

Towards a typology of pilots: the Shanghai emissions-trading scheme pilot

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Abstract: Piloting has become a prevalent feature of Chinese politics. However, there is a gap in classification of pilot types. This article offers an initial ordering of pilot types, categorized on the basis of institutional dynamics, changes, and staying power of institutions; and how pilots are handled by the local government. Government–business interactions are seen as an indicator of the government’s handling of the pilot. Three pilot types are proposed: perfunctory, policy-focused, and goal-oriented. One case is examined in depth: the Shanghai carbon-market emissions trading scheme pilot, from the time it was announced in November 2011, to the end of the first compliance cycle in June 2014. The Shanghai pilot was arguably a goal-oriented one: the local government put considerable effort into ensuring positive results, by allocating resources and interacting with the enrolled companies. The case-study draws on written sources such as government notices, regulations and news, as well as on semi-structured interviews conducted in 2015.

Keywords: pilot types; local government–business relations; Emissions Trading Scheme (ETS); Shanghai

Introduction

Local governments in China try out new policies as a prevalent characteristic of central–local government interaction patterns: “experimentation under hierarchy.”¹ One frequent type of experimentation involves *experimental points* for specific policy-issues in designated jurisdictions (hereafter: “pilots”).² Such pilot experimentation has been documented in public administration reforms,³ electoral reforms,⁴ and healthcare reforms.⁵ Piloting has also been conducted in the environmental field, as with environmental information disclosure,⁶ air-pollution permit trade,⁷ and climate-change policies.⁸ Climate-policy piloting has included low-carbon cities,⁹ power-market reforms,¹⁰ energy-saving retrofitting,¹¹ green finance,¹² and emission trading schemes (ETS) for carbon emissions.¹³ This central–local government contact mechanism promotes policy and organizational advances and innovation. It has become a crucial

element in the Chinese policy-process, and can explain much of the government's adaptational governance ability shown in recent decades.¹⁴

However, such pilots vary greatly in content, form, and policy enforcement. It may appear intuitively logical to think of pilots in terms of how successful they are in bringing about policy change and innovations, or resolving the problem at hand. However, there may be many reasons for ostensible degrees of successes. With two pilots that appear to have achieved similar results, very different influencing factors may have been involved. Sometimes factors beyond the control of the local government, such as changes in market conditions or natural disasters, play a pivotal role. If a pilot produces few results, were the regulations too strict, dooming it to failure? Conversely, if a pilot shows a 100% completion rate, were the targets too easy to achieve? Did they require real efforts? We should also question how useful it is to focus narrowly on how successful a given pilot has been. Baoding is often held up as an example of a successful Chinese low-carbon city pilot,¹⁵ but some studies have noted several challenges that may call that into question.¹⁶ Rather than measuring the success of various pilots against each other, it may be more pertinent to examine what each pilot entails. This article offers some first steps towards systematizing pilots.

Several studies have focused on pilots,¹⁷ but few have sought to classify pilot types, beyond results-based findings. Systematic distinctions are called for. This article offers a preliminary ordering of pilots, based on the processes of institutional dynamics¹⁸, how pilots are handled by the local government in question, and government–business interactions. Adding important insights on local governance, Liu et al.¹⁹ and Zhao et al.²⁰ have recognized that businesses are vital to policy implementation. Complementing their focus, this study pays special attention to the institutional dynamics between the municipal government and the companies covered by the ETS pilot in determining pilot types.

The typology proposed here categorizes pilots as *perfunctory pilot*, *policy-focused pilot* and *goal-oriented pilot*. I argue that determining a pilot's type requires in-depth examination. The case in this article, the Shanghai ETS pilot was arguably an example of a *goal-oriented pilot*. The piloted policy investigated here was significant. ETS is a nationally important policy, and the pilots were crucial in the preparation for the national ETS. Shanghai is a pertinent choice of the seven pilots that were announced in 2011. In December 2017, Shanghai was delegated responsibility for developing the national ETS trading platform,²¹ and will host the trading platform, so the effects of the Shanghai ETS pilot extend beyond Shanghai's jurisdiction. Further, Shanghai ETS pilot government–business interactions were sufficiently evident and distinct enough to lend themselves to analysis and framework development.

This study contributes empirical insights on local pilot governance in the case of the Shanghai carbon-market pilot, from its announcement in November 2011 to the end of the first compliance cycle in July 2014.²² The empirical case-study draws on written sources like government notices, regulations, decrees and news, complemented by 15 semi-structured interviews with representatives from the Shanghai pilot administration, compliance companies, third-party verifiers, as well as consultants and academics. Eight interviews (A–H) were central for understanding the case, while the other seven were useful for grasping the broader context of the pilot and low-carbon efforts undertaken by Shanghai and other local governments. All interviews were conducted between September and November 2015, in Shanghai and in Beijing. See Appendix 2 for details. The institutional dynamics in the process from formation to operation were extracted from interviews and written sources. Interview respondents were asked about the

process, the relationship and interaction between the Shanghai government and relevant actors. The resultant pilot categorization is a combination of observations from the empirical case and reading of the experimentation, pilot and local governance literature.

The next section discusses the earlier literature, followed by a description of the pilot types. Next, the case study of the Shanghai ETS pilot is presented. The final section offers concluding remarks on the classification of pilots, and the way forward.

Theorizing Experimentation and Pilots

Pilots have been theoretically examined in various ways. Previous studies have generally dealt with the structural and institutional aspects, such as central–local government relations and incentives, and the agency of cadres and local governments.

Already in the 1990s, experimentation and gradualism, were argued as main reasons for China’s economic growth,²³ whereas economic scholars saw privatization and liberalization as the chief reasons.²⁴ More recently, using economic reform experiments as data, Heilmann²⁵ posited that the policy-cycle of “experimentation under hierarchy” was a prominent feature of the Chinese governance’s adaptive capacity. Experimental points, or pilots, were among the experimental tools he identified.²⁶ Experimentation and pilots had been noted previously²⁷, but without the theoretical stringency Heilmann brought to the field. He further observed that local innovation and piloting could progress only so far, and that higher-level officials could support or obstruct the larger adoption of the policies. Noting the importance of China’s political hierarchy, Heilmann called for further study of its effects.²⁸ This call has been heeded by several scholars who have identified consequences of the hierarchical structure for piloting.²⁹

Many have noted that the central–local government relationship is crucial for piloting.³⁰ Shin’s³¹ study confirms Heilmann’s observation of higher-level policymakers as gatekeepers of pilots. In the late 1990s, the central government encouraged sulfur dioxide (SO₂) trading pilots, and local pilots began from 2001. Later, however, the central government chose other policy tools for controlling SO₂ emissions, effectively ending those pilots.³² Li³³ found that the level at which authority was placed impacted on implementation: leaving responsibility for enforcement with research institutions, and not with the local Environmental Protection Bureau, seems to have adversely impacted the implementation of one environmental information pilot. Conversely, having strong backing from the mayor proved important for enforcing and expanding the scope in another such pilot.³⁴ Mei and Liu³⁵ even argue that the role of experimentation has been overrated, as it is the central government that decides which pilots are “successful” and which pilots will be adopted nationally. However, equating a pilot’s significance to the effect on national policies may obscure other aspects and functions of pilots, as highlighted by the typology presented in this article.

Studies of pilots in the field of the environment, climate, and energy have revealed numerous institutional dynamics. Some local governments have performed quite well in institutionalizing policy-planning processes and integrating low-carbon progress into the city’s larger development path.³⁶ Echoing the “shadow of hierarchy,”³⁷ Guan and Delman³⁸ trace this to the logics of dutifully acting on central government guiding principles. Wang et al.³⁹ found successful implementation to be a consequence of local governments pursuing economic growth through low-carbon development. In other cities, however, experimentation has not resulted in much institutionalization of low-carbon or eco practices, beyond having the title of a pilot city.⁴⁰ Schreurs⁴¹ argues that lack of funding and failure to consider local circumstances when planning policies

are reasons for poor pilot implementation. Although noting differences in outcomes, these scholars have not ordered the variations as this study does.

Since the official announcement in 2011 that China would begin experimenting with greenhouse gas (GHG) emissions trading schemes through ETS pilots, there has been no shortage of ETS studies. Goron and Cassia⁴² have investigated the regulatory organizations involved in China's seven ETS pilots, and conclude that, despite the intention of letting the markets rule, dominance has been given to state organizations. Although they examined all seven pilots in their study, the authors did not discuss possible ways of classification, as the present study does. Some recent contributions have concentrated on the companies involved in the pilots, such as Shen,⁴³ Deng et al.,⁴⁴ and Zhang et al.⁴⁵ These studies shed light on the situations and behaviors of the businesses enrolled in the ETS pilots, but there is a gap in the literature as regards the interaction dynamics between the ETS market administrators and governments on the one side, and compliance companies on the other, which this article aims to fill. This article contributes by bringing in businesses as an actor group to be considered when investigating pilot implementation.

Scholars have also attempted to develop the “experimentation under hierarchy” model further. Tsai and Dean⁴⁶ propose “experimentation under hierarchy in local conditions” by bringing in provincial political and economic conditions, and the agency of provincial leaders. They argue that provincial leaders draw on the central government's encouragement of experiment and maintain close relations with the Chinese Communist Party general secretary, seeking those innovations which best fit the provincial economic situation. Similarly, Shin⁴⁷ argues that, whereas central–local relations, systemic factors and incentives play a role, mission-driven local government organizations have not received enough attention. Based on process tracing of Baoding's development and a mixed-actor government organization, Shin proposes calling successful local government innovation “collective experimentalist governance.”⁴⁸ These authors have introduced valuable refinements of actors' significance to “experimentation under hierarchy.” Focusing on the types of experimentation in pilots, this article acknowledges variation in pilots and describes some initial steps towards ordering and classifying them.

Types of pilots

The approach for delineating among pilots proposed here involves examining how the pilots are handled by the local government in the jurisdiction. Emphasizing the institutional dynamics facilitates comparisons better than does measuring by the elusive standard of “success,” and can help reveal what kind of case a given pilot represents. As research has shown, in China all pilots occur in a setting where the central government defines policy objectives with top–down delegation, and bottom–up trials, experimentation and innovation feedback to national programs.⁴⁹ Many pilots are awarded and designated from a higher governmental level, usually the central government⁵⁰—for example, the seven ETS pilots were accorded their status from the NDRC. This top–down institutional arrangement, where the mandate to test and develop policies comes from above, co-exists with an institutional structure of fierce competition among local governments for preferential treatment, subsidy possibilities, and promotions for individuals.⁵¹ Given such structural incentives, local governments are understandably interested in conducting pilots. All the seven ETS pilots *applied to the NDRC* for status as pilots, rather than being asked or delegated the responsibility.⁵² On the other hand, there is also a bottom–up aspect: it is up to the local government to formulate the specific rules and policy regulations of such policy innovations. Teets⁵³

has found evidence that innovation makes cadres stand out among peers with equal performance targets. Hence, all pilots could be expected to be meticulously crafted and enforced—but they vary considerably in form, function and results. The typology presented here categorizes pilots along how the local government handles the pilot: *perfunctory pilot*, *policy-focused pilot* and *goal-oriented pilot*.

Pilots which are enacted and which remain true to the original policy design are closest to the “basic” intent of the pilot mechanism: to try out the feasibility of a given policy—*policy-focused pilots*. Few deviations are made from the original rules once the policy period starts. Policies are tested for their viability and impact on the issue they are intended to address. In Jiangsu Province, the Zhenjiang city environmental information pilot, begun in 1999, can be classified as such a pilot. It was expanded to include more enterprises, and then became standard practice in Zhenjiang.⁵⁴ However, with policy-focused pilots there may be considerable variation, from a high degree of output to a lower degree.

Further, there have been reports of pilots with no or little action after the initial pilot status was granted. This type may be called a *perfunctory pilot*. There may have been a plan or a policy document, but the pilot got curtailed. All ten of the local governments in what was then the State Environmental Protection and the National Bureau of Statistics’ 2005 *Green GDP* withdrew from the pilot before completion.⁵⁵ With more than 40 NDRC-approved low-carbon pilots, some of these may fall into this category.⁵⁶ Zhenjiang’s counterpart, the environmental information pilot in Hohhot, ended up being smaller and more restricted than prescribed by the initial plan.⁵⁷ Poor output, or lack of success, is not the sole feature here. Such pilots are characterized by the absence of policy adoption and implementation that would otherwise have been expected. Perhaps there was a change in the top political personnel, leading to a shift in political priorities; or other difficulties may have been involved.

Thirdly, a pilot where implementation leads to a high degree of policy output may be termed a *goal-oriented pilot*. With pilots in this apparently successful category, it is important for the local government to prove that they made the policies work. Rules and regulations may be changed along the way, so as to ensure a high degree of completion and notable performances. The Shanghai ETS is one such case. With goal-oriented pilots, things may move quickly, but with uncertainty as to the effect on the policy area that was to be improved. For example, as part of Hangzhou’s “beautiful landscape” model in preparation for the 2016 G20 meeting, LED lighting was erected along the main roads in only three days—but the cost–benefit results were uncertain.⁵⁸

Expectations regarding the three types

Characteristics of implementation and the implementation rationales:

These can be expected to depend on the government’s approach to the given pilot and the circumstances. In a policy-focused pilot, the local government sees the value of the pilot as testing a policy. If other political issues gain importance at the expense of the pilot, then it is likely to become a perfunctory one. In cases where the results achieved by the pilot become an instrument for the local government in showing success, it is likely to be more of a goal-oriented pilot. In a policy-focused pilot, the local government can also attach great pride and importance to the pilot, but the value is seen as lying in the pilot itself, not the results. Enforcement is characterized by abiding by the regulations first formulated when the pilot was planned. With a perfunctory pilot, the government’s initial eagerness wanes in the face of more pressing issues, and few measures are enforced beyond the initial planning stage. By its nature, a pilot is a trial

of planned policy innovations. With a goal-oriented pilot, the local government attaches great importance to the results. It prides itself on the pilot, by achieving high scores and broadcasting the results. This means that the original policy rules may be modified or altered as means of achieving high output. Policy innovations outside the initial design are assumed to be most likely to occur in a goal-oriented pilot when new and unexpected situations arise. Whereas a perfunctory pilot produces little output, and a goal-oriented one typically shows output in line with policy goals, a policy-focused pilot may have more output, or less. Indications of the local government's approach and intentions may be found in speeches, events held in connection with the pilot, and especially in its enforcement and contact with relevant businesses and entities.

The local government's financial situation is likely to determine, at least partially, which type a pilot becomes. Funding is needed in order to plan and execute, and perhaps lobby for pilot status. Where the coffers are empty, governance will tend to be restricted to tasks already on the table. Should a pilot be initiated in a fund-deficient jurisdiction, it will probably end up as a perfunctory pilot. With sufficient funding, however, a pilot may become either policy-focused or goal-oriented.

Although the sections above describe local governments as a unitary actor, individuals can be expected to be crucial in determining the categorization of a pilot. A party secretary who favors a policy may push the pilot into a policy-focused type, whereas, if the top leadership changes, the new leaders may not be so keen on supporting their predecessors' initiatives, rendering the pilot a perfunctory one.

Assessing the pilot type correctly requires thorough scrutiny, not a superficial survey based on speeches and news reports. Particular attention should be paid to the interactions between the government and businesses, as the government's intentions can be expected to be evident in its interactions with businesses.

Local government–business interactions

Some pilots concern bureaucratic reforms and therefore involve a limited number of actors outside the government. However, most pilots in the environmental and climate areas also encompass the business sector, and require their participation.⁵⁹ Common to all types is the expectation that the pilot will be a government-driven project. Some companies may be positive, seeing the pilot as a chance to increase business or gain comparative advantages over peer companies—but the initiative lies with the local government. Businesses and industries may be invited at the planning stage. In a policy-focused pilot, such contact is expected, and the government may, to varying degrees, encourage businesses to comply with pilot regulations. However, the local government is not expected to be coercive, as that would be counter to testing the viability of the pilot policy. In a perfunctory pilot there might be contact between the government and businesses at the preparation stage, and early ribbon-cutting events. As the pilot is government-driven, if the government's priorities shift towards other policies, little or no follow-up with businesses is expected. Any attempts by businesses to contact the government concerning the pilot are likely to be met with silence or vague responses. And third, in a goal-oriented pilot, government–business contact is expected to be frequent when necessary to secure positive results. The government may play on coercive power, forcing acquiescence; on remunerative power, promising resources in exchange for cooperation; or on normative power, signaling the high importance of the pilot so as to guarantee company compliance.⁶⁰

State-owned enterprises (SOEs) are expected to be heard and more engaged with the government than the case with private companies. Since the late 1970s, China has

undergone economic liberation and political reforms,⁶¹ which has also created specific institutional circumstances for different sectors and industries. China's SOE hold a special role in the national economy. They operate under more advantageous institutional conditions, with a greater say in setting their own environmental targets,⁶² and protection from being penalized for environmental transgressions.⁶³ Hsueh⁶⁴ argues that variation in sector ownership reflects the strategic concerns of the Chinese state. Strategic sectors identified by the State Council include electricity (grid and power generation), petroleum, telecommunications, civil aviation, and shipping.⁶⁵ The governmental ownership of these sector companies enrolled in the Shanghai ETS reflects this decision. On the other hand, Szepan⁶⁶ notes how both private and state-owned companies are influenced by the Chinese government through the lending and financing policies of state banks, through funding programs and industrial policies, through regulations and approvals, and finally through the state as the key consumer by way of public procurement. The companies in the Shanghai pilot-case are assumed to share some commonalities as regards roles and identities, like perceptions of the government and its role in society. For instance, they are likely to consider it desirable to have good relations with the government, as business prospects can be greatly influenced by this. However, companies vary as regards their ties and relationships with the Shanghai government.

Pilots may change over time. The three categories describe typical characteristics, applicable to varying degrees. Pilots may even shift between the categories: for instance, a pilot might begin as a political project with great prestige attached to testing the policy's design (policy-focused); then, if the output is deemed unsatisfactory, undergo changes to ensure higher output (goal-oriented), but thereafter gradually decline in priority (perfunctory), with no further actions being taken, perhaps even be a reversal of previous achievements. If the pilot covers large and multi-faceted policy areas, as with the low-carbon city pilots, there may also be variations along the three types within the pilot involving differing sectors.⁶⁷ Table 1 summarizes the pilot types and their expected features. In the following, the Shanghai ETS pilot is presented.

Table 1. Pilot types and their characteristics

Type	Implementation characteristic	Implementation rationale	Typical expected output
Perfunctory pilot	Few actions after obtaining pilot status	Other policy areas take priority over pilot	No or little policy output
Policy-focused pilot	Pilot enacted with no or limited changes to the policies once piloting period begins	Testing whether a policy is feasible	Output varies from low to high degree of requirements met
Goal-oriented pilot	Rules may change, aspects may be added or removed	Showing that a policy is feasible	High degree of policy's requirements met

The Shanghai ETS pilot

Before any specific pilot was announced, it had already been decided in the 12th Five-Year Plan (2011–2015) that a national scheme would be arranged.⁶⁸ In November 2011,

as a preparatory step to the national market, the NDRC declared the two provinces of Guangdong and Hubei, along with five cities—Beijing, Chongqing, Shanghai, Shenzhen, and Tianjin—as carbon-market pilots. These seven pilots were to devote sufficient time and resources to developing and implementing working carbon-market pilots. The Shanghai Development and Reform Commission (DRC) was given main responsibility for the municipality’s carbon market.

The Shanghai government saw the ETS was an important political project, to which it attached great importance.⁶⁹ It was also seen as a means towards governing the city well, and improving the standard of living.⁷⁰ The city-wide targets for Shanghai were to reduce the coal share of the energy mix to 40% by 2015, down from 49% in 2010; and to reduce energy and carbon intensities by 18% and 19% between 2011 and 2015.⁷¹ Being among the first to start a carbon market was in line with the Shanghai government’s low-carbon activities otherwise, and represented an opportunity to achieve its existing goals regarding energy and carbon.

Preparing for the new regime

Preparations for the Shanghai pilot started in 2011. In addition to training Shanghai government staff, the basic regulations and design of the ETS had to be determined, and the involved companies informed, convinced, and trained. Being in charge of ETS nationally, the NDRC was the main source of training and support; additionally, training support and workshops were offered by many foreign and international actors, including the EU, Germany, the UK, and the World Bank. Chinese experts from Shanghai academic institutions and around the country offered recommendations and contributed to training sessions; Shanghai staff also communicated with businesses in Shanghai about the pilot-in-the-making.⁷² For a nine-day period in July 2013, the Shanghai Municipal Legislative Affairs Office was open for public comments to the draft of the pilot’s main regulation document, which was passed in November 2013.⁷³

There had been no prior trading scheme in Shanghai, so work on the pilot had to start from scratch. Having obtained an understanding of ETSSs, and investigated how the EU ETS and the California carbon market worked, the government then analyzed local conditions to determine how to design a trading scheme to fit conditions in Shanghai. The local energy-consumption structure was scrutinized in light of the targets for emissions reductions. Calculation methods and means for achieving the targets were examined, and legal options and penalties discussed.⁷⁴ Sectors were chosen after a review process: the decision hinged on striking a balance between cost-management and the emissions that, according to the energy structure review, it would be possible to control. Shanghai DRC already had useful information on the energy use of its largest energy-consuming companies.⁷⁵ Both industry and non-industrial sectors were selected;⁷⁶ in all, 197 companies were included. The chemical industry and the construction industry were the two largest sectors, together making up 37% of the companies. Non-industrial buildings (malls, hotels, and commercial buildings) made up 21% of the enrolled companies. (See Table 2.) For industry, the entry threshold was companies that emitted more than 20,000 tons of carbon between 2009 and 2011; and, for non-industrial companies, 10,000 tons.⁷⁷

Table 2. Sectors included in the ETS pilot

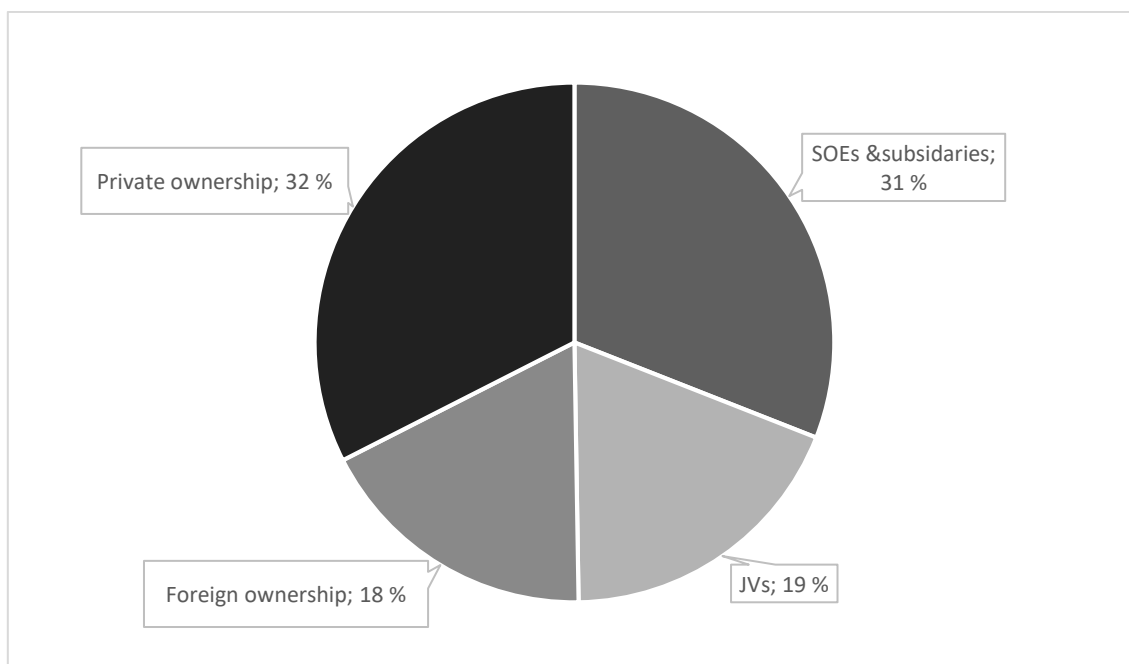
Sector	Number of businesses (percentage)
Iron & steel	8 (4%)
Petrochemicals	5 (3%)
Chemical industry	42 (21%)
Metals	16 (8%)
Construction	32 (16%)
Textiles	8 (4%)
Papermaking	6 (3%)
Rubber	3 (2%)
Chemical fibers	6 (3%)
Power industry	14 (7%)
Hotels	15 (8%)
Malls	15 (8%)
Commercial buildings	9 (5%)
Railway station	1 (1%)
Aviation & airports	8 (4%)
Port industry	9 (5%)
	N=197 (100%)

Source: Shanghai DRC, “Environmental Notice 168 of 2013”

There were almost as many SOEs and subsidiaries as private firms enrolled (see Figure 1). A considerable share had foreign involvement, whether registered as a foreign-owned company, or through a joint venture (JV) with a Chinese company. In the metals, chemicals, textiles and chemical fiber sectors there was a mix of private and foreign ownership.

The SOEs and SOE subsidiaries were spread over several business sectors, with some subsidiaries of the nationally owned giants enrolled, such as SINOPEC, CHINALCO, Bluestar and Huaneng. A few industries were dominated by SOEs and their subsidiaries, primarily the power industry, and secondly the transportation sectors. These are among the strategic sectors where the government has retained control.⁷⁸ All enrolled businesses in the power industry were SOEs, except one, which was a JV but was operated by an SOE. Airports, railway stations, and most port companies were SOEs. The non-SOE port companies were JVs between foreign partners and government-controlled companies. Many of the commercial buildings enrolled were owned by SOEs, as were the hotels. The Shanghai government’s ownership was particularly noticeable in the construction sector, where several companies were subsidiaries of the Shanghai government-owned Shanghai Land (Group)’s Shanghai Construction (Group). The Shanghai government’s Bailian Group also owned several of the malls enrolled. (See Appendix 1 for a list of enrolled companies.)

Figure 1. Ownership composition of pilot companies



Source: author's compilation

Communicating with companies; company responses

After the decision on which sectors to include in the pilot, the Shanghai DRC initiated several rounds of communication with the companies selected. My interviewees mentioned considerable communication between the pilot government and these companies. At this point, there was no formal ETS structure or official municipal pilot-decree, so the government approached the companies in ways institutionally familiar in the Chinese context: informal communication and discussions. Individual sessions were held with companies, as well as hearings and meetings where companies from several industries and sectors were invited to present their opinions.⁷⁹ As there were many companies involved, the Shanghai DRC drew on previous collaboration and enlisted the help of personnel from the Shanghai Information Office and the municipal Bureau of Environmental Protection, forming a team.⁸⁰

Company responses varied according to individual situations and interests. Companies that would probably have to buy many allowances were more active in responding than those unlikely to face high economic costs.⁸¹ A company under expansion would request that its growth be taken into consideration in the allocation of allowances. Also companies that had already implemented energy-saving measures asked that their progress be taken into account, and that allocation be done by benchmarking, or based on the previous year's production capacity, which was seen as more fair than historic emissions ("grandfathering").⁸² To some extent, these requests were accommodated: the baseline-allocation method was used for the power sector, as well as for airlines, ports, and airports. There were rules for when changed activity might result in changing allocated quotas; and if companies undertook energy-saving projects between 2006 and 2011, they could apply to have the effort taken into account in the allocation.⁸³

Generally, SOEs and international companies were the most active. Some international companies were already familiar with the EU ETS or other market mechanisms. In addition to the advantage of having good relations with the government, the SOEs had comparatively good systems for environmental management, which eased the transition to carbon accounting.⁸⁴ Some SOEs were also involved as share-owners of the exchange used by the pilot.⁸⁵ Further, if the top leadership of a company took a personal interest in ETS, that company would be more active in contacts with the pilot government and in training. Smaller private companies were generally not opposed to the pilot.⁸⁶

Most companies agreed to participate in the pilot, but ten were highly negative and refused to be included. As these companies came from several different industries, it was not a question of a given sector feeling that it was being treated unfairly.⁸⁷ Companies that were negative towards the pilot argued that they were already struggling, and that the added responsibility of ETS would represent too heavy a burden. For example, coal-fired boilers in Shanghai would be forbidden in few years' time, and gas-fired boilers would be the alternative. Some companies were considering moving out of Shanghai because of the high price of gas.⁸⁸

In order to join the pilot, each company had to agree that its emissions would be accounted for, also emissions 2009–2011, as these would form the basis for calculating allowances. Such internal information is generally considered to be highly sensitive.⁸⁹ The government conducted workshops to orient the companies on what to expect, and what was expected from them. Initially, the DRC wanted feedback on issues like technical standards, but the companies were more concerned about informing about their interests than commenting on technicalities. They were also worried about fairness among the complying companies in their sector.⁹⁰ One interviewee who had dealt with the companies in this period noted that they “were actually more concerned about what was fair than the specific number of allowances.”

The government took into account that the companies wanted fair treatment among their peers in developing the design. They met the desired fairness criterion with the intention that regulations should be concise and clear, and without entailing abrupt changes. It was also important for the pilot government that rules should precede implementation. The importance of listening to the opinions of businesses and taking their wishes into account was recognized, as they were the ones who would ultimately have to comply with the regulations and fulfill the targets.⁹¹ The pilot government was also aware that the ETS created innovative patterns of government–business interaction. Whereas the previous approach had been for each department to have contact with businesses or work-units within its issue-area, such as the education and transport departments, the ETS cut across such lines, entailing closer contact between businesses or work-units and the local government. Companies were kept informed of government policies; the government was also kept informed of business trends.⁹²

Interviewees were positive to the informal communication between pilot government and companies—noting, for example, that the pilot government benefitted from the dialogue by receiving input, making this a two-way dialogue and not a top–down “government-to-business” information situation.⁹³

When DRC published the notice informing that the city's carbon emissions trading pilot had announced the list of companies on November 29, 2012,⁹⁴ all 197 listed companies had been informed and had agreed to participate.

From informal consultations to a formal structure

On August 16, 2012, a launching ceremony was held for the pilot. Prestigious guests included NDRC's Xie Zhenhua, Su Wei, and Sun Cuihua, along with top politicians from the Shanghai municipal government.⁹⁵

In August 2012 the municipal government approved the establishment of a Leading Working Group, and then a supportive Expert Committee. Then vice-mayor Yang Xiong (who became mayor in 2013) headed the Working Group.⁹⁶ The Expert Committee, composed of local scholars, gave counsel. The Working Group functioned as the top entity in the administrative structure, with the DRC mandated to serve as office for the Group. The Shanghai DRC delegated responsibility to other agencies, and put the Shanghai Information Office, the Shanghai Environment and Energy Exchange, and the Shanghai Energy Saving and Emissions-Reduction Center in charge of research and development of guidelines, as well as enforcement.⁹⁷ Both the Exchange and the Information Office were made contact points for company inquiries.

The Shanghai Information Office was given responsibility for the daily administrative operations of the pilot, due to the heavy task-load and shortage of personnel at the DRC.⁹⁸ Companies reported their emissions on an online platform hosted by the Information Office; this was also where third-party verifiers reported their figures. The municipal government was quite generous in funding this platform.⁹⁹

Also central to daily operation of the pilot was the Shanghai Environment and Energy Exchange ("the Exchange"). The Exchange functioned as more than a mere trading-platform: it provided information, consultancy project planning and evaluation, as well as technical support to companies, investment institutions and research organizations through trainings and more informal gatherings. It also held seminars for others interested in the pilot, such as potential investors.¹⁰⁰ Companies involved in the pilot could turn to the Exchange with questions they would otherwise have had to put to the DRC. Interviewees were positive to this new communications channel: the Exchange staff were seen as being more accessible to companies, and this arrangement also partially avoided the problem of SOEs drawing on their good connections with the DRC, in contrast to private and international companies. Interviewees also mentioned that the Exchange's research team had supported the Shanghai government with policy analysis in the preparation period of the pilot.¹⁰¹ One interviewee called the Exchange the government's "supporting team."

Pilot in motion

In November 2013, the Shanghai Municipal People's Government Decree No. 10, 2013 (上海市人民政府令第 10 号 2013) was issued.¹⁰² Signed by Mayor Yang Xiong, it cemented the pilot as a policy within the Shanghai jurisdiction. The mayor's support sent important signals. As one interviewee put it: "The mayor's signature gives weight to the regulation". Although the DRC is a recognized part of the Shanghai government bureaucracy, it still needs the backing and approval of the top municipal leadership. The support of the mayor, vice-mayor or Party Secretary is important for an issue to achieve priority in local Chinese politics.¹⁰³

Another indication of the importance the municipal government accorded to the pilot were the meetings it arranged. In the first half of 2012, the municipal government hosted three meetings on pilot preparation with the DRC, attended by the vice-mayors; an additional three meetings were arranged in 2013 and 2014.¹⁰⁴ A milestone was reached on November 26, 2013, when a ceremony attended by Mayor Yang Xiong, as

well as NDRC's Xie Zhenhua and other municipal top politicians, marked the opening of trading in the pilot. The first day saw 12,000 allowances traded for a total of RMB 317,000.¹⁰⁵

For each compliance year 2013–2015, emissions were counted annually, from January 1 to December 31. Following the compliance year, the deadline for reporting emissions was March 31. During April, third-party verifiers checked the companies' figures and reported to the pilot government. The government had 30 days to confirm or instigate arbitration in case of discrepancies, and to inform of the number of allowances the complying company would need to surrender in June. By December 31, a plan for the next year's expected emissions was to be delivered to the pilot government. Allowances were allocated for the three pilot years 2013–2015 together.¹⁰⁶

In January 2014 the DRC published the rules for potential third-party verifiers. Only Chinese institutions could apply, with preference to Shanghai-based organizations. Further, only legal entities with registered capital of at least 10 million RMB, at least six qualified inspectors, and with at least three previous carbon-market related projects conducted in China or Shanghai, or CDM projects with at least two verifications in Shanghai since 2012, could apply.¹⁰⁷ In late February 2014, the DRC announced ten chosen third-party verifiers for the compliance years 2013 to 2015—all Shanghai organizations, or Shanghai branches of Chinese institutions.¹⁰⁸

The road to 2013 compliance

The first cycle of reporting and surrendering allowances concerned the compliance year 2013 and was completed in 2014. Some 160 million allowances were distributed for 2013,¹⁰⁹ each one giving the right to emit one ton of carbon.¹¹⁰ This was expected to be enough to cover the companies' emissions, although some would have to buy other companies' excess allowances on the market.¹¹¹ Of the allowances, 70% went to large state-owned companies like Baosteel, Huaneng, and Shenergy,¹¹² with Baosteel alone receiving almost 25%: 37 million allowances.¹¹³ All participating companies reported their emissions in time for the March 30 deadline.

However, high volumes of allowances had not been traded. Drawing on informal practices again, the government held a meeting early in March 2014 where high-level officials urged the companies to trade. After this meeting, trading picked up, also as companies became aware of how their 2013 emissions matched their received emissions allowances. It was mostly power, oil, and chemical companies that needed to purchase allowances, as their emissions were higher than the amount of allowances they had received for 2013.¹¹⁴ Since such data are deemed sensitive, information on who traded which amounts was not publicly available, nor were the emissions data from the individual companies. Verification of the 2013 emissions reports was conducted in April 2014 by approved third-party verifiers. For greater data reliability, they were given new lists of compliance companies to check each year.¹¹⁵

Clouds on the horizon

In April and May 2014, a problem arose: some companies that wanted to comply needed to buy allowances in order to surrender the correct amount by the deadline, but there were not enough allowances offered for sale. A representative of China Power International, whose subsidiary Shanghai Electric Power Company was enrolled in the pilot, said: "We are trying to find someone who can sell in bulk, otherwise there is no way for us to comply and we will have to pay the penalty,"¹¹⁶ and explained that in 2013 the coal used for electricity production had been dirtier than expected, resulting in

higher emissions. He added that electricity producers did not themselves make decisions on production levels, but were assigned generation numbers.¹¹⁷

The consequence of non-compliance and rule violations were stipulated fines between RMB 10,000 and 100,000,¹¹⁸ a relatively low level because of national regulations which restrict local government fines.¹¹⁹ According to the municipal decree, other possible punitive measures included three-year exclusion from and withdrawal of current funding support to energy-saving and emissions-reductions efforts. Violations would be reported to other related municipal departments, and made public on the government websites, or even through media.¹²⁰ For Shanghai Electric Power Company, it would have been cheaper to pay the fine for non-compliance than purchase the necessary allowances, but the company *wanted* to buy allowances so as to fulfill its obligation.

Some companies had more allowances than needed for the 2013 compliance year, but did not sell. A representative of the SOE Baosteel confirmed that the company had sold around 10,000 of its 37 million allowances, but would not sell much more—because Baosteel was thinking ahead to the two coming compliance years of 2014 and 2015, rather than making a profit from excess 2013 allowances: “We have to prioritize compliance not only for this year but also for future years. Trading at a profit is not our priority.”¹²¹ In the Shanghai pilot between 2013 and 2015, companies were allowed to use excess allowances from past years to fulfill their quotas for the next years (“banking”): borrowing from future years’ allowances was not permitted.¹²²

Reaching full compliance

In response to this situation, the pilot government took two measures. In late May it convened a meeting with the market’s largest companies, to get feedback. The following day, the Exchange held a meeting to try to match buyers with sellers. However, no company was willing to sell: instead, grievances were aired concerning the allocation process.¹²³ Secondly, in June, the DRC announced that one auction would be held, offering 580,000 allowances to companies in need. Allowances from that auction could be used only for 2013 compliance.¹²⁴ Auctions had not been part of the original planned compliance cycle.¹²⁵

The SOE subsidiary Shanghai Waigaoqiao Second Power Generation Company was the first entity to surrender its allowances, on June 1. By June 5, a mix of 42 SOEs, private, and foreign-owned entities had surrendered their allowances, including Baosteel, BASF Chemical, Invista Textile, Yaohua Pilkington Glass, Jinjiang Hotel, and China Construction Bank.¹²⁶ As June and the surrendering period progressed, companies behaved as the government wanted: most managed to find the necessary allowances on the market. Targeting some 30 companies that had not yet surrendered allowances, in June the pilot government held a special meeting to discuss how the requirements could be met.¹²⁷ In the days before the deadline and the auction, traded volumes rose considerably. When the auction was held on June 30, only seven companies had yet to surrender their allowances for 2013. At the auction only two companies bid, buying 7,220 of the 570,000 allowances offered. On the day of the deadline, all remaining seven companies surrendered enough allowances.¹²⁸ For the 2013 compliance period, 1,540,000 allowances had been traded, to a total value of RMB 60,350,000.¹²⁹ In July 2014, the Shanghai government could announce that, during the first year of the ETS, the participating companies together had reduced their CO₂ emissions by 4.3 million tons, or 2.7 % compared to emissions in 2011.¹³⁰ How much of this reduction was caused by the ETS pilot has, however, not been made public.

A goal-oriented pilot

Of the seven pilots, only Shanghai had a 100% compliance rate for 2013.¹³¹ Interviewees who had been involved in or contributed to the pilot expressed pride or were at least content with the result, noting that this had been achieved through hard work and diligent efforts.¹³² It is difficult to determine whether the Shanghai pilot had been goal-oriented from the very beginning in 2011, although the outreach and invited feedback of the firms from the planning stage indicate that the government sought high compliance rates from the outset. As the first compliance cycle progressed in 2014, it became evident that achieving a high compliance rate was important for the government. This goal-oriented pilot type diverges from the policy-focused pilot and the initial idea of piloting, i.e. to test the viability of new policies. However, instead of changing the ETS regulations, informal communication and meetings were used to ensure compliance. Moreover, as this case illustrates, operating a goal-oriented pilot does not necessarily mean disregard for the tested policy in favor of high output and positive results, or indifference towards the enrolled companies. In the field of climate and emissions reductions, the ETS was a top priority policy for the municipal government at the time.¹³³ The Shanghai government allocated sufficient resources to train personnel, to plan and enforce the pilot. Compliance hinged on the cooperation of the business sector. When problems arose which could have affected the compliance rate, the pilot administration used informal communication, and decided to host a one-off auction.

Would it not have been easier to adopt punitive measures to force compliance from the companies? None of the interviewees indicated that the pilot administration should or could have used other means than informal consultations and ad hoc communication meetings to achieve agreement from companies during the enforcement period. This indicates that governing by law has a high standing in Shanghai. Other possible means of achieving compliance could have involved withdrawing the company's operating license, or cutting off power or water supplies—as has been done elsewhere in China with other policies.¹³⁴ According to my interviewees, using penalties beyond those specified in the ETS regulations was simply not seen as a viable option. They stressed the importance of persuading the companies to participate, getting them to fulfill the ETS requirements of their own accord. The government did not use force—it signaled to the companies, by normative power, the importance of the ETS pilot.¹³⁵ It may well be that the prestige the municipal government accorded to the project, not least making the mayor himself the top figure,¹³⁶ induced the companies to prioritize compliance. My interviewees all noted that, for the companies, money was not as important as maintaining good relations with government. Violations were unlikely to pass unnoticed. This view was shared by all the companies. As one interviewee put it, if it became publicly known that a company had failed to reach their target: “they [would feel] very embarrassed.” Another said: “fines or penalties are only a small part of the possible negative aspects for companies. It's not good for business to be on the blacklist of the government.”

Closing remarks: First steps towards classifying pilots

Pilot projects have become a pervasive—and much-studied—feature of Chinese politics. Piloting is a central element in Chinese adaptive governance.¹³⁷ However, studies have examined pilots by using differing analytical and theoretical frameworks, making meaningful comparison difficult. Recognizing the need for a way of ordering

pilots not only by results, but by process, and by comprehensive studies rather than superficial ones, this article has taken some initial steps towards establishing a categorization. Three pilot types—perfunctory, policy-focused, and goal-oriented—are proposed on the basis of institutional dynamics, how the government handled the pilot, and the interaction with pilot businesses. The focus here has been on the environmental, climate, and energy policy literature and one specific climate-policy case, but the proposed typology should be useful for revealing the institutional dynamics in other policy domains as well.

This article has offered only a preliminary ordering of pilot types. There is room for exploration and further refinement in future research. For instance, theorizing about the influence of certain individuals on pilot types may aid our understanding. Top politicians will often come to mind as the crucial individuals here—but Li's¹³⁸ findings from the Zhenjiang environmental information pilot, and Shin¹³⁹ mixed-actor government organization have shown that also resourceful bureaucrats and employees at lower levels can make a big difference. Secondly, useful insights may be provided by factors external to the local government—social and economic aspects, as well as events that impact on the pilot's policy area. The policy area itself also matters. The more complex and vague a policy area, the harder it is to make changes,¹⁴⁰ so a pilot for a smaller demarcated policy area should be easiest to enforce. Thirdly, we have focused on the relations of local government with firms, but also other types of actors are affected by pilot programs—NGOs, schools and universities, perhaps even communities and neighborhoods. The proposed pilot typology would be strengthened through elaboration of expectations to such interaction patterns, and additional studies with more fine-grained descriptions of the nuances and differences between firms could facilitate more advanced theorizing over government–business interactions. Also the legacies and impacts of pilots on policies are worth examining on a larger scale. The purpose of pilots is to try out policies in smaller measure before upscaling, but the results may vary. China's decision to launch a national ETS (which commenced in 2017) preceded the seven ETS pilots. The Top-1000 Program, a key national energy-saving policy in the 11th Five-Year Plan period (2006–2010) was based on a pilot in Shandong province that involved only two steel mills.¹⁴¹ The first round of SO₂ pilots from 2001 provided examples and lessons which seemed to favor upscaling to national levels, but the central government opted for other policy mechanisms instead.¹⁴² Rather than looking only at whether or not a pilot had national implications, it may be equally relevant to investigate the local consequences: What was the local legacy of the pilot? Did the pilot lead to more piloting also in other policy areas? Finally, as the practice of piloting does not seem to be lessening in China, systemizing data on pilot programs remains a timely endeavor.

Notes

- ¹ Heilmann, “Policy Experimentation,” 2. In this article I base the understanding of “policy experimentation” and “policy innovation” on Teets’ definition: as the actions or process of planning and forming, trying out and implementing a policy perceived to be new to the jurisdiction. See Teets “The Politics of Innovation,” 82. A policy need not be entirely new in the world for it to be an innovation. There were carbon markets in operation outside China at the time of the Shanghai ETS pilot, for example.
- ² Heilmann, “Policy Experimentation,” 5–7.
- ³ Lin and Xu, “Structural Restraints and Institutional Innovation.”
- ⁴ Tsai and Dean, “Experimentation under Hierarchy.”
- ⁵ Li and Fu, “China’s Health Care System Reform.”
- ⁶ Li, “Self-Motivated versus Forced Disclosure.”
- ⁷ Reklev, Stian. “China Air Pollution Permit Trade Worth \$2.8 bln but National Launch Far Off.” *Carbon Pulse*, January 24, 2019. Accessed July 29, 2019. <http://carbon-pulse.com/67681/>
- ⁸ Schreurs, “Multi-Level Climate Governance.” 170–171.
- ⁹ Khanna et al., “China’s Pilot Low-Carbon City.” Experimenting with climate policies at the city level is not a uniquely Chinese phenomenon; see Castán Broto and Bulkeley, “A Survey of Urban Climate Change Experiments.”
- ¹⁰ Gosens et al., “China’s Next Renewable Energy Revolution,” 149–150.
- ¹¹ Hou et al., “Comparative Study of Commercial Building.”
- ¹² Stanway, David. “China Launches Five ‘Green Finance’ Pilot Zones.” Reuters, June 27, 2017. Accessed July 29, 2019. <https://www.reuters.com/article/us-china-environment-finance/china-launches-five-green-finance-pilot-zones-idUSKBN19I060>
- ¹³ Jotzo and Löschel, “Emissions Trading in China.”
- ¹⁴ Heilmann, “From Local Experiments to National Policy,” 1, 29–30.
- ¹⁵ Shin, “Environmental Policy Innovations,” 834.
- ¹⁶ Eaton and Kostka, “Authoritarian Environmentalism Undermined,” 375; Shin, “An Emerging Architecture,” 189; Shin, “Environmental Policy Innovations,” 843–844; Wang et al., “Developing Low-Carbon Cities,” S97.
- ¹⁷ See for example Jotzo and Löschel, “Emissions Trading in China;” Hou et al., “Comparative Study of Commercial Building,” Li and Fu, “China’s Health Care System Reform.”
- ¹⁸ The term “institutions” here refers to “formal or informal procedures, routines, norms and conventions embedded in the organizational structure of the polity,” (Hall and Taylor, “Political Science and the Three New Institutionalisms,” 938). Institutions include formal institutions such as laws and regulations, and informal institutions such as customary behavioral patterns.
- ¹⁹ Liu et al., “Policy Uncertainty and Corporate Performance.”
- ²⁰ Zhao et al., “Implementation of Energy-Saving Policies.”
- ²¹ ICAP (International Carbon Action Partnership), “China - Shanghai pilot ETS”, ICAP, April 9, 2019. Accessed July 29, 2019.

https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems%5B%5D=62

- ²² The pilot period was originally set to run for three years, 2013–2015, but in 2015 the government decided to extend the pilot to 2016 with some changes, awaiting the national ETS start in 2017. As of July 2019 it is still in operation.
- ²³ Naughton, *Growing Out of the Plan*; Nolan, “The China Puzzle,” 26.
- ²⁴ Woo, “The Real Reasons for China's Growth.”
- ²⁵ Heilmann, “Policy Experimentation.”
- ²⁶ Heilmann, “Policy Experimentation,” 5–7.
- ²⁷ Such as Jahiel, “The Contradictory Impact of Reform,” 91–98; Kuo, “Privatization Within the Chinese State,” 397–405; Naughton, *Growing Out of the Plan*, 293–300.
- ²⁸ Heilmann, “Maximum Tinkering under Uncertainty,” 457.
- ²⁹ Such as Ahlers and Schubert, “Strategic Modelling;” Lin and Xu, “Structural Restraints and Institutional Innovation,” 37–40; Tsai and Dean, “Experimentation under Hierarchy.”
- ³⁰ Heilmann, Shih, and Hofem, “National Planning and Local Technology Zones;” Huang, “Policy Experimentation;” Li and Fu, “China’s Health Care System Reform.”
- ³¹ Shin, “China's Failure of Policy Innovation.”
- ³² *Ibid.*, 925–927.
- ³³ Li, “Self-Motivated versus Forced Disclosure.”
- ³⁴ *Ibid.*
- ³⁵ Mei and Liu, “Experiment-Based Policy Making.”
- ³⁶ Khanna et al., “China’s Pilot Low-Carbon City,” 118; Peng and Bai, “Experimenting Towards a Low-Carbon City.”
- ³⁷ Heilmann, “Maximum Tinkering under Uncertainty,” 457.
- ³⁸ Guan and Delman, “Energy Policy Design,” 82.
- ³⁹ Wang et al., “Developing Low-Carbon Cities,” S96.
- ⁴⁰ Khanna et al., “China’s Pilot Low-Carbon City,” 118
- ⁴¹ Schreurs, “Multi-level Governance,” 99.
- ⁴² Goron and Cassia, “Regulatory Institutions and Market-Based Policy.”
- ⁴³ Shen, “Chinese Business at the Dawn.”
- ⁴⁴ Deng et al., “Effectiveness of Pilot Carbon Emissions Trading.”
- ⁴⁵ Zhang et al., “Integrity of firms’ emissions reporting.”
- ⁴⁶ Tsai and Dean, “Experimentation under Hierarchy.”
- ⁴⁷ Shin, “Mission-Driven Agency.”
- ⁴⁸ *Ibid.*, 555.
- ⁴⁹ Heilmann et al., “National Planning and Local Technology Zones.”
- ⁵⁰ Heilmann, “Policy Experimentation,” 9–10. More locally, cities may start their own pilots. For example, Shanghai municipal government has designated several areas within its jurisdiction as low-carbon pilot areas.
- ⁵¹ Shin, “Environmental Policy Innovations,” 836.

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- ⁵² Stensdal et al., “China’s Carbon Market,” 185.
- ⁵³ Teets, “The Politics of Innovation,” 95.
- ⁵⁴ Li, “Self-Motivated versus Forced Disclosure,” 342–345.
- ⁵⁵ Li and Higgins, “Controlling Local Environmental Performance,” 424.
- ⁵⁶ Schreurs, “Multi-level Governance,” 99.
- ⁵⁷ Li, “Self-Motivated versus Forced Disclosure,” 345–347.
- ⁵⁸ Shin, “Environmental Policy Innovations,” 844–845.
- ⁵⁹ Pilots may also engage local NGOs, schools and universities, etc., but as these actors are not potential polluters to the same extent as companies, and their roles in society differ from firms, they are not discussed here.
- ⁶⁰ Van Meter and Van Horn, “The Policy Implementation Process,” 454–455.
- ⁶¹ Hsueh, “State Capitalism, Chinese-Style,” 87.
- ⁶² Chen and Faure, “When Chinese Companies Negotiate,” 42.
- ⁶³ Eaton and Kostka, “Central Protection in China.”
- ⁶⁴ Hsueh, “State Capitalism, Chinese-Style,” 85–87.
- ⁶⁵ *Ibid.*, 92.
- ⁶⁶ Szepan, “Government Involvement in the Chinese Economy.”
- ⁶⁷ Shin, “Environmental Policy Innovations,” 838.
- ⁶⁸ 12th Five-Year Plan. “The People’s Republic of China’s 12th Five-Year Plan for National Economic and Social Development” [Zhonghua renmin gongheguo guomin jingji he shehui fazhan di shi’er ge wu nian guihua gangyao]. 2011. ch. 6.21.1. Accessed July 29, 2019. http://www.gov.cn/2011lh/content_1825838.htm
- ⁶⁹ Stensdal, “Norms and Flexibility,” 286.
- ⁷⁰ Interview G.
- ⁷¹ Government of Shanghai. “Shanghai Municipality’s 12th Five-Year Plan” Period Plan For Energy Saving and Addressing Climate Change” [Shanghai Shi jieneng he yingdui qihou bianhua ‘shierwu’ guihua], 2012. chs.1.1.1 and 2.2. Accessed July 29, 2019. <http://www.shanghai.gov.cn/nw2/nw2314/nw2319/nw22396/nw22403/u21aw597380.html>.
- ⁷² Shanghai DRC. “Shanghai DRC Environmental Notice 180 of 2012” [Hu faggai huanzi (2012) 180 hao], December 11, 2012. Preface, Accessed April 20, 2018. <http://www.shdrc.gov.cn/gk/xxgkml/zcwj/zgjil/16707.htm> ; Interview C.
- ⁷³ Shanghai DRC. “Shanghai Carbon Market Report (2013–2014).” [Shanghai tanjiaoti baogao (2013–2014)], January 2015. p.21. Accessed July 29 2019. <http://www.cneex.com/upload/resources/file/2018/07/16/25279.pdf>
- ⁷⁴ Interview C.
- ⁷⁵ Interviews C, E.
- ⁷⁶ Shanghai DRC. “Shanghai DRC Environmental Notice 168 of 2013” [Hu fagai huanzi (2013) 168 hao], November 22, 2013. ch.2. Accessed April 20, 2018. <http://www.shdrc.gov.cn/gk/xxgkml/zcwj/zgjil/16762.htm>.
- ⁷⁷ *Ibid.*, ch.2.1–2.3.
- ⁷⁸ Hsueh, “State Capitalism, Chinese-Style,” 92.
- ⁷⁹ Interviews B, E.

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- ⁸⁰ Interview E.
- ⁸¹ Stensdal, “Norms and Flexibility,” 284.
- ⁸² Interview C.
- ⁸³ Shanghai DRC, “Environmental Notice 168 of 2013,” ch.2.1–2.3
- ⁸⁴ Interview E.
- ⁸⁵ SHEEE. “Shareholders.” [Gudong danwei], Shanghai Energy and Environment Exchange, July 20, 2019. Accessed July 29, 2019. <http://www.cneex.com/gywm/gddw/>
- ⁸⁶ Interviews C, D, E, F.
- ⁸⁷ Interviews B, D, H.
- ⁸⁸ Interview B.
- ⁸⁹ Interviews C, D, E.
- ⁹⁰ Interviews C, F.
- ⁹¹ Interviews B, C, E.
- ⁹² Interview A.
- ⁹³ Interviews C, D.
- ⁹⁴ Shanghai DRC, “Shanghai Carbon Market Report,” 21.
- ⁹⁵ Ibid.
- ⁹⁶ Ibid.
- ⁹⁷ Shanghai DRC, “Environmental Notice 180 of 2012,” Preface.
- ⁹⁸ Shanghai DRC, “Shanghai Carbon Market Report,” 20, Interviews A, D.
- ⁹⁹ Interview A.
- ¹⁰⁰ Shanghai DRC, “Shanghai Carbon Market Report,” 15.
- ¹⁰¹ Interviews C, F, H.
- ¹⁰² Between 2012 and 2014, the DRC published notices on detailed implementation, including guidelines on measuring, reporting, and verification (MRV) or lists of third-party verifiers.
- ¹⁰³ Lo and Leung, “Environmental Agency and Public Opinion,” 691; Chen, “Union Power in China,” 676; Qi et al., “Translating a Global Issue,” 396; Shin, “An Emerging Architecture,” 66.
- ¹⁰⁴ Shanghai DRC, “Shanghai Carbon Market Report,” 21–22.
- ¹⁰⁵ Ibid., 22.
- ¹⁰⁶ Government of Shanghai. “Shanghai Municipal People’s Government Decree No. 10, 2013” [Shanghai Shi Renmin Zhengfu ling di 10 hao 2013], 2013. chs.3.11–3.16, 6.11–6.15. Accessed July 29, 2019. <http://www.shanghai.gov.cn/nw2/nw2314/nw2319/nw11494/nw12654/nw31364/u26aw37414.html>.
- ¹⁰⁷ Shanghai DRC, “Shanghai DRC Environmental Notice No. 5 of 2014.” [Hu fagai huanzi (2014) 5 hao], January 10, 2014. Accessed November 20, 2018. <http://fgw.sh.gov.cn/fzgggz/nyglhjnb/zcwj/12508.htm>
- ¹⁰⁸ The ten verifiers chosen were Shanghai Tobler Quality Testing Technology Corporation Ltd., Shanghai Tellhow Intelligent Energy Saving Technology Corporation Ltd., Shanghai Energy Efficiency Center, Shanghai Tongji Carbon Assets Consulting Corporation Ltd.,

Shanghai Academy of Environmental Sciences, Shanghai Academy of Building Research, Shanghai Energy Saving and Emission Center Corporation Ltd., China Environmental United Certification Center Corporation's (CEC) Shanghai Branch, China Quality Certification Center's (CQC) Shanghai Branch, and the Shanghai Information Center (see Shanghai DRC. "Shanghai DRC Environmental Notice 21 of 2014" [Hu fagai huanzi (2014) 21 hao], February 25, 2014. Accessed July 29, 2019. <http://fgw.sh.gov.cn/xxgk/cxxxgk/14826.htm>.)

- ¹⁰⁹ Chen, Kathy, and Stian Reklev. "Shanghai Firms Meet Carbon Targets after Last-Day Permit Auction." Point Carbon, June 30, 2014. <http://www.pointcarbon.com/news/reutersnews/1.5839667>
- ¹¹⁰ Government of Shanghai, "Municipal Government Decree No. 10, 2013," ch.7.44.2.
- ¹¹¹ Chen, Kathy, and Stian Reklev. "Shanghai Generators Struggle with Targets in Illiquid Carbon Market." Point Carbon, May 26, 2014. <http://www.pointcarbon.com/news/reutersnews/1.5293470>
- ¹¹² Chen and Reklev, "Shanghai Firms Meet Carbon Targets."
- ¹¹³ Chen and Reklev, "Shanghai Generators Struggle with Targets." Some large companies like Baosteel were listed more than once, because responsibility is placed with the legal entity. A company's factories or plants are separate legal entities, and the headquarters building might be located elsewhere and be a different legal entity. Thus, there are arguably fewer companies than 197 participating in the pilot, but the registered legal entities counted 197 when the pilot began. The Baosteel allowance shares of 25% were distributed to several Baosteel legal entities.
- ¹¹⁴ Chen, Kathy, and Stian Reklev. "China Carbon Prices Firm Ahead of Deadline to Report Emissions Data." Point Carbon, March 7, 2014. <http://www.pointcarbon.com/news/reutersnews/1.4429933>
- ¹¹⁵ Interview B.
- ¹¹⁶ Chen and Reklev, "Shanghai Generators Struggle with Targets."
- ¹¹⁷ Ibid.
- ¹¹⁸ Government of Shanghai, "Municipal Government Decree No. 10, 2013" ch.6.37–6.39.
- ¹¹⁹ It has since been proposed to raise the limits to RMB 2 million for environmental transgressions. National People's Congress. "Strengthen the Responsibility of the Local People's Government" [Qianghua difang renmin zhengfu doudi zeren], January 2, 2018. Accessed July 29, 2019. http://www.npc.gov.cn/zgrdw/npc/cwhhy/12jcw/2018-01/02/content_2036237.htm
- ¹²⁰ Government of Shanghai, "Municipal Government Decree No. 10, 2013," ch.3.40.
- ¹²¹ Chen and Reklev, "Shanghai Generators Struggle with Targets."
- ¹²² Government of Shanghai, "Municipal Government Decree No. 10, 2013," ch.3.16.
- ¹²³ Chen and Reklev, "Shanghai Generators Struggle with Targets."
- ¹²⁴ Shanghai DRC. "Shanghai DRC Notice No. 1 of 2014." [Hu fagai gonggao (2014) 1 hao], June 13, 2014. Accessed July 29, 2019. <http://fgw.sh.gov.cn/fzgggz/nyglhjnjb/zcwj/12516.htm>
- ¹²⁵ This was not a change of rules, however, as the option of holding auctions as necessary was included in the pilot rules. See Government of Shanghai. "Shanghai Government Notice 64 of 2012" [Hu fufa (2012) 64 hao], July 31, 2012. part 3.5. Accessed July 29, 2019. <http://www.shanghai.gov.cn/nw2/nw2314/nw2319/nw10800/nw11407/nw29273/u26aw32789.html>

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- ¹²⁶ Shanghai Information Office. “This City’s Carbon Market Pilot Smoothly Entered the First Compliance Period.” [Ben shi tanpaifang jiaoyi shidian shunli jinru di yi ge fuyueqi], June 6, 2014. Accessed July 29, 2019. <http://www.reg-sh.org/dtkxContent.jsp?artid=5162&colid=470>.
- ¹²⁷ Shanghai Information Office. “This City’s Carbon Emission Market’s Trading Volume Had Exceeded 1 Million Tons.” [Ben shi tanpaifan shichang jiaoyiliang tupo baiwan dun], June 19, 2014. Accessed July 29, 2019. <http://www.reg-sh.org/dtkxContent.jsp?artid=5263&colid=470>
- ¹²⁸ Chen and Reklef, “Shanghai Firms Meet Carbon Targets;” Shanghai Information Office, “Announcement Regarding the Results of the 2013 Allowance Auction.” [2013 niandu pei’e youchang jingjia fafang jingjia jieguo gonggao], June 30, 2014. Accessed July 29, 2019. <http://www.reg-sh.org/sousuoContent.jsp?artid=5333..>”
- ¹²⁹ IdeaCarbon. “IdeaCarbon Weekly City Market Report June 30 - July 4, 2014. Some are happy, some are worried.” [TanDao shichang zhoubao 2014.6.30-7.4 Jia jia huanxi ji jia you]. Accessed July 29, 2019. http://www.ideacarbon.org/news_free/45534/.
- ¹³⁰ People’s Daily Online, “Shanghai Municipal Government Executive Meeting Points out That the Preliminary Results of the Carbon Emission Trading Pilot Work Show That There Is Still Need to Intensify the Advancement.” [Shanghai shi zhengfu changwu huiyi jiu tanpaifang jiaoyi shidian gongzuo zhichu, xiaoguo chubu xianxian tuijin rangxu jiali] July 31, 2014. Accessed July 29, 2019. <http://politics.people.com.cn/n/2014/0731/c70731-25377003.html>.
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- ¹³³ Stensdal, “Norms and Flexibility,” 287.
- ¹³⁴ See Zhao et al., “Implementation of Energy-Saving Policies,” 172.
- ¹³⁵ Stensdal, “Norms and Flexibility,” 287.
- ¹³⁶ *Ibid.*, 284.
- ¹³⁷ Heilmann, “From Local Experiments to National Policy,” 1, 29–30.
- ¹³⁸ Li, “Self-Motivated versus Forced Disclosure,” 342–343.
- ¹³⁹ Shin, “Mission-Driven Agency.”
- ¹⁴⁰ See Shin, “Environmental Policy Innovations,” 846.
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Appendix 1. Announced companies enrolled in the Shanghai ETS first operating period, 2013–2015

1. Baosteel Iron and Steel Co., Ltd.
2. Baosteel Stainless Steel Co., Ltd.
3. Baosteel Special Materials Co., Ltd.
4. Baosteel Nippon Steel Auto Plate Co., Ltd.
5. Shanghai Krupp Stainless Co., Ltd.
6. Yatai Special Steel Group Co., Ltd.
7. Shanghai STAL Precision Stainless Steel Co., Ltd.
8. Shanghai Baihe Walsin Lihwa Special Steel Products Co., Ltd.
9. Shanghai Donghai Nonferrous Alloy Factory
10. Sapa Extrusion Shanghai Co., Ltd.
11. Chinalco Shanghai Copper Co., Ltd.
12. Shanghai Sigma Nonferrous Metals Co., Ltd.
13. Xinye Copper Industry Co., Ltd.
14. Shanghai Dachang Copper Industry Co., Ltd.
15. Shanghai Longyang Precise Compound Copper Tube Co., Ltd.
16. Shanghai Hailiang Copper Co., Ltd.
17. Shanghai Wuxing Copper Co., Ltd.
18. Shanghai Highly Foundry Co., Ltd.
19. Shanghai Nanhui Lida Foundry Co., Ltd.
20. Shanghai Shenhua Aluminum Foil Co., Ltd.
21. Shanghai Huxin Aluminum Foil Co., Ltd.
22. Seyen Machinery (Shanghai) Co, Ltd
23. Shanghai Huaxin Alloy Co., Ltd.
24. Shanghai Riguang Copper Co., Ltd.
25. SINOPEC Shanghai Petrochemical Co., Ltd.
26. SINOPEC Shanghai Gaoqiao Petrochemical Co., Ltd.
27. Shanghai Coking Co., Ltd.
28. Shanghai GaoQiao SK Solvent Co.,Ltd.
29. Shanghai SECCO Petrochemical Co. Ltd.
30. Shanghai Chlor-Alkali Chemical Co., Ltd. (SCAC)
31. Shanghai Baosteel Chemical Co., Ltd.

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32. Shanghai Chemical Industry Zone Industrial Gas Co., Ltd.
 33. Shanghai Cabot Chemical Co., Ltd.
 34. SINOPEC Asset Management Co., Ltd. Shanghai Gaoqiao Branch
 35. Bayer Material Technology (China) Co., Ltd.
 36. BASF Chemical Co., Ltd.
 37. Shanghai Wujing Chemical Co., Ltd.
 38. Shanghai BASF Polyurethane Co., Ltd.
 39. Far Eastern Industries (Shanghai) Co., Ltd.
 40. BOC-SPC Gases Co., Ltd.
 41. Oriental Petrochemical (Shanghai) Co., Ltd.
 42. Evonik Specialty Chemicals (Shanghai) Co., Ltd.
 43. Shanghai Huayi Acrylic Acid Co., Ltd.
 44. Shanghai Lianheng Isocyanate Co., Ltd.
 45. Shanghai Zhongyuan Chemical Co., Ltd.
 46. Shanghai Bluestar POM Co., Ltd
 47. Shanghai Hualin Industrial Gas Co., Ltd.
 48. Shanghai Hengyi Polyester Fiber Co., Ltd.
 49. Shanghai Gaoqiao-BASF Dispersions Co., Ltd.
 50. Shanghai Sinopec Mitsui Chemical Co., Ltd.
 51. Shanghai 3F New Materials Technology Co., Ltd.
 52. Shanghai Wugang Gas Co., Ltd.
 53. Lucite International (China) Chemical Co., Ltd.
 54. Flint Chemicals (China) Co., Ltd.
 55. BASF Applied Chemical Co., Ltd.
 56. Shanghai S. C. Johnson & Son, Co., Ltd.
 57. Shanghai JinFei Petrochemical Co., Ltd.
 58. Praxair (Shanghai) Semiconductor Gas Co., Ltd.
 59. Shanghai Arkema Hydrogen Peroxide Co., Ltd.
 60. Shanghai Jinhai Albemarle Fine Chemicals Co. Ltd.
 61. Shengpin Precision Gas (Shanghai) Co., Ltd.
 62. Shanghai Taiyo Nippon Sanso Acid Gas Co., Ltd.
 63. Shanghai Pengbo Titanium Dioxide Co., Ltd.
 64. Kingfa Science & Technology Development Co., Ltd.
 65. BASF Gaoqiao Performance Chemicals (Shanghai) Co., Ltd.
 66. Shanghai Huntsman Polyurethane Co., Ltd
 67. Shanghai Coatings Co., Ltd.
 68. Shanghai Coking Chemical Development Co., Ltd.

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69. Shanghai Songbai Gas Industry Co., Ltd.
 70. Shanghai Yoo-Point Chemical Industry Co., Ltd.
 71. CINIC Chemical (Shanghai) Co., Ltd.
 72. Double Coin Group Holdings Co., Ltd.
 73. Double Coin Group Shanghai Donghai Tyre Co., Ltd.
 74. Shanghai Michelin Tires Co., Ltd.
 75. Shanghai Wenlong Chemical Fiber Co., Ltd.
 76. Invista Synthetic Fibers (Shanghai) Co., Ltd.
 77. Invista Fibers (Shanghai) Co., Ltd.
 78. Invista Special Fibers (Shanghai) Co., Ltd.
 79. Invista Fibers Co., Ltd.
 80. Shanghai Lianji Synthetic Fibers Co., Ltd.
 81. Shanghai Shangdian Caojing Power Generation Co., Ltd. (Caojing Power Plant)
 82. Shanghai Caojing Thermal Power Co., Ltd. (Caojing Thermal Power Plant)
 83. Shanghai Waigaoqiao Power Generation Co. Ltd. (Waigaoqiao First Plant)
 84. Shanghai Wujing Power Generation Co., Ltd. (Wujing Power Plant)
 85. Shanghai Electric Power Co., Ltd. Wujing Thermal Power Plant
 86. Huaneng International Power Co., Ltd. Shanghai Shidongkou First Power Plant
 87. Huaneng International Power Co., Ltd. Shanghai Shidongkou Second Power Plant
 88. Huaneng Shanghai Gas Turbine Power Generation Co., Ltd. (Huaneng Gas Turbine Power Plant)
 89. Shanghai Waigaoqiao No.2 Power Generation Co., Ltd. (Waigaoqiao Second Power Plant)
 90. Shanghai Waigaoqiao No.3 Power Generation Co., Ltd. (Waigaoqiao Third Power Plant)
 91. Shanghai Wujing No.2 Power Generation Co., Ltd. (Wujing Second Power Plant)
 92. Shanghai Shenergy Lingang Gas Turbine Power Generation Co., Ltd.
 93. Shanghai Weigang Energy Co., Ltd.
 94. Shanghai Shidongkou Power Generation Co., Ltd.
 95. Shanghai Wan'an Enterprise Corporation
 96. Shanghai Baoshan South Cement Co., Ltd.
 97. Shanghai Conch Cement Co., Ltd.
 98. Shanghai Jinshan South Cement Co., Ltd.
 99. Shanghai Building Materials Group Cement Co., Ltd. Pudong Cement Plant
 100. Shanghai O-I Glass Co., Ltd.
 101. Fuyao Group (Shanghai) Automobile Glass Co., Ltd.
 102. Saint-Gobain Ritter Glass (Shanghai) Co., Ltd.
 103. Yaohua Pilkington Automobile Glass Group Co., Ltd.

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104. Shanghai Yaohua Pilkington Engineering Glass Co., Ltd.
 105. Shanghai Seves Glass Co., Ltd.
 106. Shanghai Porcher Industries Co., Ltd.
 107. Shanghai Flat Special Glass Co., Ltd.
 108. Shanghai KOA Glass Co., Ltd.
 109. Shanghai Honghe Electronic Materials Co., Ltd.
 110. AGY Shanghai Technology Co., Ltd.
 111. Shanghai Baotian New Building Materials Co., Ltd.
 112. Shanghai Zhedong Building Materials Co., Ltd.
 113. Boral Gypsum Systems (Shanghai) Co., Ltd.
 114. Boral Gypsum Building Material (Shanghai) Co., Ltd.
 115. Shanghai Armstrong Building Products Co., Ltd.
 116. Shanghai Tangshi Jianhua Pipe Pile Co., Ltd.
 117. Shanghai Jianhua Pipe Pile Co., Ltd.
 118. Shanghai ABM Rock Wool Co., Ltd
 119. Shanghai Construction Component Products Co., Ltd.
 120. Saint-Gobain Gypsum Materials (Shanghai) Co., Ltd.
 121. Shanghai Changgu Ceramics Co., Ltd
 122. Shanghai Ytong Co., Ltd.
 123. Jinxing Ceramics (Shanghai) Co., Ltd.
 124. Shanghai City Construction Materials Co., Ltd
 125. Shanghai Smik Ceramics Co., Ltd.
 126. Shanghai CIMIC Holdings Co., Ltd.
 127. Shanghai Prosperous Paper Co., Ltd.
 128. Shanghai Chung Loong Paper Co., Ltd.
 129. Unicharm (China) Co., Ltd.
 130. Jinfengyuan Paper Industry (Shanghai) Co., Ltd.
 131. Shanghai Dongguan Paper Industry Co., Ltd.
 132. Shanghai Kimberly-Clark Paper Industry Co., Ltd.
 133. Shanghai Challenge Textile Co., Ltd
 134. Shanghai Wanggang Hualun Printing and Dyeing Co., Ltd.
 135. Everest Textile (Shanghai) Co., Ltd.
 136. Shanghai Uchino Co., Ltd.
 137. Shanghai Hexiao Printing Co., Ltd.
 138. Shanghai Ninth Knitting Factory
 139. Shanghai Jiale Co., Ltd.
 140. Shanghai Tiqiao Textile Yarn Dyeing Co., Ltd.

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141. China Eastern Airlines Co., Ltd.
 142. China Freight Aviation Co., Ltd.
 143. Shanghai Airlines Co., Ltd.
 144. Juneyao Airlines Co., Ltd.
 145. Spring Airlines Co., Ltd.
 146. Yangtze River Airlines Co., Ltd. (Suparna Airlines from 2017)
 147. Shanghai International Port (Group) Co., Ltd. (SIPG)
 148. Shanghai Guandong International Container Terminal Co., Ltd.
 149. Shanghai East Container Terminal Co., Ltd.
 150. Shanghai Shengdong International Container Terminal Co., Ltd.
 151. Shanghai Mingdong Container Terminals Co., Ltd.
 152. Shanghai Luoqing Ore Terminal Co., Ltd.
 153. Shanghai Pudong International Container Terminal Co., Ltd.
 154. SIPG Logistics Co., Ltd.
 155. Shanghai Fubao Harbour Affairs Co., Ltd.
 156. Shanghai Pudong New Area Shangri-La Hotel Co., Ltd.
 157. Shanghai Huating Hotel Co., Ltd.
 158. Shanghai Jinjiang Hotel Co., Ltd.
 159. Shanghai East Jinjiang Hotel Co., Ltd.
 160. Shanghai International Equatorial Hotel Co., Ltd.
 161. Jing'an Hilton (Shanghai)
 162. Jin Jiang International Hotel (Group) Co., Ltd. Jin Jiang Tower
 163. Radisson Blu Shanghai New World Hotel Co., Ltd.
 164. Okura Garden Hotel (Shanghai)
 165. Shanghai Youyou International Plaza Co., Ltd. Sheraton Shanghai Pudong Hotel
 166. Shanghai Summit Property Development Co., Ltd. Longemont Hotel
 167. Shanghai Tomorrow Square Co., Ltd.
 168. Shanghai Pullman Skyway Hotel Co., Ltd.
 169. Shanghai Everbright Convention & Exhibition Center Co., Ltd.
 170. Shanghai Shangshi Nanyang Hotel Co., Ltd. Shanghai Four Seasons Hotel
 171. Shanghai Railway Administration (Shanghai Railway Station, Shanghai South Railway Station)
 172. Shanghai Airport (Group) Co., Ltd. (Hongqiao International Airport)
 173. Shanghai International Airport Co., Ltd. (Pudong International Airport)
 174. Shanghai No.1 Yaohan Co., Ltd. (No.1 Yaohan)
 175. Shanghai New World Co., Ltd. (New World City)
 176. Shanghai Pacific Department Store Co., Ltd. (Pacific Department Store (Xujiahui))
 177. Shanghai Jiuguang Department Store Co., Ltd. (City Plaza)

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178. Shanghai Bailian Department Store Co., Ltd. (No. 1 Department Store)
 179. Shanghai Wenfeng Qianjiahui Shopping Center Co., Ltd. (Wenfeng Shopping Plaza)
 180. Shanghai Longzhimeng Shopping Center Management Co., Ltd. Cloud Nine Mall (Zhongshan Park)
 181. Shanghai Golden Bund Real Estate Co., Ltd. (Bund Center)
 182. Shanghai Huaqing Real Estate Development Co., Ltd. (Raffles City)
 183. Shanghai Ganghui Real Estate Development Co., Ltd. (Grand Gateway 66)
 184. Shanghai Hengbang Real Estate Development Co., Ltd. (Plaza 66)
 185. CITIC Pacific Co., Ltd. (CITIC Square)
 186. Shanghai Meilong Town Square Co., Ltd. (Westgate Mall)
 187. Shanghai Bailian Xijiao Shopping Mall Co., Ltd. (Bailain Xijiao Shopping Mall)
 188. Shanghai Bailian Youyicheng Shopping Mall Co., Ltd. (Bailain Youyicheng Shopping Mall)
 189. Shanghai Branch of China Construction Bank Co., Ltd. (World Financial Building)
 190. Shanghai Branch of Industrial and Commercial Bank of China Co., Ltd. (Century Financial Building)
 191. Shanghai Branch of Bank of Communications Co., Ltd. (Bank of Communications Building)
 192. Bank of Communications Co., Ltd. (Jinming Building)
 193. Shanghai Branch of Bank of China Co., Ltd. (Bank of China Building & Jiading Branch Building)
 194. Shanghai Pudong Development Bank (Zhongshan East Road No. 12 Building)
 195. Bank of Shanghai Co., Ltd. (Bank of Shanghai Building, Foster Building & Shiquan Building)
 196. Shanghai Futures Exchange (Futures Building)
 197. China UnionPay Co., Ltd. (UnionPay Building)

Appendix 2.

Table of Interviews

<i>Interview Code</i>	<i>Interviewees' Position</i>	<i>Place and Date of Interview</i>
<i>A</i>	Expert & pilot-project administration employee	Shanghai, September 22, 2015
<i>B</i>	Academic & advisor to the pilot project	Shanghai, September 18, 2015.
<i>C</i>	Expert & pilot-project administration employee	Shanghai, October 19, 2015
<i>D</i>	Third-party verifier	Shanghai, October 15, 2015
<i>E</i>	Academic & advisor to the pilot project	Shanghai, November 10, 2015
<i>F</i>	Experts & pilot-project administration employees	Shanghai, September 21, 2015.
<i>G</i>	Business representative	Shanghai, November 2, 2015.
<i>H</i>	Consultants	Shanghai, October 20, 2015
<i>I</i>	International donor employee	Shanghai, August 27, 2015.

<i>J</i>	Scholar	Shanghai, September 18, 2015.
<i>K</i>	NGO employee	Shanghai, September 18, 2015.
<i>L</i>	Expert	Beijing, September 28, 2015.
<i>M</i>	Academic	Beijing, September 29, 2015.
<i>N</i>	Academic	Beijing, October 29, 2015.
<i>O</i>	Academic	Beijing, October 29, 2015.