independent of policy initiatives or government incentives (Carter & Fowler, 2008).

Given that SMRG remains a nascent industry, there is no specific official documentation or statistics on it. The author used the municipal statistics of annual vertical greening development datasets (including green roofs, green walls, and other forms of above-ground greenings) to identify the SMRGs and verified them with the responsible municipal officers.

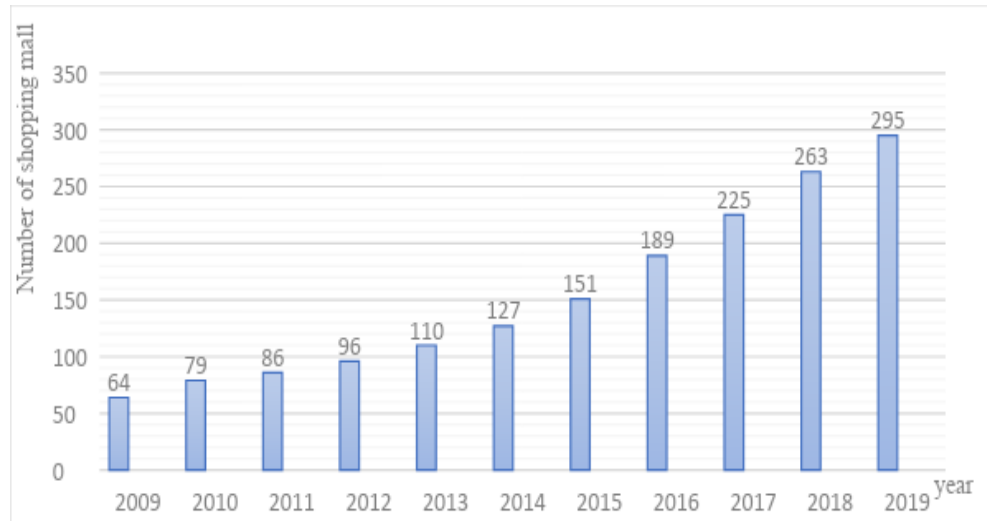


Figure 2.1 Total number of shopping malls in Shanghai (2009-2019)

Note: Malls have business areas $\geq 30,000$ m², with few exceptions.

Source: Shanghai Commerce Development Research Center, 2018 and Shanghai Council of Shopping Centers, 2019.

2.3.2 Data collection

Data collection focused on the SMRG's sustainability, policy gaps identified by administrators and developers, and the perceived policy solutions. Data were collected through document review, field investigation, semi-structured interviews, and online satisfaction evaluation from customers. The first step was to review official documents to understand shopping-mall development and existing green-roof policies in the city. Then online resources, especially the largest commercial customer feed-back sharing website www.dianping.com was heavily used to learn about the user experience of SMRGs.

Field investigation and on-site interviews were conducted in the summers of 2016, 2017, and 2019. The author visited 40 SMRGs in all. To make the field investigation sampling representative, investigated SRMGs were selected according to the location, size, and age (Appendix Table 2.3). Different time slots were chosen including weekdays and weekends, daytime and night (sometimes after 22:00). Sustainability per se is a concept very difficult to precisely evaluate (Hueskes, Verhoest, & Block, 2017). The author, based on the municipal Green Roof Technological Guideline, used three basic indicators including

sufficient vegetation coverage (>60%), maintenance level (>80% plants in good shape), and persistent upkeep (>15 years) as a convenient reference to learn about the sustainability status of SMRGs. Forty-two SMRG developers, onsite managers & gardeners, and 28 onsite visitors were interviewed. Of all the interviewees, developers and managers were usually identified and recommended by the mall receptionist upon request; gardeners and visitors were randomly met in the SMRGs. Interviews with six officials from the Shanghai Administration of Greening and City Appearance (SAGCA) (both city-level and district-level) were arranged separately. Inquiries include SMRGs' perceived challenges in the process of management and operation; the relevance of existing green roof policies to SMRGs and post-implementation monitors; the potential new policies to boost SMRG's development; government's and developer's interests in SMRG. Data from different sources were triangulated to verify the validity.

2.4 Results

Of all the 295 malls developed during 2009-2019 in Shanghai, around 1/3 malls (101) have SMRGs. Among the 40 surveyed SMRGs, the average size reaches 4,913 m², much larger than the non-mall roof gardens in the city (Table 2.1). In the surveyed SMRGs, 22.5% are completely open free to mall customers; 77.5% have various for-profit activities located in the garden, with businesses ranging from youth equestrian club, garden center, urban farm, mini zoo, to garden café/bar. Those non-profit SMRGs or the toll-free areas of a for-profit SMRG partially serve as social spaces for public gatherings, especially when shopping malls become not just commercially driven venues but the center of city life (Miller, 2014). For instance, in the author's field investigation, sometimes around 22:00, there were still nearby residents hanging out in the SMRG. In one field survey, a young couple commented: "Every weekend when we visit our parents who live nearby, we visit this garden too. We actually want to move back as there is no such a nice garden near our residence." In this sense, these SMRGs complement the public green space shortage and serve as public goods.

However, many SMRGs have sustainability concerns. According to the author's

investigation, around 60% of gardens have problems like low vegetation cover, poor maintenance, or being abandoned in only a few years. These problems are also confirmed by online users' feedback from Dianping.com, as well as interviewees from the greening department. For example, garden users' complaints include the poor maintenance of gardens, unexpected closure, smell from the rooftop flue pipe, or elevators not going to the top floor. Kayden (2000) suggests that when the private developers innovate to engage in the public good provision, it becomes relevant to look at the role of the government and to detect the potential policy gaps in facilitating the goods' quality and sustainability.

Table 2.1 A summary of the 40 SMRGs investigated in Shanghai

SMRGs	Results	Notes
Location	40% Inner ring; 47.5% Middle; 12.5% Outer ring	Divided by three rings on the municipal map
Year of construction	10% prior 2010; 30% 2011-2015; 57.5% 2016-2019	
Average size	4,913 m ²	
Sustainability	40%	
For-profit activities in the SMRG	77.5%	Equestrian club, garden center, urban farm, mini zoo, café
Accessibility	80%	20% closed in the author's field trip
Evaluated by visitors (dianping.com)	87.5%	

Source: by author

2.4.1 Existing policies

Various green-roof policies have been developed in Shanghai, ranging from regulation

to public education. However, all policies were designed for green roofs as public goods, facilitating the green roof's establishment but without taking the green roof's business operation into consideration. Specifically, the two categories of regulation and incentives are most relevant to SMRGs (Table 2.2). For regulations, one is the 2015 Shanghai Greening Regulation, which stipulates a minimum of 30% of roof greening establishment on new public buildings. Here public building means both public ownership or public accessibility, including government buildings, schools, hospitals, and shopping malls. The other is the annual vertical greening (mainly green roofs & walls) development plan, requiring the city's 16 districts to complete an overall construction plan of 400,000 m²/year, which increasingly becomes a tough task after one decade's implementation as feasible roofs without an existing green roof decrease in the city.

For incentives, one is the 2012 direct subsidy policy. Different types of green roofs are subsidized differently, ranging from 50 to 200 CNY /m². According to the author's interview investigation, this incentive covers about 20% of an SMRG's construction cost. The other is the 2014 in-lieu policy. Any green-roof area not already receiving a subsidy, and in excess of the compulsory 30% roof greening, can be counted to offset a maximum of 15% of the required ground-level green space area. Developers can use the saved ground-level green space to increase the first-floor building area or parking lots, but according to the municipal planning regulation, the total FAR of the project will remain unchanged. Usually, the increased first-floor building or parking area varies between dozens or hundreds of square meters. According to some interviewees, compared with SMRG's high construction cost, this incentive is rather modest.

Table 2.2 Existing policies relevant to roof garden (RG) development

	Policy tool	Content
1	2015 Regulation	New public buildings must green 30% of the applicable rooftop area.
2	Annual plan	The city (16 districts) needs to establish 400,000 m ² /year of vertical greenings.

3	2012 Direct subsidy (CNY/m ²)	Intensive RG (garden-style)	Semi-intensive RG (in-between)	Extensive RG (lawn-style)
		200	100	50
4	2014 In-lieu policy	The green roof area in excess of the required 30% can be used to offset a maximum of 15% of the required ground-level greening area.		
		Type/Height of RG		Conversion Coefficient
		Height (H) of green roof (m)	1.5<H≤12	0.7
			12<H≤24	0.5
		Type of green roof	Intensive	1.0
			Semi-intensive	0.7
Extensive	0.5			

Source: author compiled according to government policy documents.

2.4.2 Policy-caused gaps in SMRG's sustainability

Club goods with positive externalities are desired by both the public and governments. Existing policies to different degrees encourage SMRG's establishment, yet they are not conducive to SMRG's for-profit activities. In other words, current policies cannot monetize SMRG's positive ecological, social, or recreational benefits, which implies they can barely help developers offset the payoffs (Prakash & Potoski, 2007). When the external benefits are not internalized, the developers are not able to recover the production costs and maintain the goods' sustainability. Moreover, SMRG's cross-sector nature entails interdepartmental collaboration to design and implement policies effectively. Yet, such collaboration is largely absent so far. Three policy-related gaps in terms of finance, legitimacy, and oversight are identified.

2.4.2.1 The financial gap

Claus and Rousseau (2012) compared the green roofs' costs and benefits based on a 50-year life span to find that for private investors, the costs far exceed the benefits, when the public ecological benefits include improved air quality, increased biodiversity, and mitigated greenhouse gas emissions cannot be internalized. SMRGs, compared with other green roofs, are much larger, and both the construction and maintenance costs have to be paid by the private developers. Unfortunately, the direct governmental subsidy covers only around 20% of SMRG's construction costs. SMRG managers also frequently mentioned the high maintenance expenditure including the irrigation cost in hot summer. The tiered water rates made the garden's water bill a big burden for garden developers. Given these financial gaps, developers need to make ends meet by gaining revenues from garden-based for-profit activities. Nevertheless, it is noteworthy that in Shanghai, most ground-level public parks and gardens as public goods have been open to citizens for free since 2004, except for some specialized ones such as the botanical garden, zoo, or classic gardens (Jiang, 2005). The private developers could barely charge entrance fees for SMRGs because of this public park's free-entrance policy. What can be charged are the added values based on the SMRG, like mall member's kitchen gardens, horticultural DIY classes, or children's nature education. The revenue from these horticultural businesses is relatively low. The more profitable businesses include garden cafés, garden restaurants, and youth equestrian clubs. The equestrian club is among the highest return-on-investment rooftop businesses; one equestrian class can be charged as high as 880 CNY (125 USD)/45 mins. In the 31 for-profit SMRGs, over 25% have introduced the youth equestrian business. Nevertheless, these businesses still have a legitimacy problem.

2.4.2.2 The legitimacy gap

Given SMRG's cross-sector nature, a legitimacy problem arises in the process of garden business operation. For-profit SMRGs are relevant to several departments including the greening, urban planning, business, and fire department. As mentioned, the existing green roof policies do not support SMRG's for-profit business, which influences SMRG's

financial and management sustainability. As a nascent industry, SMRGs are not compatible with the existing urban planning regulatory system, especially the FAR policy. According to the planning regulation, SMRGs are not supposed to have any roofed structure, which should be counted in a building's pre-approved FAR. Accordingly, structures like a tool shed, plastic arch shed, or gardener's resting room will be tagged as "illegal construction", which greatly impacts SMRGs' physical supporting conditions. For example, seedlings may die, and the horticultural DIY classes have to be canceled in inclement weather.

SMRGs are also related to the business department for the license issue. The business law stipulates that a business needs a physical address to be licensed, but the rooftop does not have an address. If the FAR policy allows SMRGs to have a roofed structure, and accordingly a formal address, then the garden businesses can apply for a license. As a result, though catering businesses like garden cafés or garden teahouses are popular with visitors, they become illegitimate when not licensed. According to one SMRG developer, "We have an informal 200 m² indoor space, yet we cannot use this space to apply for a business license. Many visitors are interested in hosting company gatherings in our garden. Yet they hesitate as they need to pay the cost to a formal company." While some gardens are operated as informal businesses, "We cannot advertise for our unlicensed garden café. We are afraid of whistleblowers. Should it be a legitimate business, I am sure the garden can self-sustain or even make a profit." SMRG's financial sustainability is thus greatly impacted.

The third department that influences SMRG's sustainability is the fire department. The legitimacy problem further causes other management problems, including fire safety regulation. For this new industry, the fire department cannot apply the regular fire specification as SMRGs are not formally registered; but SMRGs, as a component of the mall, still undergo fire inspection. According to a garden manager, "It is a gray area, nobody says we are illegal, nobody says we are legal. We want to register our garden center at the Fire Department, but they do not accept our application. During important city events, the city's fire inspector simply asks us to shut down to eliminate any potential safety risks." Given these FAR-related legitimacy and management problems, some SMRGs and

businesses exist for only several years before the gardens are transferred to the next tenant or just abandoned. For instance, the Vanke Garden Center, which was established in 2017 with 23 small flower shops established, as of 2019, only three shops survived.

2.4.2.3 The oversight gap

Due to the abovementioned financial and legitimacy gaps, some developers can avoid the ban, driving the oversight problem. Though SMRGs are club goods, they are not completely independent of government regulation or incentive. Most developers have applied for and received either the direct subsidy or the in-lieu incentive; meanwhile, they need to follow the 30%-green-roof regulation. In this regard, the government must monitor the policy implementation outcome and make sure all the incentivized or regulated SMRGs are well established and maintained. Generally, green roofs, compared with ground-level green spaces, are scattered and less accessible, which poses considerable oversight problems for the government with limited staff (Keeley et al., 2013).

First, although around 1/3 developers volunteered to establish SMRGs, others may want to enjoy a green image without having to actually pay the costs of being environmentally responsible (Prakash & Potoski, 2007). SMRG's cross-sectoral nature leaves loopholes in policy implementation. For instance, when negotiating the mall developing plan with the district government, some developers may ask to reduce the project's 30% green roof establishment duty. Johns (2019) suggests that green infrastructure's implementation is always influenced by political or economic considerations. Shopping malls, given their economic contribution and positive influences on communities' life, are regarded as both an economic and political achievement for the located district (M. Li, 2017). District governments with relatively lower GDP tend to accept such a green-roof reduction request to attract the mall to locate in their district. A cross-departmental administrative system renders this compromise possible. For instance, the greening regulation may be compromised when it is made by the greening department but implemented by the planning department in the project approval process. A good example is the mall of Yuexing Global Port, one of the largest malls in Shanghai. Both the

municipal and district greening departments contacted the developer several times in the hope of establishing a high-quality demonstration SMRG to serve as a green role model for other malls. To their disappointment, the mall was finally completed with only a small green roof, even though it publicized in the media its 30,000 m² SMRG. The greening officers were annoyed: “This mall project even fails to meet the ground-level greening requirement. We do not understand why this project is even approved when it does not meet the greening requirement. According to the in-lieu policy, they should construct more roof greening as compensation.” In other cases, in order to encourage the mall to locate in their district, the district’s high-level officers may ask the greening department to allocate some subsidy, even if the roof garden area is not big enough to qualify for a subsidy. When departments have incompatible interests and are not well coordinated, the SMRG may become a compromise instead of a necessity.

Second, SMRG’s economic stringency directly leads to SMRGs’ degrading quality, which impacts the garden’s ecological and social benefit provision. Developers tried to minimize maintenance costs by decreasing the greening areas or using lots of plastic plants. In the Let’sCreateMore SMRG, almost 90% were plastic plants. In the Macalline SMRG, the on-site gardener complained: “The maintenance has been contracted out for many years at a low price of 10 CNY/m²/year (Note: at the district-level, the maintenance quota is 12.7 CNY/m²/year). But this year, the manager plans to find a new maintenance company, as the present maintenance cost remains a heavy burden for the mall.” Another way of saving maintenance costs is to reduce opening hours or simply to close the garden when the operation costs exceed the benefits. Many gardens have much shorter opening times than the mall’s, such as 11:00-18:00. In the author’s field investigation, around 20% SMRGs were either temporarily closed or never open for public use. This is echoed by comments from the Dianping.com evaluation website; many customers complained about the unexpected closure of the SMRGs. Of course, SMRG’s opening or not is completely at the developer’s discretion. However, as a club good, when the SMRG is poorly maintained and even closed to visitors, the expected benefits of increasing the customer base cannot be realized.

Finally, when regulations are inconsistent with the developers' interests, they may defend their interests by putting up an active and direct resistance or playing games with the system (Chris Ansell & Gash, 2008). This is the case in SMRG projects, where the developer's noncompliance with the regulation or the FAR policy is not uncommon. For example, some developers actively invite equestrian clubs to locate in their SMRG, but part of the established roof greening is removed and replaced with either sand or plastic grass. Or, when the sheltering structure is not allowed, some developers find leeway to get around the ban. They use the caravan or a refurbished container for necessary indoor activities; such facilities are mobile and can function as an office but not allowed. Some developers constructed temporary shelters. Such non-compliance adds to the urban planning department's inspection and oversight burden.

2.5 Discussion

The emergence of club goods represents a voluntary compensation of the under-supply equilibrium of the provision of a public good (McNutt, 1999). However, when both the policy design and implementation fail to sufficiently respond to the club good's positive externality and cross-sectoral nature, the club goods become unsustainable. On the one hand, the policies are not able to internalize SMRG's external benefits to recover the production costs. The identified policy gaps are closely interrelated with the SMRG's financial stringency, which is exacerbated by the legitimacy gap. Both the financial and the legitimacy gaps further cause the noncompliance as well as the oversight gap, and undermined the quantity and quality of club goods. On the other hand, the departmentalism did not resonate with SMRG's cross-sectoral nature. Thus, club-good-friendly policies have not formed yet and the policy implementation compromises the existing policy effectiveness. Christopher Ansell, Sørensen, and Torfing (2017) contend that in order to improve execution success, policies need to be designed in a way that "connects actors vertically and horizontally in a process of collaboration and joint deliberation" (P475). This section will discuss how an appropriate institutional response, including coordinated policy design and interdepartmental administration may address the above-identified gaps and improve club-goods' sustainability.

2.5.1 Policy tool design to internalize club-good's benefits

When a club good's revenue is insufficient to cover the costs, the government can design policies to monetize the good's external benefits (Prakash & Potoski, 2007). For SMRGs, some benefits such as the energy-saving can be automatically internalized when the building's energy bill decreases after green roof installation. However, other benefits like air quality improvement, stormwater management, or urban biodiversity cannot be easily evaluated and monetized (Claus & Rousseau, 2012). The stormwater tax and the FAR incentive are two popular policy tools that can reduce a green roof developer's financial pressure.

2.5.1.1 The stormwater tax to internalize the stormwater management benefit

The effectiveness of a club approach depends on the government's skillful policy design (Peters, 2010). Optimized policy design by adding a stormwater tax to the existing direct subsidy policy can ensure all club-good investors benefit from such a policy tool mix. For shopping malls, usually, the roof owner is not always the garden developer, and the SMRG may be taken over by different garden developers (Miller, 2014). The initial garden developer receives the one-lump-sum subsidy, but when the garden business is not promising, he may transfer the SMRG to the next developer or simply abandon it, and the successors receive nothing. The added stormwater tax can encourage the successors to maintain the SMRGs, too. So long as the SMRG is kept in good shape, its stormwater management function will benefit the developer through the stormwater tax rebate. In the long run, the saved stormwater tax would be very considerable (Carter & Fowler, 2008). Of course, these saved stormwater tax rebates can also be converted to a water quota bonus. As summer irrigation is a high maintenance cost, such a water quota bonus can relieve the SMRG developer's water bill burden. The greening department has been in negotiation with the water department for identifying the potential of this policy. Of course, the stormwater tax rebates can only partially cover the SMRG maintenance costs. Other incentive policies like the FAR will indirectly help internalize the positive benefits.

2.5.1.2 The FAR bonus to legitimize club goods

When the FAR becomes the key to solving SMRG's legitimacy problem, the FAR policy may be revised to allow $n\%$ of the total garden area to be legally roofed for garden-related use. In many countries, the FAR bonus is a widely-used indirect incentive for green roof development (Carter & Fowler, 2008; Kayden, 2000). Yet, for SMRGs as club goods, the FAR bonus allows developers to use the bonus roofed space to acquire the business license. In Shanghai, there are a few cases of allowing the FAR bonus. For example, the 2012 Macalline (Beicai) SMRG was approved for a 10% FAR, which allows the business to be legally licensed and to have a formal indoor space for operation. Compared with the direct subsidy, this policy enables developers to support the club goods' development. According to one manager: "We prefer the FAR policy than the direct subsidy policy. The FAR policy is like allowing us fishing; while the subsidy policy is like giving us some fish." The FAR bonus policy has the potential to turn both the government and the developer's inputs into meaningful outputs.

Legitimization indirectly allows developers to internalize SMRG's ecological benefits and create other positive public values. For instance, the Yangpu District Sci. & Tech. Commission proposed to establish a Youth Education Center for Nature-Deficit Disorder in one SMRG by granting annual funding. But this proposal is so far not realized as the SMRG is not a formally registered organization. Once this legitimacy problem is solved, the SMRG as a club good can provide valuable social services, because youth nature-deficit disorder is a big social problem in cities (Beatley, 2010). Shopping malls are usually at the hub of transportation with good public accessibility (Brunner, 2011). The location advantage along with the provision of nature-related services will allow developers to explore an appropriate club model. For instance, rooftop equestrian clubs have become popular because parents do not have to spend hours on transportation to send the children to remote suburban sites for equestrian instruction. Customers are willing to go to the SMRG to enjoy nature-related activities with convenience. In this sense, the FAR policy allows developers to create a kind of for-profit sustainability.

2.5.1.3 The resultant benefits of reducing the oversight burden

Kayden (2000) suggests that when the private sector is engaged in providing public goods, regulation is necessary to secure public service quality and operation. In a club-good approach, Warner (2011) instead argues that the developer must maintain high-quality services and infrastructure in order to internalize benefits to the club members; otherwise, fee collection or charging will become less possible. In this sense, when the SMRG business is legitimized and revenue increases, the developers will have improved financial capacity and motivation to adequately maintain an appealing roof garden to attract more customers, rather than to frequently close the garden to lower the maintenance costs. Prakash and Potoski (2007) contend that club goods with positive externalities tend to be underproduced and vice versa. In this research, if the SMRGs become profitable and well maintained, the positive ecological and social externalities will increase; meanwhile, more malls would like to follow suit, which implies that there will be more SMRGs established in the future.

Such a desirable outcome will ultimately reduce the government's quality oversight responsibility. For instance, one interviewed officer suggests that, from her viewpoint, government oversight is not even necessary as she believes "when developers are willing to construct a garden, that means they either love SMRGs or at least they perceive SMRGs positively. If finally, the garden is out of maintenance, it is very possibly because of the funding shortage. Then, financial or policy support instead of oversight is more needed by them." Moreover, when SMRG's FAR bonus is present, the government's responsibility for overseeing illegal construction will be minimized too. As when the business has legitimate roofed spaces, developers need not take the risk by playing with the system and using caravans, containers, or other restricted structures for indoor activities. Other management problems like fire inspection will be automatically solved, too. Private businesses are thus directed towards sustainable development (Steurer, 2013). However, such a virtuous cycle is based on the premise of close interdepartmental collaboration towards effective policy design and implementation.

2.5.2 Collaborative administration to respond to SMRG's cross-sectoral nature

An enabling institutional environment entails not only to design policy tools that can solve the problems but to integrate the stakeholders to find sufficient common ground to advance the policy-making and implementation process (Christopher Ansell et al., 2017). This is especially important for club goods like SMRGs which suffer from a cross-sector nature. As is obvious, all the policies including the stormwater tax, the water quota policy, or the FAR bonus policy will require inter-departmental collaboration. Much like the public-private collaboration, where cross-sectoral interest conflict is not uncommon, cross-departmental collaboration involves interest conflicts, too (Chris Ansell & Gash, 2008). A potential solution is to identify and represent all stakeholders' interests in order to break administrative silos and boost voluntary participation in municipal governance opportunities (Fung, 2004).

The achievement of such interest representation requires the advocacy party's efforts. In a multi-department policy network, not only leadership but also the interest priority and power relationships will influence the green policy adoption (Johns, 2019). The greening department has always been eager to promote more SMRGs, which is usually a small part of a huge mall development project and not necessarily the interests or political priority of other departments. Hence, the greening department must act as a knowledge broker to market the SMRG's deep values, and to build alliances with new partners. Koppenjan (2015) suggests that advocates always need to frame an issue in a bigger framework and to represent the relevant party's interests in collaborations. For the moment, green roof establishment is justified mainly as increasing recreational green space for citizens. That is not enough. For instance, to convince the water department to support the legislation of a stormwater tax, the greening department needs to explain SMRG's benefits in stormwater runoff reduction and storm peak flow delay. In many countries, green roofs are encouraged mainly for the urban stormwater management function, which is especially important in populous urban centers (Carter & Fowler, 2008). In most Chinese cities, urban flooding is becoming an increasingly severe environmental problem. Thus, the green roof's

stormwater management function, which has been largely downplayed, would be a good selling point to obtain the water department's collaboration.

In a similar vein, the greening department may advise or guide developers to fit SMRGs into the planning department's agenda. According to some interviewees, the FAR bonus policy has been frequently proposed by the greening department but not supported by the planning department because the latter worries that the policy may ultimately lead to far more illegal construction and exacerbate the oversight problem, which, of course, is not necessarily the case as previously discussed. From the planning department's perspective, they perceive that the bonus policy will bring only burdens rather than benefits to them. Such a negative perception may be compensated through a multi-product approach, which means SMRGs can produce both club-goods and pure public goods, shared by both club members and cities (McNutt, 1999). The club-good approach is usually criticized for preventing an equal distribution of the club goods by catering to only a specific group's interests (Warner, 2011). A multi-product approach can compensate for this disadvantage. For instance, the planning department is now dedicated to a "15-minute living circle" community revitalization plan as part of the municipal urban planning (2016-2040), which means citizens can reach the basic living services and public spaces within a 15-minute walking distance (M. Li, 2017). Shopping malls as important hubs of city life are unquestionably included in this plan, yet the rooftop is always a forgotten space. SMRG's multi-product clubs will be able to contribute to this community revitalization plan by making the SMRGs more user-friendly. Responding to SMRG users' evaluations from the Dianping.com website, the improvement measures may include adding more amenities for children, extending the garden opening hours, better designing the rooftop flue pipes to minimize the greasy smell, arranging an elevator that can directly reach the garden, or organizing community activities like open-air movies. There are now several malls that established outdoor stairs to make the SMRG accessible beyond the mall business hours; other malls can be encouraged to do so, too. These adjustments will not only improve customer satisfaction and customer base but will also meet the planning department's interests, and thus will be more motivated to provide necessary support for SMRGs.

2.6 Conclusions

Urban green space provision in high-density metropolises is a big challenge for governments when land resources are in severe shortage. The club-good approach to producing SMRGs presents some potential. However, existing green roof policies, though benefiting SMRG's establishment, are insufficient for their long-term sustainability as these policies fail to internalize the club good's positive externalities and respond to their cross-sector nature. Without sufficient policy support, there are financial and legitimacy gaps, and the resultant club good's degraded quality and developer's noncompliance further cause an oversight gap for the government. Moreover, SMRG's cross-sectoral nature requires multi-department collaborative administration in the policymaking and implementation process. For the moment, when the pioneering 1/3 malls have established roof gardens but are struggling with the sustainability problem, while other 2/3 malls have not taken action yet, it is important to provide a timely institutional response. Such responses include (1) optimized policy design to internalize SMRG's external benefits in order to financially sustain and legalize the club goods, and ensure their quality to reduce oversight responsibility; (2) to build cross-departmental allies and boost voluntary participation in municipal governance opportunities through interest representation. Both contribute to a club-good enabling institutional environment. However, this research is constrained by the nascency of the SMRG industry and based on the authors' single-city investigation. This recommends future research to explore the feasibility of a club-good approach to mitigating the urban green space shortage problem, and to conduct more empirical examinations of the importance of an enabling institutional environment for this for-profit sustainability initiative.

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Appendix

Table 2.3 SMRGs surveyed in Shanghai

	Mall name	Year of establishment	SMRG area (m ²)	Location	Sustainability of SMRGs	SMRG business	Evaluated on Dianping.com (Y/N)	Open (Y/N)	Interviewed	
									Developer Manager	Visitor gardener
1	K11	2014	300	Inner	Insufficient maintenance	Café	Y		0	1
2	Multi-media Life Plaza	2014	1,483	Inner	Insufficient maintenance	No	No		0	0
3	Hongqiao The Place	2016	5,800	Middle	Good	Urban farm	Y	Closed	1	1
4	Arch Shanghai	2014	7,600	Middle	Good	Mini zoo/urban farm	Y		2	1
5	Vanke (Qibao)	2017	8,000	Outer	Almost abandoned	Garden center	Y		1	1
6	The MixC (Wuzhong)	2017	5,000	Middle	Plastic plants	Restaurant	Y		0	1
7	Aegen Place (Shanghai)	2017	4,000	Middle	Good	Equestrian , café, urban farm	Y		2	2
8	Yuexing (Global Port)	2013	3,260	Inner	Insufficient maintenance	Equestrian	Y		1	1
9	Yuexing Furniture Mall	2016	1,200	Inner	low vegetation rate	Restaurant	Y		1	1
10	Ruihong Tiandi Moon Bay	2016	282	Inner	Good	No	Y		0	1
11	Xingyou City	2007	2,500	Inner	N/A	No	No	Not for public	0	0
12	Joy City (Change Feng)	2018	9,850	Middle	Plastic plants	Sports	Y		0	1
13	Raffles (Changning)	2017	1,200	Inner	Good	Restaurant	Y		1	

14	TaiKoo Hui	2017	4,446	Inner	low vegetation rate	Fairs/shows	Y	1	1
15	MTR City Plaza	2014	2,840	Middle	N/A	Basketball	No	1	0
16	Starlight (Zhenru)	2018	5,372	Middle	N/A	Basketball	No	1	2
17	Westlink	2017	4,600	Outer	low vegetation rate	Equestrian	Y	0	2
18	Bailian (Expo Axis)	2014	6,000	Middle	Insufficient maintenance	Equestrian	Y	1	2
19	Bailian (Zhonghuan)	2007	9,200	Middle	Insufficient maintenance	Equestrian	Y	2	0
20	Bailian (Wujiaochang)	2019	900	Middle	Plastic lawn	No	Y	0	0
21	Bailian (Century Avenue)	2016	3,000	Inner	Good	No	Y	1	1
22	Sh-Centurylink	2018	1,000	Inner	low maintenance	No	Y	1	1
23	Zendai Big Thumb Plaza	2005	1,100	Middle	Insufficient maintenance	Football	No	1	0
24	Macalline (Zhenbei)	2017	4,668	Middle	Good	Urban farm	Y	4	0
25	Macalline (Beicai)	2012	8,000	Middle	Good	Garden center	Y	2	0
26	Macalline (Pujiang)	2014	17,300	Outer	Good	No	Y	1	1
27	Macalline (Jincang Rd.)	2016	9,058	Middle	Insufficient maintenance	Equestrian	Y	1	0
28	Printemps (Tangqiao)	2019	1,400	Inner	Good	Urban farm	Y	1	1
29	Capitaland (LuOne's)	N/A	N/A	Inner	N/A	Restaurant	Y	1	0
30	Capitaland (Qibao)	2016	12,000	Outer	Good	Equestrian; playground	Y	2	1
31	LCM	2018	7,000	Inner	Plastic plants	Playground	Y	1	0
32	Shanghai Magnolia Plaza	2017	12,150	Inner	Good	Club events	Y	1	0

33	Touch Mall (Xuhui)	2013	2,193	Middle	Good	No	Y		0	2
34	Greenland Being Fun (Xuhui)	2017	13,000	Middle	Good	Equestrian	Y		1	2
35	Greenland Being Funny (Huangpu)	2018	200	Inner	Insufficient maintenance	Urban farm	Y	Closed	1	0
36	International Financial Center (IFC Mall)	2013	8,000	Inner	Good	No	Y		2	0
37	Skymall (Minhang)	2009	4,000	Outer	Abandoned	Mini zoo; Urban farm	Y		1	0
38	Hopson One (Wujiaochang)	2015	1,600	Middle	low vegetation rate	Club events	Y		1	1
39	Life Hub (Jinqiao)	2014	600	Middle	Abandoned	Urban farm	Y		2	0
40	Sheng Park	2018	1,500	Middle	Good	Urban farm	Y		2	1
	Sum-up	10% prior 2010 (4) 30% 2011-15 (12) 57.5% 2016-19 (23)	Average 4,913 m ²	40% Inner (16) 47.5% Middle (19) 12.5% Outer (5)	40% are sustainable (16)	77.5% for-profit (31)	87.5% evaluated (28)	20% closed that day or never open to the public (8)	42	28

Note: Location: “Inner” means the mall is within the city’s inner ring road on the city map; Outer means outside the outer ring road; Middle is in between the two rings. Source: by author.

Unveiling the Quasi-Public-Private Partnership (QPPP): Evidence from China's environmental service sector

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Abstract

Originating in neoliberal democracies, the Public-Private Partnership (PPP) is a common policy tool allowing governments to provide public service through collaboration. In some non-liberal societies, PPPs may not squarely fit into the classic PPP category but rather take different forms, which we label as 'Quasi-PPPs' (QPPPs). QPPPs provide important functions especially in economies in transition, yet have received little academic attention. Here we propose a general definition of QPPPs as 'partnerships between a government entity and a not-fully private entity', and explore factors that influence the PPP-QPPP transition in non-liberal contexts, using the nascent Chinese eco-environmental service partnerships for a case analysis. Drawing on insights from a self-established dataset and interviews, we find that the PPP-QPPP transition involved two-steps: (1) the eco-environmental service partnerships, initially established as PPPs, became inoperable with inexperienced partners and unsupportive markets; (2) with state bailout, the private partner became a subordinated partner in an 'SOE-private consortium', and PPPs transitioned to QPPPs. QPPPs brought about two outcomes: hidden debts for the government and the private sector's nationalization. We conclude that in a non-liberal society, when three critical PPP assumptions, namely competent partners, supportive market, and horizontal structure, are violated, PPPs are more likely to transition to QPPPs.

Keywords: PPP; Quasi-PPP; eco-environment service; China

3.1 Introduction

Governments all over the world are using partnership arrangements to shift or share the costs and risks in providing public goods and services (Brinkerhoff & Brinkerhoff, 2011). One popular arrangement is the Public-Private Partnership (PPP). PPP is defined as a ‘cooperation between public and private actors with a durable character in which actors develop mutual products and/or services and in which risk, costs, and benefits are shared.’ (Klijn & Teisman, 2003, p. 2). PPPs have well-recognized features including long-term contracts, private engagement, and major investments from the private sector (Hodge & Greve, 2007). New Public Management proponents have argued that PPPs increase governments’ problem-solving capacity, assuming that the private sector can provide cost-efficient and reliable services for the same or better quality standards and price (Rakić & Rađenović, 2011). For instance, private partners may have the ability to maximize value for money and thus deliver outcomes at a lower cost through PPPs (Andrews & Entwistle, 2010).

Besides PPPs, there are other extensively used yet less-noticed partnerships that do not squarely fall into the classic PPP category, which are labeled as Quasi-PPPs (QPPPs). QPPPs have emerged in service-provision sectors, i.e. health and medicine, education, and energy (Zapata & Hall, 2012), and often in countries with a dominant public sector, such as Russia (Nikitenko, Goosen, & Sablin, 2016), Poland (Tasan-Kok & Zaleczna, 2010), the Middle East (Burbury, 2017), and China. Nikitenko et al. (2016) defined QPPPs in terms of the proportion of public investment and the contract term. They note that Russian QPPP projects feature a high percentage of state investment, which can be over 50%, with shortened contract terms running less than three years on average. In Poland, QPPP initiatives refer to those project partnerships that do not fall under PPP as defined by the legislature but are partnerships in terms of organization and objectives (Tasan-Kok & Zaleczna, 2010). Zapata and Hall (2012) distinguished quasi-public versus quasi-private PPPs. Both are funded mainly by the public sector, but quasi-public are QPPPs characterized by high participation of actors from the private sector and civil society, while quasi-private QPPPs are managed by the private sector. The common thread throughout

these cases is the use of ‘quasi’ to indicate a deviation in the characteristics of one of the partners or the partner relationship itself. These deviations may lead to distinctive outcomes. For example, in Russia, QPPP projects greatly outnumber PPP projects, and the prominence of QPPPs has essentially blocked PPP development; private investment accounts for only 0.89% of total Russian GDP (Nikitenko et al., 2016).

Synthesizing across these limited studies, we propose a formal definition of QPPP as a partnership between a government entity and a not-fully private entity, characterized by one or more of the following features: shorter contract periods, predominant funding from the public sector, with costs and benefits not always equally shared between partners. The rarity of QPPPs in the literature may be due to their unique role in countries with centralized governments or a dominant public sector, particularly in communist or former communist states.

In China, the concept of providing public services through partnerships began in the 1980s and experienced three waves (Zhang, Gao, Feng, & Sun, 2015). Through the waves, the government’s main partners shifted from foreign investors in the 1990s to SOEs in the 2000s, and domestic private enterprises in the third wave beginning in 2014 (Tan & Zhao, 2019). Before 2014, partnerships developed at a negligible scale and were largely limited to the provision of infrastructure and utilities. Meanwhile, state-owned enterprises (SOEs) play substantial roles in these partnerships. Although in China most people use the term ‘PPP’ referring to partnerships between the government and SOEs (Tan & Zhao, 2019; Xiong, Chen, Wang, & Zhu, 2019), others have questioned the nature of Chinese PPPs. For instance, Adams, Young, and Zhihong (2006) suggested that Chinese-style PPPs are qualitatively different, embedded in a system based on public ownership that alters the relationship between the public and private sectors. Some scholars use Public-Enterprise-Partnerships (Zhang et al., 2015) or Public-Public-Partnerships (Braadbaart, Zhang, & Wang, 2009; Mu, De Jong, & Koppenjan, 2011) when referring to Chinese partnerships.

Economically, Chinese partnerships were suboptimal as they did not provide services at a lowered cost (Mu et al., 2011). In the third-wave initiative, the central government attempted to establish ‘real PPPs’ by ‘following the international PPP practice’ to realize

the benefits associated with PPPs (Lavanchy, 2018, p. 11). The Chinese government encouraged the public sector to collaborate with ‘Enterprise Capitals’, which includes both state-owned and private enterprises (Tan & Zhao, 2019). This research will examine the eco-environmental service partnerships in the third-wave initiative, which as initially established between the government and private non-SOEs were real PPPs. These PPPs became infeasible and gradually transitioned into government ‘SOE-private-consortium’ partnerships, namely QPPPs. This paper will explore the factors that influence such a PPP-QPPP transition. Given the challenges of establishing real PPPs in China, it is of great importance to understand why partnerships in China fail to develop into real PPPs, but instead, evolve into QPPPs.

3.2 Features of Chinese QPPPs

Generally, a Chinese QPPP can be defined as a ‘partnership between a government and an SOE-involved not-fully private partner.’ In China, there lacks a clear demarcation between the public and private sectors (Zhang et al., 2015). The context for Chinese QPPP is characterized by several historic economic and political factors that benefit SOEs and corporatized public entities. This results in an over-dominance of SOEs and an underrepresented private sector, and often results in economic under-performance of the partnership’s programs and activities.

In Chinese QPPPs, SOEs often have governmental connections and monopolistic behaviors, and thus have inherent advantages when dealing with government-related business. SOEs may also have greater capacities in technology and management experience than private companies, and a more appropriate organizational size to handle large-scale municipal projects (Cheng, Ke, Lin, Yang, & Cai, 2016). Before the 1980s, almost all transportation projects were assigned to SOEs for design, construction, operation, and management (Mu et al., 2011). Moreover, SOEs have a more robust financing capacity, which is a key success factor for PPP investment in public infrastructure (Cheung, Chan, & Kajewski, 2012). PPPs often require higher financing costs from the private partner compared with other financing approaches. Given the SOEs’

governmental connections, they have a more favorable lending status with state-owned banks (Cheng et al., 2016). Wei and Wang (1997) found that even though roughly one-third of SOEs were in substantial debt, few went bankrupt as state-owned banks provided generous loans to keep SOEs afloat. This reduces the risk of bankruptcies that would normally terminate PPP contracts.

As in Russia, Chinese QPPPs are notable for reduced partnership opportunities for the private sector given the SOEs' predominance. In a public-dominant society, the relationship between the public and private sectors is delicate. From the public side, some private companies' opportunistic or deviant behaviors reduce their credibility and reliability, and increase risks to all partners. Mu et al. (2011) suggested that projects granted to private contractors were sometimes abandoned and eventually transferred to SOEs for completion, or otherwise did not meet expectations. Reliability issues and risk aversion for municipal infrastructure projects deter the government from future partnerships with the private sector. From the private side, the lack of a system for recognizable private property rights is not yet in place, and this lack increases the uncertainty of asset ownership in private companies. This uncertainty imposes a serious constraint on the willingness of private companies to be involved in partnerships (Adams et al., 2006).

Finally, Chinese QPPPs typically demonstrate suboptimal economic performance when SOEs operate in a more bureaucratic and less-businesslike way despite (or partially because of) the above-mentioned intrinsic advantages benefiting SOEs. A PPP's cost-effectiveness is highly dependent upon the private sector's businesslike operations (Cheung et al. (2012). In Chinese QPPPs, SOEs are the major partner. Their semi-bureaucratic operating system is often overstaffed and values outputs such as social benefits over efficiency and profitability (Holz, 2002). Furthermore, QPPP project bidding may not always follow the best value-for-money principle. When SOEs are the government's first-choice partner, projects with no real-risk transfer and limited (or no) life-cycle obligations tend to be awarded to local SOEs, not necessarily in a competitive procedure (Lavanchy, 2018). More critically, when SOEs have easy access to cheaper financing, they often accept lower returns for QPPP projects (Bloomberg News, 2017),

undermining the prioritization of economic performance. For these reasons, in the third-wave initiative, the central government had strongly encouraged the private sector's engagement to emphasize the desirability of economic efficiency (Lavanchy, 2018, p. 11).

3.3 Methodology

The PPP concept is rooted in neo-liberal democracies and highly dependent on some context-specific assumptions (Linder, 1999). If critical assumptions are not satisfied, the probability of adverse consequences may increase, such as forced renegotiations of the contract, the bailout of the private sector, or termination of PPPs (Vecchi, Hellowell, Della Croce, & Gatti, 2017). Although a PPP's viability relates to many legal, economic, technological factors (Cheung et al., 2012; Jamali, 2004; Zhang et al., 2015), we do not intend to enumerate these factors here. However, as QPPPs happen largely in non-liberal contexts, we focus on context-specific factors. Combining insights from an elaborated study of the literature and a preliminary study of the third-wave partnership practice, we suppose (1) the competent partners and (2) market support may directly relate to the viability of PPPs, and (3) the partner's structure may influence the redirection of inoperable PPPs.

3.3.1 Three context-specific assumptions of PPP

First, a viable PPP assumes the availability of competent partners, including a skilled government to package PPP projects and experienced and reliable private partners to execute projects (Ng, Wong, & Wong, 2010). The government's capabilities may include maintaining a stable political and social environment, establishing a transparent and sound regulatory framework, or allocating and managing risk. The private partner's capabilities include businesslike practices and thinking, the business acumen of profit-making, the ability to evaluate and avoid financial risk, and/or the ability to secure private capital (Jamali, 2004). A partner's lack of experience may lead to many problems including cost overruns, revenue deficiency, and construction schedule delays, which can result in early termination of PPP projects (Song, Hu, & Feng, 2018).

Second, a PPP's viability entails effective market-based policy-tools to help private investors attain the necessary capital and revenue. Policy tools for capital acquisition in a developed market economy may include direct provision of debt and equity or capital credit-enhancement tools. Infrastructure PPPs usually have strong and long-term investors such as pension funds, life insurance companies, and sovereign wealth funds (Gatti, 2014). These investors are attracted to the long maturities and stable returns associated with infrastructure-related financial securities. As for revenue, for PPP projects like transportation or utilities, the PPP investors are paid back by collecting tolls or utility fees from users. For non-revenue-generating services, including environmental services, policy-tool design to monetize the service becomes indispensable. In the US, urban stormwater-management PPP projects are funded through property taxes, in-lieu fees, and banking & offset programs (USEPA, 2015). For example, in Washington D.C., stormwater tradable credits are generated by flood-mitigation installations like rain gardens and green roofs that can be exchanged for development permits (The Nature Conservancy, 2016).

Third, a PPP also assumes a horizontal rather than hierarchical structure, with roughly equivalent power and authority sharing between the public and private entities. The equality of PPP partners lies in not only cost and risk sharing, but in service-delivery design and decision making, including veto power (Rakić & Rađenović, 2011). Inequality between partners can diminish the benefits of a PPP and alter the overall PPP development trajectory. Public-sector dominance can reduce the ability of the private actor to make cost-efficient decisions, while the dominance of private sector interests diminishes the benefits to the state actor (Brinkerhoff & Brinkerhoff, 2011). The overdominance by private partners may also lead to privatization, which represents a shift of power and responsibility from public to private actors and an ownership transfer from the public towards the private sector (Linder, 1999). Some even argue that PPPs are equivalent to privatization, which 'reinforces the view that the government cannot be expected to perform well' (Savas (2000)).

3.3.2 Case selection and data collection

Data on the central government’s post-2014 PPP initiative were acquired from the official database of China’s ‘Public-Enterprise-Capital Partnership Center’ under the Ministry of Finance (www.cpppc.org). This research centers on projects in the environmental services sector, which includes renewable energy, flood mitigation, air and water pollution mitigation, and ecosystem restoration. We focused on environmental service QPPPs for two reasons. First, while environmental protection QPPP projects accounted for only 0.5% of the total number of QPPP projects before 2013 (Cheng et al., 2016), this sector became the third-largest category (9.82%) by 2014, following public utilities and transportation (Table 3.1), thus representing a rapid rise in the popularity of the sector. Second, compared with other sectors, environment-protection projects usually have a lower investment cost and have thus attracted more private engagement from small and medium-sized enterprises, offering a larger and more diverse pool of projects to examine (Lavanchy, 2018). Within this pool, we chose the subset of ‘ecosystem restoration’ or ‘eco-environment’ projects that were more tightly linked to urban green space construction and restoration to create a set of cases that would be comparable.

Table 3.1 Categories of Chinese QPPP projects

	Categories of PPPs	Number of Projects	Percentage
1	Municipal engineering	3620	39.76%
2	Transport	1291	14.18%
3	<i>Ecological/Environment protection</i>	894	9.82%
4	Town development	583	6.40%
5	Education	430	4.72%
6	Hydraulic construction	380	4.17%
7	Tourism	319	3.50%
8	Healthcare	263	2.89%
9	Infrastructure	198	2.17%
10	Culture	194	2.13%

11	Guaranteed housing	154	1.69%
12	Science and Technology	131	1.44%
13	Energy	119	1.31%
14	Sports	118	1.30%
15	Eldercare	104	1.14%
16	Agriculture	76	0.83%
17	Forestry	57	0.63%
18	Social security	35	0.38%
19	Others	138	1.52%
	Total	9,104	100%

Source: Data from MOF Public-Enterprise Capital-Partnership database, as of Jul. 31, 2019.

Note: ‘*Environment protection*’ refers to the whole environment sector, including the subset of ‘Eco-environment’.

To start, we identified the major eco-environment private partners, most of which are listed companies. Non-listed companies represented a very small share of partnerships and thus were not the focus of our analysis. As the main partner, listed companies are required by law to release business and financial information, which makes partnership data easier to acquire. We used the Chinese stock trading software of ZhiyuanYihutong developed by the China Merchants Securities Co., Ltd., to collate the private companies listed under the section of ‘Landscape’ and ‘Eco-environment’ (26 listed companies in total as of May 2019). To validate, we also examined the stock-exchange section of the professional landscape website www.yuanlin.com, which showed 30 listed landscape companies. These two sources were pooled to form a 45-company database, which includes both SOEs and private enterprises. We then looked at all the 45 companies’ official websites and annual reports since 2014 and identified 21 private, non-SOE companies with their main business revenue from eco-environment or related fields as a set of QPPP cases.

In data collection (Table 3.2), we focused on whether Chinese partnerships violated or met our three PPP assumptions; if one or more assumptions were violated, we determined how the violation of assumptions affected project or partnership outcomes. More descriptions about the evaluation of each assumption are presented in Appendix 2. To collect information for our assumptions, we used listed companies' official websites and reports, financial market websites such as www.eastmoney.com, and governmental websites. We recorded the private company's qualification-strengthening efforts including IPO and rebranding (merging and renaming) and the company's financial situation (Assumption 1); market-based financial products (Assumption 2); and buyout/bailouts, and ownership of the original private (non-SOE) companies (Assumption 3).

Table 3.2 PPP assumptions and evaluations

Assumptions	Partner competence	Market support	Horizontal structure
Evaluation	-Conception/ expectation of PPP -Experience with PPP -Risk perception and aversion	-Availability of market- based policy tools to monetize eco-service -Financial products in the market	-Ownership (the controlling shareholder) -Independence of the private -Buyout/bailout

Data to test the assumptions were not always available through second-hand data sources. For instance, detailed information on Special Purpose Vehicle (SPV)'s business models was difficult to obtain. For some projects with perceived profits such as sewage treatment charges, there were only vague clauses in the contract. We then used snowball sampling to interview 12 key informants from seven listed companies, three unlisted companies that engaged or attempted to engage in partnerships, as well as two industry associations. Interview questions complemented and validated online information and filled the gaps in the secondary data. Our questions elicited information on all three assumptions, including the partner's understanding of and experiences with PPPs; the availability of market-based policies and financing products; companies' relationship with the local government and the challenges associated with the private identity; the company's financial situation and project profitability; and SOE investment in the private companies

and the impact of such investment. The basis of our argument was formed from interview responses, the documentary evidence, and themes developed from coding.

3.4 Eco-environment partnerships and the private partner

3.4.1 Eco-environment partnerships

Rapid urbanization in recent decades has brought about substantial rural-to-urban population migration and boosted the real estate market, which has become a significant contributor to Chinese GDP growth (Fung, Jeng, & Liu, 2010). Up to 50-60% of local government revenue currently depends on two sources: (1) land conveyance fees from the gap between the lower cost of land acquisition from peasants and higher leasing prices to developers/enterprises; (2) taxes from enterprises and property marketing (Tao, Su, Liu, & Cao, 2010). The real-estate market has stimulated many industries, including landscape architecture, with about 90% of its business closely tied to the real estate industry. At the time of the third-wave initiative, over 16,000 landscape companies were established nationwide (Peng, 2016). Most of these companies were small- to medium-sized private firms, with fewer SOEs. Given the capital-intensive nature of landscape projects, larger companies entered the capital market via initial public offering (IPO) and became listed (Table 3.3). Among the eight early-listed companies, with the exception of two Special Treatment companies (Ecobeauty and Yunnan), the other six, Orient Landscape & Environment (OLE), Palm, Techand, Meichen, Mengcao, and Pubang, became pioneers in the third-wave competitions.

Urbanization has resulted in severe environmental problems along with skyrocketing housing prices. The central government regulated the real-estate market against speculation and simultaneously called for '*Beautiful China*' development by emphasizing ecological and environmental protection. These paired policies placed local governments under financial pressure. Post-boom declines in the real-estate market shrank local revenue, while the *Beautiful China* initiative demanded expenditures on environmental protection measures that increased construction costs. These were conditions under which the third-

wave PPP initiative was launched. Local governments responded to the central initiative by organizing a myriad of training and field surveys, selecting pilot projects, and establishing a PPP center (Huo, 2014).

This third-wave initiative has represented new opportunities for industries impacted by the real-estate market downturn, including the landscape industry. The ‘*Beautiful China*’ initiative involves many areas related to the landscape industry: theme park planning, water treatment, soil restoration, and large green infrastructure construction. It is noteworthy that most eco-environmental projects are not typically revenue-generating, and previous to the PPP initiative were completed using a short-term build-transfer approach. Now in the form of a partnership, the contract period includes 3-5 years of construction plus 10-30 years of operation/maintenance. Given that these projects have very limited revenue-generating potential during the operation/ maintenance stage, usually, the government pays both construction and maintenance costs for these partnership projects.

The landscape companies envisioned these partnerships as an opportunity to break the state monopoly on public goods/services provision. For instance, OLE’s 2015 annual report stated that ‘PPP opens the door for the private companies to engage in public goods/services like water and park service, and broadens the development room of private companies’ (P10). The president of the Techand company stated his resolution in a 2017 meeting: ‘(except for SOEs), private enterprises can also perform well in PPPs’. These companies, owned and controlled by domestic private individuals (non-SOE companies), became the main private partners in eco-environment partnerships.

3.4.2 Private partner qualifications

Given their previous underrepresentation in PPPs, landscape companies modified their credibility, financial capacity, and branding to position themselves as eligible partners. Credibility and financial capacity are two basic requirements for private partners. Cheng et al. (2016) suggested that local governments prefer private investors with sufficient competence and a higher degree of information disclosure as partners. Although SOEs are perceived as a more reliable partner, they are minor actors in the landscape industry, which

provided private enterprises room to develop in the environmental services sector. From the perspective of our interviewees, the level of transparency associated with listed companies is now regarded as a precondition for credibility by many governments. These public listings also allowed for companies to expand their financial capacity. Before 2014, there were only eight listed companies; during 2015-2017, 13 more became listed (Table 3.3). Those already listed (except two special treatment companies) had substantial first-come advantages.

Branding is an equally important strategy for entering PPPs. The companies rebranded through merger and renaming to facilitate PPP-project bidding. For example, companies expanded their business from a narrow focus on landscaping design to services such as water treatment and waste disposal. Much of this adjustment was accomplished through an enterprise merger. Of the 21 listed landscape companies, 17 were involved in mergers and acquisitions and the largest companies expanded dramatically (Table 3.3). For instance, during 2015-2016, OLE merged with five environmental companies at the cost of fivefold of its net profits (Lei, 2018). Sixteen out of these 21 companies took on new names to appear more comprehensive and align with nationwide opportunities (Table 3.3). The term 'landscape' was regarded as too narrow and was replaced by 'ecology' 'environment', or 'eco-environment', and terms indicating the company's locality were removed to appear more national. This process of mergers and rebranding helped the companies sign more trans-industry and trans-regional PPP contracts, boosting the number of eco-environmental partnerships nationwide.

Table 3.3 The private sector's self-preparation for eco-environment QPPPs

IPO	Name of the company		Merger	Market value Bn. CNY 2018	State-controlled shareholder & year of involvement	State is the controlling shareholder
	Old Name	Rename and Year				
1	<i>Beijing Shenhuaixin Co., Ltd.</i>	ST* Shenzhen Ecobeauty Co., Ltd. 2016	Yes	1.50	<i>No</i>	
2	Yunnan Greenland Biological Technology Co., Ltd.	ST* Yunnan Investment Eco-Environment Sci & Tech Co., Ltd. 2014	Yes	1.04	Yunnan Investment Holding Group Co., Ltd. Nov. 2011	19.86% - Yes
3	Beijing Orient Landscape & Ecology Co., Ltd.	Beijing Orient Landscape & Environment Co., Ltd. 2016	Yes	9.28	State-owned Assets Supervision and Administration Commission of Chaoyang District, Beijing Nov. 2018	10% - Yes
4	Palm Landscape Architecture Co., Ltd.	Palm Eco-town Development Co., Ltd. 2016	Yes	5.54	Yuzi Guaranteed-Housing Management Co., Ltd. Henan Prov. Nanjing Qixia Construction Co., Ltd. Apr. 2019	23.88 % 11.87 % Yes
5	<i>Techand Ecology & Environment Co., Ltd.</i>	<i>No</i>	Yes	5.61	Shenzhen Investment Holdings China Energy Conservation & Enviro. Protection Group Dec. 2018 Apr. 2020	10% >20% Yes
6	Shandong Meichen Sci. & Tech. Co., Ltd.	Shandong Meichen Ecology & Environment Co., Ltd. 2017	Yes	6.34	State-owned Assets Supervision and Administration Commission of Shandong Province Nov. 2018	21.46% - Yes
7	Pubang Landscape Architecture Co.,	Pubang Holdings Co., Ltd. 2016	Yes	3.96	Shandong State-owned Assets Holdings Co., Ltd. N/A	1.42%

17	2017	Zhejiang Yuancheng Landscape Group Co., Ltd.	Yuancheng Environment Co., Ltd	2018	Yes	0.96	No		
18	2017	<i>Hangzhou Landscape Architecture Design Institute Co., Ltd.</i>	<i>No</i>		<i>No</i>	0.68	No		
19	2017	Zhejiang Chengbang Landscape Co., Ltd.	Chengbang Eco-construction Co., Ltd.	2018	Yes	0.85	No		
20	2017	Tianjin Loving Landscape Engineering Co., Ltd.	Tianjin Loving Landscape&Ecology Construction Co., Ltd.	2014	Yes	1.02	No		
			Changed the belonging industry from 'Landscape' to 'Ecological protection and Environmental treatment'.	2018					
21	2017	<i>Jiangsu Dongzhu Landscape Co., Ltd.</i>	Dongzhu Eco-construction Protection Co., Ltd.	2018	<i>No</i>	2.63	No		

Note: * Shenhuaxin was a textile company and listed since 1995. In 2016, it completely transitioned to the eco-construction industry.

The entries in *italic* are companies either not involved in renaming, merging, or state-investment.

3.5 Applying PPP assumptions to eco-environment partnerships

Using our previously stated definitions and assumptions of PPPs and QPPPs, we examined Chinese eco-environmental partnerships between the government and the private listed companies. Here we determine whether these partnerships meet the three critical PPP assumptions and if not, how the violation of assumptions affects project and partnership outcomes.

Assumption 1: Competent partners

The partners' experience or capability greatly influences their perception of PPP opportunities and evaluation of the associated risks, costs, and benefits (Jamali, 2004). The third-wave partnership initiative became very popular in less developed regions where there were more untapped infrastructure needs (Lavanchy, 2018). Accordingly, many local governments saw partnerships as a 'mega credit card' to alleviate local financial stringency (Hodge & Greve, 2007) and committed to developing more projects through partnerships. This is clear from the national PPP database. In hinterland provinces with lower GDP per capita, hundreds of PPP projects were initiated regardless of local financial circumstances. Moreover, local governments in these areas had few or no experiences with PPPs in terms of how to minimize risks and build capacities (Lavanchy, 2018) and often awarded PPP contracts to companies with name recognition, paying little attention to their economic situation. For example, a public planning agency in Sichuan province signed a Sponge City development project with OLE in July 2018, but by then OLE was already involved in a cash crisis. As a result, this signed project remains unexecuted to date, as shown in the database. Also, local governments still had a bureaucratic rather than a market mindset to problem-solving, reducing the potential for PPPs to generate benefits. For instance, in wastewater treatment and waste management sectors, the fee levels in long-term offtake agreements are regulated by local governments rather than based on a market-based formula (Lavanchy, 2018).

From the private side, despite the non-revenue-generating nature of most eco-environmental projects, the companies ambitiously expanded their PPP business, which

generated substantial cash-flow risks. The six leading companies each contracted dozens to hundreds of projects and took over the upfront costs to enable the projects to get started quickly (Lei, 2018). For instance, OLE contracted 113 eco-environment projects with a total investment reaching 169 billion CNY. As Table 3.4 shows, 97.6% of projects which specified an upfront-cost split between partners had a 70-100% private upfront expenditure of the total project investment. It is noteworthy that these projects' aggregated upfront expenditure was already more than 10 times OLE's market value. The large number of projects multiplied by each project's high percentage of upfront cash investment can accumulate huge debts and overwhelm a private company. Public listing helped secure part of the cash flow, but the remaining had to be leveraged through market-based financing.

Table 3.4 Upfront-cost split between the public and private of OLE's QPPP projects

Split of upfront expenditure		No. of projects	Percentage
Private	Public		
100.00%	0%	2	97.6%
92.20%	7.80%	1	
90.50%	9.50%	1	
90.00%	10.00%	26	
85.00%	15.00%	1	
80.00%	20.00%	30	
76.70%	23.30%	1	
75.00%	25.0%	1	
70.00%	30.00%	17	
60.00%	40.00%	1	
51.00%	49.00%	1	
		82	100%

Source: Data from OLE's annual reports (2014-2018)

These expansions soon generated cash crises for the companies that affected project

progress and performance. The cash crisis was exemplified by the trendsetter OLE's bond-issue failure in May 2018, which caused stock-market panic for 'eco-environmental PPPs' (Lei, 2018). The stock price of many listed eco-environmental companies decreased by over 50% in 2018. OLE suffered the largest loss - its total stock-market value shrunk by 60% in five months, approaching bankruptcy (Lei, 2018). Due to severe cash shortages, OLE suspended or postponed some of its contracted projects under construction, such as the Liuli Wetland in Beijing and the Zihe hydro-ecological project in Shandong province (Li, 2018). Our interviews revealed that many companies shared these experiences. These lengthy project delays led to inoperable and failed partnerships.

Assumption 2: Market support

Market support implies the availability of market-based tools to minimize the private sector's capital and revenue risks. Such tools include (1) policy tools to marketize non-revenue-generating service value so that projects turn a profit, and (2) market-based financing tools such as loans to secure capital for the private partner. However, such tools are far from sufficient in the Chinese market. First, in eco-environmental services, only a few types of services like theme parks or rehabilitated brownfields for real estate or cultural-tourism sites can be revenue-generating, and the revenue rarely compensates for the private investors' huge upfront expenditure (Wang, 2018). Accordingly, the private partner is put at remuneration risk and must depend upon the government for payback (through general revenues, for example), which adds to the government's long-term burden. This is clear in the national database: among the 64 Sponge-City stormwater 'PPP projects', only one project is user-payment, while 36 projects (56%) are government-payment and 27 are mixed payment (42%). In this sense, the partnership is simply an instrument for the local government to develop projects while extending the payback period from 3-5 years in the traditional built-transfer arrangement to 10-30 years in PPP arrangements. Such projects were regarded as 'fake PPP projects' and have been prohibited by the central government since 2018 (Lavanchy, 2018, p. 3).

Second, diversified market-based financial products help the private sector secure

capital. Financing products such as credit-trading or banking and offset programs are rare in China (Wang, 2018) and project financing is also not the norm (Lavanchy, 2018). Moreover, the lending bias against private companies remained unchanged during this third wave, even though the central government issued many policies attempting to create an equitable environment for SOEs and private companies. Some large, state-owned banks provided lower rates, some even as low as 1.2% for 10-20 years, which were only available to 100% SOE-invested QPPP projects (Lavanchy, 2018). The private sector often had to borrow from commercial banks or shadow banking systems at higher interest rates. At the beginning of the third-wave initiative, some banks responded positively when the central government encouraged ‘environmental PPPs’ (Tan & Zhao, 2019) and developed financing products like carbon financing, pledged loans for forestry rights, and green eco-environment funds. However, the cash crisis increased the market’s concern about eco-environment projects’ return on investment and the bias grew to impact both the private sector and the ‘environmental PPPs’. The interest rate for these projects increased from roughly 6% in 2017 to 7.5% in 2018 (Li, 2018), and many of these projects became financially untenable.

Assumption 3: Horizontal partnership structure

Although the eco-environmental partnerships became financially infeasible when violating assumptions 1 and 2, the violations did not directly lead to a QPPP transition. A PPP’s infeasibility is a necessary but not sufficient condition for the transition. It was not until the third assumption was violated as the government prevented the partnerships from failing or terminating, intervening by providing financial aid, which substantially redirected the partnerships’ trajectory into a QPPP. PPPs imply a horizontal collaborative structure between independent partners from the outset of a project (Brinkerhoff & Brinkerhoff, 2011). Initially, a horizontal structure was present for the Chinese eco-environmental PPPs, given the listed companies’ nationally-recognized branding and competency. However, when the cash crisis happened and the state intervened, the private company’s autonomy degraded, and some private companies’ ownership changed.

To help the private sector tackle the cash crisis, SOEs, and other state-owned assets invested in the private sector by buying stock shares from the private listed companies. During 2018-2019, 11 out of 21 companies had acquired state financial investment (Table 3.3). These formerly private companies became SOE-private joint enterprises, which changed the power and responsibility structure of the partnership. The eco-environment partnerships then evolved into QPPPs. While the cash shortfall was temporarily bridged, high-rank manager interviewees worried about the companies' independence. Some of their specific concerns included the necessity to establish an in-house Communist Party branch, or caps on the chief executives' income — generally undesirable changes in the private sector. More importantly, interviewees worried that state investment might force them to follow the SOEs' semi-bureaucratic-management system, which provides less flexibility to adapt to the market.

Increased state involvement not only transitioned these PPPs into QPPPs, but also led to ownership concerns and 'nationalization'. For six out of the 11 companies with a state bailout, an SOE became the largest stakeholder and the ultimate controller (Table 3.3). One interviewee from the Palm put it simply: the future of the Chinese PPP market belongs to the SOEs. In essence, private companies best situated to engage in 'eco-environmental PPPs' were nationalized. While seeking support from the state, the private sector refrained from participating in partnerships since the costs of loss of company ownership outweighed the benefits of expanding into partnerships. In the 2018 annual reports, all companies highlighted their concern about PPP risks. Those companies with the most partnership contracts announced their strategic adjustment of shifting engagement from PPP to EPC (Engineering Procurement Construction), and in the future would only accept PPP projects with established payback mechanisms. YuanCheng stated it would limit PPP revenue to no more than 1/3 of the company's total revenue. Indeed, an interviewee from Tianyu emphasized its lower debt ratio of 53.93% due to fewer 'PPP projects' contracted, and he admitted to avoiding even the use of the term 'PPP'.

3.6 Discussion and conclusions

PPPs originated and became popular in liberal market economies (Linder, 1999). However, their features and performance can be substantially transformed by the socio-economic context (Table 3.5). In China, the central government attempted to achieve the benefits of genuine PPPs, and both the local government and the private sector responded actively by strengthening their qualifications to engage in PPPs. However, the initial PPPs ultimately transitioned to QPPPs when the private partners' lack of experience and access to market support drove the PPPs to become SOE-private consortiums with a dominant public sector partner, and the desired PPP benefits failed to materialize.

Table 3.5 Features of typical PPP versus Chinese QPPP

	PPP	QPPP
Socioeconomic system	Neoliberal market economy	Socialist market economy
	Market tools to evaluate service	Insufficient tools to evaluate service
	Financing products to secure capital	Lending bias towards SOEs
Partner/Partner equality	Government and private	Government and SOEs/private enterprises
	Yes	The private is a subordinate actor
Economic returns	Vary across projects: optimum or not	(1) Suboptimum. (2) Impose hidden debts on the governments.
Potential concern	Privatization	Nationalization

Source: by authors.

In a non-liberal economy, partners' inexperience with PPPs likely leads to PPP's infeasibility. China is more accustomed to in-house project development than PPPs (Mu et al., 2011), and both the public and private actors viewed PPPs as a panacea and had lofty expectations that were unlikely to materialize in the short run. For local governments, the exorbitant easy revenues from the land market became unavailable after reforms in real-

estate regulations. Accordingly, they saw PPPs as an alternative to funding shortages and showed more interest in increasing investments than improving governance (Cheng et al., 2016). For the private sector, the economic slump in the landscape industry encouraged private companies to hastily expand into eco-environment PPPs. Neither party had a sound understanding of PPPs or their risks. Furthermore, previous partnerships had been developed at a small-scale and were based largely on government-SOE partnerships. The limited experience gained in these earlier projects was insufficient to ensure the successful involvement of the private sector. PPPs entail skillful government involvement, including encouraging the private sector to introduce business-like practices into the public sector. However, local governments still employ bureaucratic power to intervene in the market to achieve preferred outcomes, which counteract these business practices and reduce the efficiency of service provision. More critically, partners should have complementary skills to accomplish a shared goal (Jamali, 2004), which was not evident in the eco-environment PPPs.

Although financial difficulties in PPPs are not rare, the inability of the private partner to equitably access market support may be unique to the Chinese context. The environment sector became the third-largest category of service in PPP initiatives, but the market was far from ready to engage with this sector. In the previous two waves of partnerships, the services provided were public utilities or transport services with stable, guaranteed revenue streams. For non-revenue-generating PPPs in the third wave, when beneficiaries of environmental projects were not paying for these goods and services directly, market-based policy tools were needed to reduce profit uncertainties by placing a value on environmental services. The absence of such instruments not only increased the private sector's revenue risk but also kept risk-averse financial institutions from incentivizing eco-environment PPPs. The slow development of an enabling financial environment was critiqued by private partners given the expanding environment-service partnerships (Li, 2018). Thus, PPP as a new ideology in China requires a free and fair market environment, which implies not only the availability of service-marketization tools but also a reduction of pro-SOE biases (Zhang et al., 2015). If the macro socioeconomic system remains unchanged, the disadvantages will cause PPPs to fail, facilitating their transition to QPPPs with an SOE

partner, and scare off potential private partners.

In a public-dominant context, the powerful government partner did not let PPPs directly fail, but tried to rescue them by forming a type of SOE-private consortium, which transitioned PPPs into QPPPs. In neo-liberal economies, PPPs imply a horizontal structure with some degree of partner equality as opposed to the domination of one partner over the other (Brinkerhoff & Brinkerhoff, 2011). Hence, when a PPP fails, the government may take some remedial measures like the renegotiation of the contract or bailout (Vecchi et al., 2017). In a Chinese context, the government acted as a ‘superpartner’ by directly intervening in the market to rescue the private sector. The government’s strong intervention turned the horizontal partnerships into hierarchical ones, undermining the private partner’s independence. Only when the private sector becomes a competitive partner, the government can reduce its involvement and treat commercial failures as risks borne by business entities, as intended by the PPP arrangement (Hodge & Greve, 2007). Otherwise, a poorly-performing private partner could conceivably under-perform a public sector counterpart. Wei and Wang (1997) suggested that once the private sector reaches a certain scale, the costs of maintaining a large and inefficient state sector will outweigh the benefits. If this occurs, we predict that QPPPs will become less popular than traditional PPPs.

When PPPs revert to QPPPs, the widely-touted PPP benefits do not materialize. Rather, two unexpected outcomes occur: hidden debts for the government and nationalization of the private sector. When the cash crisis happened, the government became the payer of last resort. Although private companies originally invested in eco-environment PPPs, once PPPs became inoperable, their debts were taken over by SOEs. Cui (2019) found that SOE investments in the private sector are not limited to eco-environment companies, but have become a prevailing trend in all environmental service QPPPs. This echoes the general experience of Chinese QPPPs in many sectors. Tan and Zhao (2019) suggested that among the 572 national demonstration PPP projects, more than two-thirds are partnered with SOEs (and thus are probably QPPPs). Of the top ten PPP investors, eight remain SOEs (Lavanchy, 2018). When SOEs become the main investor, the government is then ultimately responsible for payment on both sides of the partnership, which drives public

budget deficits and subsidy overruns. QPPP thus creates a new form of hidden debt in which ‘the government’s financial responsibility could easily be underestimated, threatening the financial sustainability of the government’ (Tan & Zhao, 2019, p. 4).

In China, the private sector’s engagement in eco-environment QPPPs becomes nationalized through state intervention, contrary to concerns of privatization resulting from PPPs. This nationalization has driven the private industry’s waning interest in new PPPs. It took only five years for the private sector to turn from enthusiastically embracing PPP to cautiously shifting towards EPC schemes. When an enabling institutional environment remained absent (Zhang et al., 2015), PPPs proved a poor fit for non-revenue-generating sectors like eco-environment. For PPPs to extend into non-traditional areas with equally complicated valuation like education, health, or social care, it is inevitable that many smaller private enterprises will get involved. This points to the need for a more supportive institutional environment to foster the private sector’s competence and independence.

To conclude, China’s third-wave partnerships, though sought to be ‘real PPPs’, became inoperable when partners were inexperienced and the market was less supportive; with state intervention, the private companies became subordinated partners in SOE-private consortiums. PPPs thus transitioned to QPPPs with high degrees of public control. Instead of sharing the government’s financial debts, QPPPs have become saddled with tremendous hidden debt, which revolves back to local governments. As this research is limited to the eco-environment service, we recommend a more comprehensive analysis of QPPPs in other service sectors as well as in other countries. Of special interest is how the new private-SOEs consortium influences QPPP projects, including potentially reducing the lending bias and financing cost compared with the solely private partner.

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Appendix

Descriptions about the evaluation of the three assumptions

Assumption 1. Partners' competence

- **Understanding/expectation of PPP:**
 - The purpose of PPP adoption
- **Experience with PPP**
 - Have partners ever engaged in PPP before?
 - How do the partners respond to the central QPPP initiative?
- **Risk perception and aversion**
 - Understanding of partner's financial affordability
 - The payback mechanism of QPPP projects

Assumption 2. Market support

- **Market-based policy tools to monetize eco-service**
 - How is the project investment paid back? Sewerage fee, park entrance fee?
- **Financial products in the market**
 - What kind of financial products are available?
 - How high is the interest rate?
 - Do private companies have equal access to these financial products as SOEs?

Assumption 3. A horizontal structure

- **Independence of private companies**
 - Can the private shareholders make the decisions by themselves?
 - Do the private shareholders have the veto power?

- **Buyout/bailout**

- State/SOE's investments in the private company

- Is the investment a one-time bailout or a long-term plan?

- **Ownership**

- Who is the largest/controlling shareholder?

How does policy goal ambiguity influence policy outcomes? Sponge-City Program implementation in old neighborhoods

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Abstract

When a central program is implemented in a top-down manner, the possibility for layered policy goals increases. A lack of coherence among these goals can cause policy goal ambiguity. This research examines how policy goal ambiguity influences policy implementation outcomes, exemplified by the Chinese Sponge City Program (SCP) implementation. SCP is a centrally initiated program, which requires using largely green instead of gray infrastructure to manage stormwater and implies two goals of sustainability and stormwater management. The municipal government of Zhenjiang (a Sponge City pilot program) layered a local goal of resident satisfaction. The sustainability goal has no clear measurement indicators, but the other two have. Drawing on data from in-depth interviews and field observations, this research finds that when the incoherent goals are not specified a priority, implementers prioritize the stormwater management and resident satisfaction goal, which put the sustainability goal in an inferior position. When the sustainability goal has only vague descriptions, implementers downsize green infrastructure, yet still regard the program as sustainable. This research concludes that in a multiple-policy-goal program, the goal priority ambiguity leaves implementers the discretion to decide the order of goals to manage interest conflicts; the goal measurement ambiguity allows implementers to decide the degree of their commitment to and interpret the performance of a goal. Such ambiguity-caused discretions may drastically divert some specific policy goals.

Keywords: multiple policy goals; goal incoherence; priority ambiguity; measurement ambiguity; Sponge City Program

4.1 Introduction

When a policy is implemented top-down, from the supranational to the national level, or from the central to the local level, there could be multiple goals layered. Policy goal layering involves grafting new policy goals onto an otherwise stable institutional framework (Thelen, 2009), and may cause policy goal incoherence. Policy incoherence implies conflicts between the multiple goals or objectives (Wellstead & Howlett, 2017), and can result in policy goal ambiguity. Chun and Rainey (2005) have conceptualized policy goal ambiguity in four aspects: goal mission comprehension ambiguity, directive ambiguity, priority ambiguity, and evaluation ambiguity. Goal priority ambiguity, or the level of interpretive leeway in deciding on priorities among multiple goals, will arise if the hierarchical order is not specified by policy actors (Chun & Rainey, 2005). Goal evaluation ambiguity refers to the level of interpretive leeway that a policy or program allows in measuring the progress toward the achievement of the goal.

Urban stormwater management has become a severe environmental problem with rapid urbanization and climate change (Uittenbroek, Janssen-Jansen, & Runhaar, 2016). Urban stormwater management will need to shift from traditional gray infrastructure to a green infrastructure (GI) approach because of the substantial economic, environmental, and ecological benefits that GI provides (Johns, 2019). SCP is such a program initiated by the Chinese central government in 2014, advocating to manage urban stormwater through GI approaches and to reduce the dependence on traditional large-scale gray infrastructure systems (Ma, Wang, & Ding, 2018). SCP includes two goals. One is sustainability, which implies the use of low impact and green strategies to manage stormwater. The other is successful stormwater management, in terms of flooding and pollution control. SCP is assumed to greatly benefit residents when implemented in urban and old town centers where both green space and flood mitigation are desperately needed (H. Li, Ding, Ren, Li, & Wang, 2017). When SCP was implemented in the pilot city of Zhenjiang, a local goal of resident satisfaction was layered onto the central goal of sustainable stormwater management by the local government tasked with implementing SCP. The frontline implementers were supposed to attain all these goals while meeting all the performance

requirements. This research will specifically focus on goal priority ambiguity and evaluation ambiguity and determine how they influence the policy implementation outcome, exemplified by the Chinese Sponge City Program (SCP) implementation in the pilot city of Zhenjiang.

According to the national SCP Guide, 80% of a city's built-up area should meet the sponge criteria by 2030 (MHURD, 2014). As an indispensable part of the built-up area, old residential neighborhoods usually suffer most from flooding damages (G. Li, 2017). Zhenjiang's old-neighborhood-based implementation will provide empirical evidence for sustainable stormwater management when SCP is implemented in compact cities. The next two sections are the literature review on policy goal ambiguity, and a brief description of the city and methods, followed by the results of how in a multi-goal program, the sustainability goal is undermined and the performance becomes hard to measure. The next section presents the mechanism of such impacts. This paper ends with a brief conclusion and suggestions for a myriad of other cities that are struggling in a stormwater management paradigm shift.

4.2 Policy goal priority ambiguity and measurement ambiguity

Policy ambiguity can be found in many aspects, such as the definition of policy goals, actor roles, or funding approach. Policy goal ambiguity is defined as a goal or set of goals that allows leeway for interpretation (Chun & Rainey, 2005). Such ambiguity can be caused by missing or inadequate information, inconsistency, and incoherence (Wellstead & Howlett, 2017). Goals are regarded as coherent when they are logically related to the same overall policy aims and can be achieved simultaneously without any significant trade-offs (Kern & Howlett, 2009). They are incoherent if they are contradictory and if goals can only be partially attained. Policy goal incoherence brings about the goal ambiguity concern, which is regarded as having many serious consequences (Chun & Rainey, 2005). For frontline implementers, they always have to coordinate among competing forces and achieve these goals as much as possible. Meanwhile, they must make decisions about which goal should take precedence over others at a given time.

Goal priority ambiguity has been given less research attention (Conner et al., 2016). Priority ambiguity refers to the degree of uncertainty in indicating priorities among multiple goals. Priority ambiguity means it is not clear which goals should take precedence over others during a specific period or there is no determined goal hierarchy (Chun & Rainey, 2005). The goal with higher priority on the implementation agenda will more likely be pursued; a higher priority goal need not conflict with a lower priority goal (Conner et al., 2016). Goal priority can help moderate goal conflicts or goal incoherence with regard to coordinating the intention-decision relationship (Conner et al., 2016). For instance, Gao (2009) finds that in a hierarchical policy implementation system, usually the central government will present and prioritize their policy objectives, which are used to direct local policy implementation. This approach can ensure that the policy goals set at the central level are achieved at the local level. Competing interests may influence goal priority ambiguity, as politicians need to at least partly address the demands of all stakeholders in order to encourage every affected party (Chun & Rainey, 2005). However, the juxtaposed goals without any hierarchical arrangement and prioritization leaves much room for interpretation for which goals should take precedence. Jung (2014) finds that priority ambiguity actually decreases the public servant's job satisfaction when many equally important tasks have to be completed, which decreases their work efficiency. Chun and Rainey (2005) found that the need for political compromise, age of the agency, or the financial publicness are positively related to the agency's goal priority ambiguity.

Compared with goal priority ambiguity, the goal's evaluation ambiguity has caught more attention in the goal-ambiguity literature. Evaluative goal ambiguity refers to the level of interpretive leeway in evaluating the progress toward goal achievement (Chun & Rainey, 2005). Policy goal clarity and clear performance measurements provide good guidance for goal achievement. That means the policy goal needs to be translated into performance indicators or indexes, in order to evaluate the policy outcome (Conner et al., 2016). Different policies can have different degrees of clarity regarding evaluation criteria or objective performance indicators. Instrumental criteria or indicators are not always available in government public goods/service provision or policy implementation (Chun & Rainey, 2005). Some policies have clear performance targets objectively and validly that

allow very little space for interpretive leeway. Though Gao (2009) suggests that when the public service performance is measured simply by numbers, some substantial aspects such as governance improvement or social and political tensions can be neglected. Other policies descriptively present performance measurements and give much space for interpretation in evaluating whether the performance measurements are satisfied. Furthermore, Liu, Tang, Zhan, and Lo (2018) suggest that policy measurement ambiguity in the form of confusing goal standards is one of the main sources of divergence between central policy goals and local interpretations. Researchers have argued that given the difficulty in articulating and measuring goals, public servants have attempted to measure performance by looking at surrogates such as inputs, processes, workloads, and outputs, rather than objective outcomes and impacts (Chun & Rainey, 2005).

Policy goal ambiguity is usually studied as a concept or a phenomenon from perspectives such as justifying the goal ambiguity, identifying the source and consequences of goal ambiguity (Thelen, 2009; Wellstead & Howlett, 2017), or how to conceptualize goal ambiguity (Chun & Rainey, 2005). This paper contributes to the literature by unveiling how goal ambiguity influences the policy implementation outcome.

4.3 Methodology

4.3.1 SCP in the pilot city of Zhenjiang

Zhenjiang is one of 16 cities in the first pilot group to experiment with SCP. Each pilot city was allocated a minimum of 1,200-million-CNY as seed money and was given two directives: to raise matching funds through Public-Private Partnerships (PPPs) and to combine SCP with old neighborhood retrofit efforts. Zhenjiang's SCP covers a total pilot zone of 22.5 km² with 80% of the zone located in the old downtown district that contains both old residential areas and non-residential areas. Zhenjiang is the only pilot city that developed SCP projects mainly in old downtown areas with substantial public engagement. This research focuses on SCP implementation in old neighborhoods in which about 276,000 residents live.

High-level goals are always expressed in the form of a mission statement and must be translated into directives and guidelines for practical actions, especially for frontline implementers (Chun & Rainey, 2005). SCP envisions a city to operate like a sponge to absorb, store, and infiltrate through GI measures (H. Li et al., 2017). SCP is a green policy patterned after the American Low Impact Development (LID) approach, as suggested by the title of the national *Technological Guide of Sponge City Construction: Establishing LID Rainwater System (Trial)* (MHURD, 2014) (“Guide”). LID, a term sometimes used interchangeably with GI, refers to managing stormwater at the source with decentralized small-scale green measures like rain gardens, green roofs, and permeable pavements, to increase site infiltration and reduce dependence on engineering structures and decrease infrastructure construction costs. While SCP’s overarching goal is sustainable stormwater management, it is divided into two goals. The first goal is “sustainability”, which implies to use low impact and green strategies for SCP, and therefore more green infrastructure than gray infrastructure is used. However, no explicit performance measurements are specified for this goal. In the 2018 *Evaluation Criteria of the Sponge City* national report, the measurements concerning sustainability are vague and descriptive, with no specific quantifiable indexes. The second goal is stormwater management, which has clear technical indexes of 70% runoff control and 60% pollution control (Table 4.1). Moreover, Zhenjiang specifically added a 30-year recurrence flood-control standard to this stormwater management goal.

Green stormwater management programs usually need to address the flooding problem and also other problems like social well-being, local economy, and ecosystem health (Uittenbroek et al., 2016). SCP is a nationwide high-profile program, and therefore Zhenjiang as a pilot city is under the spotlight. When SCP’s target population involves hundreds of thousands of residents in old neighborhoods, there are perceivable challenges for SCP’s implementation. The old neighborhoods, like those in most cities in China, have various problems including outdated infrastructures, budget shortfalls, and poor management associated with residents’ informal land use. Thus, the city proposed an informal local goal of “resident’s satisfaction” (BHURD, 2018). Labeling it as “informal” indicates that it was not directly integrated into Zhenjiang’s SCP goal statement, but the

goal frequently appeared in meetings and media coverage and actually became an implicit guideline in SCP implementation. To successfully complete this program, the city also established a three-tier decision-making and implementation network including an ad hoc SCP Office (Appendix Table 4.4). Many SCP public education activities through municipal TV/ newspaper publicity, posters, and flyers were carried out around the city. A WeChat SCP knowledge platform was developed, too. The Office partnered with each neighborhood’s Commission to interact with and respond to residents, including answering the 12345-complaint hotline. The number of complaint calls is a practical index to evaluate whether SCP’s performance is satisfactory to residents.

Table 4.1 Layered policy goals in Zhenjiang’s SCP implementation

Nation-level	Program	SCP		
	Goals	Sustainable	stormwater management	
	Evaluation	Green infrastructure	70% of runoff control 60% of pollution control	
City-level	Program	SCP + neighborhood retrofit		
	Goals	Sustainable	stormwater management	Resident’s satisfaction
	Evaluation	Green infrastructure	75% of runoff control 60% of pollution control	Number of complaint calls
		30-year recurrence-interval flood control		

Source: author’s compilation based on government documents.

4.3.2 Data collection

Data collection centered on five aspects: SCP’s goal coherence, goal priority, goal measurement, challenges in policy implementation, and implementation outcomes. Data, including the goal measurements (for sustainability, stormwater management, and

resident's satisfaction) and policy outcome (acceptance by residents, infrastructure projects pass central government inspection) were first acquired through second-hand sources including official documents and mainstream media coverage. However, most of these official or mainstream-media sources largely describe the general results of SCP implementation, such as how the SCP has mitigated the city's waterlogging risk and how citizens are satisfied with the program implementation. Therefore, an in-depth interactive interview approach was used to gain detailed information, including insider knowledge (Uittenbroek et al., 2016) and internal documents.

The lead author took a field trip to Zhenjiang in Aug. 2019, four months after the SCP's central inspection and acceptance, and visited twelve SCP project sites including nine residential neighborhoods and three non-residential demonstration projects. Through snowball sampling, interviews were conducted with eighteen officials (mainly officers from the SCP Office and some GI officers outside the SCP Office) and professionals, including SCP experts both inside and outside of Zhenjiang (Appendix 2). Some re-interviews were conducted by telephone during Feb.-Mar. 2020. Interview questions inquired about: conflicts between goals (goal coherence); indications about which goal should be prioritized (goal priority); the main challenges of developing SCP in old neighborhoods (implementation process); and the outcomes (what are central inspectorate's comments about Zhenjiang's SCP; residents' response to SCP). In the field trips to nine old residential neighborhoods, over twenty neighborhood residents and three maintenance staff were interviewed. Questions included their perception of SCP, the influence of the SCP on their life, their satisfaction with SCP implementation, and their communication and interaction with the SCP implementers. All interviews were recorded and transcribed.

4.4 Results

Sustainable city development for both human and other eco-environment functions is challenging (Johns, 2019). Zhenjiang's SCP was combined with old neighborhood retrofit efforts. Thus, the implementation became very complicated, as implementers needed not

only to handle the flooding problems but also the non-flooding problems. In the “SCP + retrofit” program, the three goals of sustainability, stormwater management, and resident’s satisfaction were found not always coherent. For instance, sustainability implies installing many GI projects in neighborhoods, which requires more land and competes with residents’ demands for more parking lots. The resident’s flood-free expectation will require more gray infrastructure in old neighborhoods and contradicts the sustainability goal. The neighborhood retrofit improved resident’s satisfaction yet entailed resources channeled from SCP, which undermined the sustainability goal, too. The three juxtaposed goals also have a priority ambiguity, namely, there is no explicit statement about which one should take precedence over others. As to goal measurement, both the stormwater management and resident’s satisfaction can be measured, but not the SCP’s sustainability goal. Implementers tried to attain these goals by following the available performance measurements.

4.4.1 The goal of stormwater management

In a multi-goal program, when no goal priority is specified, to act according to the clear numeric indexes is a safe and easy way for implementers to complete tasks. The city-level stormwater management goal has three measurement indicators. The first two of 75% runoff control and 60% pollution control were consistent with the central SCP guideline and straightforward. Many high-density neighborhoods in Zhenjiang were built in the 1980s with water and sewerage infrastructure that quickly became outdated and undersized and often failed to cope with the intensity of precipitation events made worse by climate change (She, 2019). The SCP Office, made up of mainly water experts, collaborated with both domestic and foreign experts, and developed many hydraulic models to meet the three parameters. Some local experts had initially suggested to prioritize green over gray infrastructure, but their recommendations were not adopted (Jiang, 2017). One SCP planner argued: “We have thought about prioritizing green over gray in residential neighborhoods, but there the sewer infrastructure per capita remains low. To give up gray and depend on the green to achieve urban stormwater management is not realistic. So, we juxtapose green and gray.” Accordingly, a series of large-scale water engineering projects,

including sewage treatment plants, rainwater pumping station construction, and water-quality monitoring stations were developed. GIs including rain gardens or bioswales were also used, however, compared with gray projects, the green ones were rather small-scale.

What is controversial is the third stormwater management measurement indicator of a 30-year flood-control standard, which is intended more to meet the resident's satisfaction. SCP was initiated in direct response to the focal event of the devastating Beijing 61-year-recurrence flood in 2012 (H. Li et al., 2017). Thus, an implicit objective of SCP as expected by both the public and media is to handle the extreme flooding. People will not easily accept that SCP is not able to solve the extreme precipitation events in typhoon seasons. Such expectation puts implementers in a decision dilemma. As water professionals, they know that GIs can mitigate only the first inch (20-30 mm/24 hours) of rainfall (Wise, 2008), and the limited green spaces could barely satisfy flood-free expectations. As public servants, they must handle the public's complaints and expectations (Gao, 2009). Finally, implementers chose to meet the local goal by increasing Zhenjiang's flood-control standard to 219 mm/24 hours (or a once-in-30 years event standard). One interviewee from the Zhenjiang Planning & Design Institute explained: "This index is very contentious, as usually SCP is supposed to handle light to moderate rain. We increased the recurrence standard because we want to make sure the residents will not suffer from flooding in the following 30 years." Achieving this 30-year standard in old neighborhoods requires extra high-volume underground gray infrastructure, which makes the program much grayer than green in old neighborhoods.

To meet all the three stormwater indicators, gray infrastructures substantially surpassed GIs in both the number of projects and the percentage of budgets. As shown in Table 4.2, GIs accounted for about one-third of the total SCP investment with the three bolded items the only GI categories budgeted in SCP.

Table 4.2 SCP PPP construction projects in Zhenjiang

No.	Projects	Estimated investment (2,585.00 million CNY)
1	Central subsidy for pilot SCP of Zhenjiang	1,200.00
(1)	LID measures	731.52
(2)	Ecological restoration and hydraulic engineering	283.48
	-Ecological restoration of the rainbow river	26.00
	-Dongwei area hydraulic engineering	30.00
	-Zhenrunzhou wetland eco-system construction	115.00
	-Smart Sponge system construction	30.00
	-Zhenrunzhou headwater quality guarantee project	82.48
(3)	Pipe and network project	42.00
(4)	Standard-reaching project of waterlogging	143.00
2	PPP SPV investment	1,385.00
(1)	Sewage treatment plant	230.00
(2)	Rainwater pumping station construction	164.00
	-Rainwater pumping station construction in Yangzi River, Yuqiao village	75.00
	-Rainwater pumping station construction at Three-ferry, South to Yangze River	86.00
	-Retrofit of Six-ferry pumping station	3.00
(3)	A standard-reaching project of drainage, runoff, non-point pollution treatment	991.00
Total		2,585.00

Source: B. Zhang, Huang, Du, Du, and He (2018)

4.4.2 The goal of resident satisfaction

Street-level officers are responsible not only for providing public services but to deal with public complaints in their jurisdictions (Gao, 2009). For SCP implementers, when resident's satisfaction became a local goal, they tried to meet their needs as well as gain their compliance.

4.4.2.1 Sources of resident's dissatisfaction

Client dissatisfaction can be caused by interest conflict or insufficient knowledge about the policy. For instance, Ryan, Fábos, and Allan (2006) find that when implementing regional greenways on private lands, it requires coordination with private landowners, as they worry about the loss of privacy, liability, illegal parking, or noise. For SCP, although the stormwater management goal had been attained, unfortunately, this goal did not necessarily align with all resident's interests. For instance, some first-floor residents did not see the immediate benefits of the new rain gardens and gradually turned them into private kitchen gardens again. Others complained about the shrubs in the rain garden affecting their window daylighting. Furthermore, initial support from residents for SCP projects decayed over time as the noise and inconvenience of construction impacted their lives or eliminated space for their outdoor exercise. Some extreme behaviors emerged, including unrooting plants or using boiled water to kill some plants in the night.

Neighborhood's perception of policy together with their learning capacity also decides the degree of their satisfaction. SCP, aiming for green-gray transition, is new to most residents (Dai, van Rijswick, Driessen, & Keessen, 2018). Keeley et al. (2013) find that the community oftentimes has a weak understanding of the stormwater problem and much of the public believes that rainwater is "clean" and is not a problem. Although many SCP public education activities were carried out, they are usually literal or dogmatic, and not necessarily understood by residents. Some residents paid far more attention to very localized outcomes while ignoring SCP's overall green goals. Old residents have a deep sense of belonging to the neighborhoods in which they have lived for decades; any change may result in their dissatisfaction (Gu, Li, Zhu, & Wang, 2019). The residents' complaints

included a new steel bench that was too hot to sit on in summer, messy-looking green spaces, and the slow replacement of mailboxes. Some disliked the yellow color of the flowers and admired other neighborhood's cherry blossom's red color, which is a symbol of happiness in traditional Chinese culture. However, in the field investigation, none of the residents discussed stormwater management through a green or a gray approach. Implementers had to spend much time communicating with the residents to reduce vandalism and increase compliance before the projects could resume.

4.4.2.2 Improving satisfaction through "SCP + retrofit"

Old neighborhoods have many non-flooding problems, such as roof leakage, low building energy-efficiency, insufficient amenities, and poor property management (She, 2019). The maintenance budgets depend upon each household's property management fee, but the collection rate is very low in old neighborhoods, especially when on average 52.6% of residents are retired and live on pensions (Gu et al., 2019). Given these realities, SCP is a great opportunity to improve the residential environment. As shown in Table 4.2, the expanded SCP included gas-line retrofits, building energy efficiency, as well as aesthetic upgrades such as building stuccoing and corridor lighting. In the aggregate, only three out of all the eight categories related to flooding mitigation.

"SCP + retrofit", being a free service provided by the government, generated increasing retrofit demands from residents. It is noteworthy that such an expanded program requires more expenditure than simply SCP development. Though Zhenjiang used a PPP to raise funding for SCP, the financial gap remained large. Accordingly, the Office had selected the 45 most qualified old neighborhoods out of hundreds for SCP development, based on six criteria, including suffering from flooding, and poor facilities and landscaping. Such a selective strategy brought about the service distribution impartiality issue. Many non-selected neighborhoods noticed neighborhood betterment from SCP implementation and approached the Office for retrofits too. "Some residents used all kinds of networking, others visited the office of the Neighborhood Commission three times a day, to petition for retrofits. We (the SCP Office) are under high pressure but try to meet resident's needs."

Gradually, some unlisted neighborhoods were also added to the SCP. As a result, the SCP expanded substantially in both project purview and number, which made “SCP + retrofit” almost not a stormwater management program.

Table 4.3 “Sponge + Neighborhood Retrofit” plan of Zhenjiang’s SCP

Sponge+	Improve livability	<ul style="list-style-type: none"> • Increase recreational spaces • Preserve big trees • Landscape reclamation
	Flood Mitigation	<ul style="list-style-type: none"> • Route impervious surface into rain gardens and green spaces • Change sidewalks to permeable pavement
	Better Property Management	<ul style="list-style-type: none"> • Re-organize property management • Establish maintenance guidance
	Retrofit Gas lines	<ul style="list-style-type: none"> • Switch from coal gas to natural gas
	Upgrade Water-Supply Infrastructure	<ul style="list-style-type: none"> • Repair leaking pipes and meters • Replace eroded pipes
	Increase Parking	<ul style="list-style-type: none"> • Increase parking spaces • Install porous parking lots
	Energy Conservation	<ul style="list-style-type: none"> • Utilize thermal insulation materials • Install window shading • Upgrade electrical system and lighting
	Sewer Separation	<ul style="list-style-type: none"> • Disconnect illegal connections • Separate sewer from storm drains

Note: Projects that can contribute to flood mitigation are bolded. Source: (She, 2019).

Most public policies aim to align client behavior for compliance with government aims (Howlett, 2018). In this sense, the “SCP + retrofit” was successful by improving the resident’s satisfaction rate. According to one officer, “During a three-year period, our 12345-hotline received over 1,000 complaint calls. While many complainers repeatedly called, it is estimated that there are about several hundred complainers, which is not a bad result.” According to a public post-implementation poll, citizen’s satisfaction rate reached 94.63% by August 2018 (Sima, 2018). In interviews, some residents proudly told the author

that their property's value increased by 5%-10% after SCP. Accordingly, more residents became willing to pay the property-management fee (Zhai, 2017).

4.4.2.3 Concerns about diverting from the sustainability goal

SCP's sustainability goal is obviously to use a green approach to manage stormwater (H. Li et al., 2017). Nevertheless, "SCP + retrofit" gradually diverted from this primary focus when resources were channeled towards non-flooding related projects. For one, gray infrastructure projects accounted for about two-thirds of the total funding, with the remaining one-third left to be shared among GIs and neighborhood retrofit projects. Moreover, when a project involved both gray and green infrastructure, the gray projects were usually prioritized in both construction schedules and budgets. According to one interviewee, in the first-year audit, some expenditures on shingle roof retrofits were not accepted as SCP expenditures because they used shingles that did nothing to mitigate flooding. Although the final audit for Zhenjiang's SCP has not yet occurred, the interviewed officers expressed anxiety about how to explain these expenditures to central auditors. For the other, the "Sponge + Retrofit" program required more inter-departmental coordination, necessitating hundreds of meetings between the sectors including planning, housing, electricity, energy, water, transportation, environment, in order to solve the surfaced problems. One frontline implementer commented that "So many tasks are packaged into an 'SCP + retrofit' program. We have to solve problems from roof leakage to septic overflow. Much of the work is not within the purview of SCP at all."

4.4.3 The goal of sustainability without measurements

Although both the stormwater management goal and the resident satisfaction goal are well attained, they say little about the sustainability goal. On the one hand, the conflicts between green space and other land use that residents desire are always a big concern in GI installation (Dhakal & Chevalier, 2016). In Zhenjiang, implementers removed some unmaintained green spaces to mitigate these conflicts. In old neighborhoods, parking space shortage is a severe problem. Accordingly, in neighborhoods where 80% of residents gave consent, all available vacant corner spaces, as well as some unmaintained green spaces,

were converted to pervious parking spaces. Increasing parking spaces was an effective way to improve residents' satisfaction, as it developed a new, stable revenue stream for neighborhoods and improved the neighborhoods' management. For example, in the old SaoMaoGong neighborhood (35,000 m²), the retrofits added 8,000 m² of pervious parking space with some parking lots built on previous green spaces. The new parking lots were leased out and the revenue was used to invest in neighborhood management, turning the open neighborhood into a gated one. Residents were more satisfied with the tidy and safer neighborhood, even though the green space diminished. In interviews, some residents commented: "Previously the neighborhood green spaces were so poorly managed. In such cases, we prefer not to keep these ugly spaces." Replacing some green space with parking lots became popular in other pilot projects, with some exceptions. ChaoYangMen, an old neighborhood largely occupied by teachers, retired officers, and relatively higher-income professionals, refused this approach and the green spaces were kept intact.

On the other hand, implementers also decided to give up some potential green measures because they worried about GI's long-term maintenance. For SCP, the central grants were earmarked for SCP construction but not maintenance (H. Li et al., 2017), and old neighborhoods do not have sufficient budget for maintenance. Without financial support or neighborhood buy-in, this maintenance is not likely to occur. Given insufficient funding for GI maintenance, implementers chose projects that would endure, instead of contributing to SCP's green stormwater-management goal. For example, for the roof leakage problem in the retrofit program, implementers prioritized the shingled roof to solve the roof-leakage problem for residents, as green roofs require more frequent maintenance. In interviews, implementers expressed concerns about future maintenance: "We know the green roof is better for SCP. But it still bears the risks of plant root penetration and roof leakage and entails frequent maintenance. Moreover, we do not know who will take this responsibility and where does the maintenance budget come from?" Thus, in SanMaoGong, 12,000 m² flat roofs were retrofitted into shingled roofs, while only 700 m² became green roofs. Another low-maintenance example involves rain barrels. The original plan was to install 2,000 barrels, but ultimately only 500 were installed. According to one officer, they doubted whether the residents would use the barrels (given that it was a new concept for

them), and the maintenance would be regarded as future trouble, too. Although many of such changes may seem small individually, in aggregate they may drastically reshape the strategic policy intention (Lipsky, 2010).

To sum up, SCP in old neighborhoods, with substantial gray infrastructures installed, met all stormwater-management objectives, and achieved a high resident-satisfaction rate, but not necessarily in a sustainable or green approach. To hit the central goal, many GI projects including parks, water bodies, and wetlands were added to non-residential areas within and outside the pilot zone (Sima, 2018). These projects met the SCP goals of mitigating flood risk through GIs, though these areas were far from the impervious surfaces in the old residential districts.

Zhenjiang's SCP passed the central inspection in 2019. As commented by one local officer, "All the stormwater management indexes are met. Zhenjiang does have a lot of green measures in SCP." Another officer mentioned that "When there are no specific indexes like the percentage of green roofs, the central inspectorate can only roughly evaluate how 'green' the pilot program is." According to two central inspectors, "SCP remains a pilot program. When it is impossible to set clear indicators for the sustainability goal, we try to encourage pilot cities to do better and adopt more green measures. But no pilot city 'fails to pass' the final inspection".

4.5 Discussion

The incoherence among multiple goals increased goal ambiguity, which is manifest in both priority ambiguity and measurement ambiguity. Such ambiguities bring implementers substantial challenges, but also leave them discretion to handle these challenges. At the central level, the tenet of SCP was a paradigm shift from green to gray in stormwater management (H. Li et al., 2017). However, the efforts towards the paradigm shift were undermined in a multiple-goal implementation. As a result, while both the stormwater management goal and the resident satisfaction goals were met, the sustainability goal was substantially compromised. Goal priority ambiguity and goal measurement ambiguity, when processed at implementers' discretion, drastically altered the program

implementation trajectory and outcome.

4.5.1 Goal priority ambiguity

Implementers tried to manage goal conflicts, they exercised discretion in deciding whose interests or which goal took precedence when not all can be met simultaneously. When they prioritized the resident satisfaction goal, the sustainability goal was put in an inferior status and the program-implementation trajectory was altered. Environmental programs usually involve both local interests as well as broader public interests (Lane & McDonald, 2005). Regionally beneficial decisions may have adverse consequences locally, and vice versa. The short term and parochial focus of community-based interests present a risk of diverting policy outcome when policies involve much public influence (Leach, Mearns, & Scoones, 1999). This is especially true in Zhenjiang's old neighborhoods. Low-income residents remain self-interest maximizers in enhancing pleasure and avoiding pain (Howlett, 2018). Residents care more about small and short-term interests like the kitchen garden or the window lighting but do not care much about whether the stormwater is managed through green or gray measures. However, SCP's goals of sustainable stormwater management entail establishing as many green measures in neighborhoods as possible. When multiple goals have severe interest conflicts, implementers resort to "satisfying" solutions rather than optimal or desirable ones (Gilson, 2015). They must compromise between program expectations and what they can feasibly achieve, predicting the impact of client compliance on policy efficiency and effectiveness (Howlett, 2018). In SCP, implementers prioritized residents' needs in the hope of minimizing vandalism and facilitating the implementation process. Resident satisfaction became an important action guideline of frontline implementers. Accordingly, the flood recurrence standard was increased to 30-years, which greatly exceeded the GI's functioning capacity, and SCP was combined with retrofit programs. Through this route, many non-listed neighborhoods were incorporated into the retrofit lists, and some green spaces were turned into parking lots.

These discretions not only changed the trajectory of policy implementation, but also the program's resource redistribution, which is disadvantageous to the non-prioritized

sustainability goal. Here the resources include both time and funding. Multiple goals make it more difficult for implementers to concentrate efforts effectively (Jung, 2014). In particular, an expanded “SCP + retrofit” program will require implementers to collaborate with various stakeholders, including many relevant departments and residents. O'Toole Jr and Montjoy (1984) warn that inter-organizational implementation tends to encounter more delay and failure than would intra-organizational implementation. In the case of Zhenjiang, the hundreds of meetings among a myriad of government departments had become very time-consuming and daunting. The program implementation became slow and tedious. As to the residents, given the knowledge gaps in public engagement (Leach et al., 1999), implementers had to spend time on solving problems both relevant and non-relevant to flooding, responding to resident's demands both reasonable and unreasonable. SCP had a three-year implementation period to complete hundreds of projects, leaving only a few months to complete each project. Frontline implementers must balance between the expectations of the program and what they are able to accomplish (Lipsky, 2010). While struggling to catch up with the schedule, they paid less attention to the quality of each project, including SCP's green nature. For instance, they handled the problem of parking-space shortage simply by removing some green spaces. The time constraint precluded implementers from finding sustainable solutions, such as shared parking spaces with nearby entities or vertical parking lots, which could solve the parking problem while preserving the existing green spaces. In addition to the time resource, SCP's funding was also diverted from flooding mitigation. In an expanded “SCP + retrofit” program, only three out of the eight task categories really related to stormwater management. To meet the raised flood-recurrence standard, two-thirds of funds went to gray infrastructure, and the remaining one-third had to be shared between GIs and neighborhood retrofit. The resource deviations went so extreme that frontline implementers were risking their political accountability, when neighborhood retrofits that had no flooding mitigation connection were difficult to justify to central government financial auditors.

Implementers' discretion in deciding the order of interests and goals can help streamline the implementation process by boosting resident's compliance. Yet such discretion as well as the consequent resource reallocation drastically crowded out GI. The

existence of multiple goals without a clear hierarchical order harms the salience and relevance of efforts when interest conflict frequently arises (Jung, 2014). The priority ambiguity is an important dimension of goal ambiguity that affects the sustainability goal achievement. The program's sustainability focus was largely diluted and diverted. Goltz, Mayer, and Orr (2020) illustrate that without addressing local concerns, sustainable development interventions are rarely sustained. In this research, when addressing too many of residents' concerns, the sustainable interventions are hardly sustained, either.

4.5.2 Goal evaluation ambiguity

While policy goal priority ambiguity leaves room for actors to decide which goal to prioritize, goal evaluation ambiguity allows implementers the discretion to decide the degree of their commitment to a goal and to interpret the goal performance in their own way. For stormwater management, it has become a consensus that the paradigm needs to shift from a traditional gray to a green approach, because of the substantial economic, environmental, and ecological benefits that GI provides (Johns, 2019). Yet, for Zhenjiang's SCP, although it passed the central inspection and the residents were satisfied with the SCP service, to what extent the paradigm has been shifted remains unclear, as neither the stormwater indexes nor the resident satisfaction rate conveys any information about how much and how well the GIs have been applied in SCPs. In this sense, these indicators are far from sufficient to evaluate the sustainability goal of this program. Compared with the straightforward stormwater indexes and the satisfaction rate, formulating measurable sustainability criteria is more challenging (Hueskes, Verhoest, & Block, 2017). This is consistent with GI's measurement challenges. According to the interviews with two drafters of the *SCP Evaluation Criteria* national report, the GI performance measurements are descriptive instead of quantified because of the difficulty for central planners to develop one-size-fits-all standards to adapt to local conditions. They admitted that the SCP's evaluation standard is far from perfect. While for city-level implementers, the benefits of GIs are still perceived as difficult to gauge and associated with high maintenance costs (Johns, 2019).

Bastien (2009) finds that when there are no clear goal evaluation criteria, street-level implementers will treat such absence as a green light. In other words, goal measurement ambiguity leaves implementers much freedom in deciding to what degree they commit to that goal. In SCP, when implementers prioritized the other two goals, the sustainability goal was already put in a disadvantaged position. The goal was further downplayed when it did not have a clear measurement. For SCP, GI's maintenance is a perceivable burden. Ryan et al. (2006) suggest that when the implementation agency does not have enough resources to manage and maintain GIs on a long-term basis, they may count on private entities or the public to share this burden. In cities like Cleveland and Milwaukee, the management and maintenance burden precluded the sewer authority from using a GI approach (Keeley et al., 2013). In Zhenjiang, when both GI's maintenance responsibility and budget were not clear, implementers chose to reduce some feasible GI measures, including scaling down the rain barrel plan and using shingle roofs instead of green roofs. Without clear measurement, implementers were actually granted substantial freedom to decide how much GIs to be used in SCP. This points to the importance of establishing some basic sustainability targets, which can prevent GIs from being crowded out, secure funding for GIs, and encourage more GI installation (Johns, 2019).

Without clear goal evaluation criteria, frontline implementers may also believe that their own evaluation criteria would match the organization's criteria (Bastien, 2009). When there were no specific indicators to evaluate the sustainability goal, all actors had their own way to explain what sustainability means. For local implementers, Zhenjiang's SCP implementation had been successfully completed when the three indexes of stormwater management were achieved, residents were satisfied with SCP, and the sustainability goal was attained by the installation of various GIs, such as rain gardens, bioswales, rain barrels, and green roofs in old neighborhoods. Nevertheless, most of these green measures were established more in a demonstration way, rather than being extensively and intensively used to solve the water problems. For central inspectors, without clear performance indicators, they cannot precisely evaluate how green the pilot city's SCP is. These may explain why sustainability considerations currently play only a limited role in many urban infrastructure projects (Hueskes et al., 2017).

4.6 Conclusions

When a central policy is implemented top-down, the layered cross-level goals become incoherent and cause policy goal ambiguity, which substantially deviates the policy process and outcome. Neither the goal priority ambiguity nor the measurement ambiguity is beneficial to the sustainability goal achievement in a complex implementation setting. Policy goal priority ambiguity allows implementers the freedom to decide which goal to prioritize when interest conflicts arise in the implementation process, which puts the sustainability goal in an inferior position. Goal measurement ambiguity further allows policy actors to decide how much they may commit to a goal and to interpret the service performance in their own way. In SCP, when no specific indicators were available to evaluate the sustainability goal, some small-scale GI demonstration projects symbolized sustainability, which substantially undermined the green tenet of SCP.

As can be learned from this SCP case, clearly specified goal priority and measurement may bolster the goal achievement, though clarity is not always possible (Chun & Rainey, 2005). In a top-down policy implementation system, the high-level decision-makers may prioritize their policy objectives, which can ensure their preferred policy goals are achieved at the local level (Gao, 2009). Although it is difficult for central decision-makers to establish one-size-fits-all sustainability measurements, they can require local implementers to develop some basic performance indicators based on local conditions, which can ensure the implementer's commitment and prevent misinterpretation.

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Appendix

Table 4.4 Main policy actors involved in Zhenjiang SCP implementation

Central government: Commissioned SCP to pilot cities, including Zhenjiang		
City level	Role	Members
Leading Group of Zhenjiang SCP (ad hoc)	Leadership	Director: Mayor Deputy Director: Vice Mayor Member: Representatives from different public agencies, including planning, housing, electricity, energy, water, transportation, environment, as well as some relevant Districts.
SCP headquarters (ad hoc)		Director: Vice Mayor Deputy Director: Director of the Municipal Bureau of Housing and Urban & Rural Development (BHURD) Deputy Secretary-General of the municipal government
SCP Office (ad hoc, established in Municipal Administrative Division of Water Supply and Drainage)		Office Chief: Director of BHURD Deputy Chief: Consultant of Bureau of Finance Deputy director of the Bureau of Water Resource
	Implementation	Deputy Director of BHURD
		Members from the Municipal Administrative Division of Water Supply and Drainage
Technological experts	Project planning and design	Professionals from Herrera Environmental Consultants (US), CPG Corporation (Singapore), Shanghai Water Planning & Design Institute, Zhenjiang Planning & Design Institute, ManJiangChun Urban Planning & Design Co. Ltd., and so on.
Public Private Partnership SPV	Project construction	China Everbright Water Co. Ltd. (Zhenjiang)
Neighborhood-level		
Office of Neighborhood Commissions	Coordination	Commission director and employees. (The commission is at the lowest level in the Chinese administrative system.)

Clients	Participation	Residents
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Source: compiled by authors, part of data from Zhenjiang. gov.cn

Table 4.5 A list of interviewees

	Affiliation of interviewees	Number. of interviewees
1.	The Municipal Bureau of Housing and Urban & Rural Development	1
2.	Zhenjiang Planning & Design Institute	2
3.	Municipal Administrative Office of Water Supply and Drainage	2
4.	Municipal Bureau of Transport	1
5.	Neighborhood Commission	3
6.	ManJiangChun Urban Planning & Design Co. Ltd.	1
7.	Zhenjiang EverBright Water Co. Ltd.	1
8.	Zhenjiang SCP expert	1
9.	Drafter of Sponge City Guide/Evaluation Criteria (National Report)	2
10.	SCP professional out of Zhenjiang	4

5. Conclusions

“Sustainable city” is a broad topic. This dissertation investigates two aspects of green space provision and stormwater management in cities. However, as is obvious, the relevant policy-making and implementation are very complex. This may be partially because many urban sustainability policies or programs resemble policy experiments. In this dissertation, the first two policies are innovated at the local level, while the second two are central policies tried out at the local level. The four chapters also represent different stages in a typical public-policy process. Ch. 1 deals with a policy entrepreneur, which happens at the initial agenda-setting stage. Ch. 2&3 discuss policy tools, which are used in the policy design and implementation stage. Ch. 4 involves how the policy goal design influences policy outcome, which links the policy formation stage with the policy evaluation stage.

5.1 Chapter review

Bottom-up innovations are based on local situations and show better chances to succeed. Chapter 1 tells the story of how an individual’s efforts can be decisive in driving a city’s green roof policy innovation. The policy entrepreneur is a proactive insider. Vertical greening’s esoteric nature implies that initially it was overlooked by the local government and was almost invisible to the media and the general public. The policy entrepreneur put it on the policy agenda and looked ahead to implementation, trying to remove barriers to adoption. All of her political, technical, and publicity efforts were focused on facilitating the implementation of vertical greening. Her efforts in Shanghai set an example for other cities in China, which have subsequently advanced this vertical greening innovation.

The green roof regulation presented in Ch. 1 engages green roofs as non-profit public goods. Ch. 2 points to the insufficiency of such public policies in response to the private sector’s provision of shopping mall roof gardens, in the form of club goods. When the public policies are designed only for public goods, they fail to internalize the club good’s positive externalities and respond to their cross-sector nature. Without sufficient policy

support, there are financial, legitimacy, and oversight gaps. For now, when the pioneering one-third of malls have established roof gardens but are struggling with the sustainability problem, and the other two-thirds of malls have not taken action yet, it is important to provide a timely and sufficient institutional response.

Compared with a club-good approach, PPP is a more popular way of the private sector's engagement in public service provision. PPP's application to non-revenue generating environment services is an unprecedented yet bold initiative in a public-dominant political system, especially when the institutional environment is not ready yet (S. Zhang, Gao, Feng, & Sun, 2015). Although the central government is eager to include the private sector and seeks to establish 'real PPPs', it becomes inoperable when partners are inexperienced and the market is less supportive. PPPs thus transitioned to QPPPs with high degrees of public control. Instead of sharing the government's financial debts, QPPPs have become saddled with tremendous hidden debt, which revolves back to local governments.

Finally, SCP as a policy experiment provided the pilot cities the opportunities to try out sustainable stormwater management. However, in a cross-level implementation system, goal ambiguity, especially the goal priority ambiguity and measurement ambiguity, largely compromised the policy outcome, as priority ambiguity leaves implementers the discretion to decide which goal to take precedence, while measurement ambiguity allows actors to interpret the service performance in their own way. These discretions largely compromised the sustainability goal.

5.2 Limitations with this research

This dissertation uses causal case study approaches. Flyvbjerg (2006) suggests that a single case study can provide valid research outcomes when the case in question is supposed to be sufficient and illustrative enough. The four cases in this research are selected mainly because they are critical and unusual. For instance, in Chapters 1&2, both the two Shanghai cases are picked because Shanghai is the pioneering city in green roof development, with the green roofs provided either as public goods or club goods. Another reason lies with the author is a long-term observant of the green roof practice and policy

development in this city, which to some degree ensures data availability and validity. In Chapters 3&4, the Zhenjiang case and the eco-environment service sector are selected also because of their distinctiveness. In this sense, the overall replication logic is not the priority of this research. According to Yin (2017), a case study must be distinguished from the sampling logic commonly used in surveys for three reasons. First, a case study is not the best method for and thus should not be used to assess the prevalence of phenomena. Second, an individual case study would have to cover both the phenomenon of interest and its context, yielding many potentially relevant variables. This would require an impossibly large sample of cases—too large to allow more than a superficial examination of any given case. Third, if a sampling logic had to be applied to all types of research, many important topics could not be empirically investigated. For these reasons, the findings of this research are better to be understood as the phenomena of interest rather than the phenomena of prevalence.

However, other research methods like surveys and statistics could also be used for next-step research. Using a survey, while abiding by certain principles such as ensuring representativeness, minimizing bias, and improving response rate by following procedures in handling the data, I will be able to enhance the external validity of the study. For instance, when more cities start to mandate green roof policies on new buildings, I can examine whether these followers are adopting the green roof policy because of policy entrepreneurship or because of policy learning. Policy entrepreneurship is the main driver of policy change (Mintrom & Norman, 2009). However, when the pioneering city has already developed and implemented policies successfully, other cities may simply “borrow” such policies without strong pushes from a policy entrepreneur, which is of course not always available. So I can use a survey to identify the drivers of green roof policy change. In a similar vein, I can use a survey to understand why green roof adoption remains low in the Sponge City program to find the influencing factors such as policy, technology, and physical barriers (roof structure and load).

In this research, each chapter uses a case to explain a “why” or “how” research question in policy theories. It implies that appropriate explanations clarify the causal process on

which the outcome is drawn. In order to answer the research question, causal relationships between events need to be identified. Causal case studies tell a story of a sequence of events or processes and use these events or processes to build explanatory theories that derive from this story (Beach & Pedersen, 2016). For future research, I can conduct causal case studies more rigorously. Given the societal context, there could be the case of unifinality, multifinality, or equifinality (Hedström & Ylikoski, 2010; Lindquist & Wellstead, 2018). It means that the same effect could be caused by various mechanisms or vice versa. In this line of thinking, the mechanism provides an explanation about the outcomes. Moreover, the role of the mechanism is not limited to explanation, it has also the potential to distinguish true causal relations from spurious correlations. Obviously, the causal mechanism approach would help identify important variables and detect the causal relationship between the variables.

5.3 Future research

Policy innovation always depends upon a reformer's commitments. A policy entrepreneur is more likely to succeed at the local level or at a small scale where an entrepreneur's capacity is sufficient to influence all three policy streams towards successful policy change (Cairney, 2018). 'Trivial' topics like vertical greening usually lack outside catalysts as they do not attract much attention from interest groups, the public, or the media. In this sense, entrepreneurship as a powerful internal driver contributes to the overall policy change. It is worthwhile to look also at other sectors with various political and vested interest stakeholders. It would be expected that other entrepreneurial strategies to earn political capital are needed towards desirable policy change (He, 2018).

Collaborative governance towards public good provision, especially the non-profit-generating green space, remains rare. Both the club-good approach and the PPP approach to urban green space development deserve more research attention. This points to future research potential to explore the enabling institutional environment. SMRG can be regarded as a type of voluntary environmental program that provides positive externalities to the city. But as shown from this study, given the less sustainable outcome as a result of

voluntary innovation, it is worthwhile for the government to take proactive measures to direct the voluntary program towards a more sustainable outcome. Future research can focus on how the greening department acts as a policy entrepreneur to build allies with other departments in creating a more conducive institutional environment. As to the other market-based solution of QPPP, this research is limited to the eco-environment service sector in China. Of special interest is a more wide-ranging study to examine how the new private-SOEs consortium influences QPPP projects, including potentially reducing the lending bias and financing cost compared with the solely private partner.

Finally, policy goal ambiguity is a well-studied theoretical topic. In this research, it proves to be especially detrimental to the sustainability goal achievement when both the goal priority and measurement are vague. It would be helpful to do some comparative research, for instance, in a matrix of goal priority clarity/ambiguity and goal measurement clarity/ambiguity to see how different combinations of ambiguity/clarity may influence the policy outcome. Nevertheless, although goal clarity is important to the sustainability goal achievement, other supporting policies are also critical. For instance, in the Sponge City program, stronger incentives for green roofs could mobilize more private developers, as shown in the SMRG case. For the moment, except for some metropolitan cities like Shanghai, Shenzhen, and Beijing, most sponge pilot cities have not institutionalized green roofs in their municipal laws. Once various regulations or incentive policies are in place, green roofs will be generalized more easily.

5.4 Advice for policymakers

For policymakers, it would be beneficial to understand the positive and encouraging outcomes from a policy entrepreneur's efforts. That Shanghai became the first city in the nation to mandate vertical greening can be largely attributed to the policy entrepreneur's initiative and perseverance. This may shed light on other cases or scenarios. For example, as to the SMRG case, the greening department (as the advocacy agent) can act as a policy entrepreneur and build allies with both the water and the planning departments, to shepherd the necessary policies for incentivizing club goods such as shopping mall green space. In

a similar vein, policy entrepreneurship may also propose stronger incentives for green infrastructure in Sponge City programs.

In addition to the role of policy entrepreneurship, policymakers may also examine the effectiveness of policy tool design. Existing policy tools are largely designed for the scenarios of government direct provision of public goods. Nevertheless, when the private sector is involved in public goods provision, the intrinsic sectoral interest conflicts will entail policy tool redesign to take the private partner's interests into consideration. Such interests may include both a green reputation and monetary benefits. In this sense, the government can encourage the enterprises to voluntarily fulfill their corporate social responsibility by establishing green roofs. For large scale green infrastructure projects, the government would need to design policy tools to ensure that benefits can cover the production costs and to allow the private sector to be self-sustaining through motivating the private sector to consistently contribute to public/club goods provision. Otherwise, the initial voluntary engagement may degrade and become unsustainable as in both the SMRG and eco-environmental PPP case.

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