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China's low-carbon city initiatives: The implementation gap and the limits of the target responsibility system

Kevin Lo*

Department of Resource Management and Geography, University of Melbourne, Victoria 3010, Australia

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A B S T R A C T

The Chinese government has promulgated a wide variety of low-carbon initiatives to control the rapid growth of energy consumption and carbon emissions in the cities. Past records, however, show that the central government's policies are often poorly implemented or distorted by local officials. Using a case study from the city of Changchun, this paper examines how and why the issue of poor implementation persists despite the establishment of the Energy Conservation Target Responsibility System (ECTRS). As a key institutional mechanism providing local officials with political incentives to implement low-carbon policies, the ECTRS has been constrained by a number of problems, including a poorly designed scoring system, weak targets, the use of energy intensity instead of absolute energy consumption as a policy objective, and the lack of reliable local energy statistics.

Introduction

The dual concerns of climate change and energy scarcity are experiencing renewed political prominence and are reviving global interest in low-carbon cities (Bulkeley, Broto, Hodson, & Marvin, 2011; Chan, Choy, & Yung, 2013). This trend has been more evident in rapidly urbanizing China. Without a doubt, the expansion of China's metropolises has accelerated the country's energy consumption and carbon emissions. The 35 largest Chinese cities contribute 40% of China's energy uses and carbon emissions (Dhakal, 2009). The levels of per capita carbon emissions in many Chinese cities are now comparable or even higher than cities in developed countries (Wang, Zhang, Liu, & Bi, 2012). Facing tough domestic and international pressures, the Chinese government announced in 2005 that it would cut national energy intensity by 20% in five years (Zhou, Levine, & Price, 2010). This was followed by a pledge just prior to the 2009 Copenhagen Climate Summit to cut carbon intensity by 40–45% relative to 2005 levels by the year 2020 (Zhang, 2011). A wide variety of low-carbon policies has been developed in a short period of time to realize these ambitious energy and climate objectives (Lo & Wang, 2013).

A substantial amount of research has been conducted with respect to the design and development of China's low-carbon policies (Andrews-Speed, 2009; Kejun, 2009; Kong, Lu, & Wu, 2012; Lo & Wang, 2013; Price et al., 2011; Zhou et al., 2010); however, the empirical studies concerning the implementation of these initiatives at the municipal level have been underwhelming. Although China is a unitary state by constitution, its local governments have gained considerable autonomy in *de facto* federalism since the reform period began in 1978 (Zheng, 2007). Consequently, Chinese policy implementation has become a contested process, and there are often disparities between policies on paper and their actual implementation, which is known as an implementation gap. It is not uncommon anymore for local Chinese governments to challenge the central government's order for the sake of local interests. Although no studies have closely examined the implementation gap of China's low-carbon policies, the media often report related anecdotes. For example, the Obsolete Capacity Retirement Program was unpopular among local governments because of the negative social and economic impacts associated with the forced closure of factories. Consequently, many local governments have been caught falsifying the production capacity of the factories that were closed down, or closing the same factory multiple times to claim extra credit.

These anecdotal accounts suggest that policy implementation can be a serious challenge to China's low-carbon city initiatives. There is an urgent need to examine the implementation problems to determine how they can be resolved. This study addresses this issue. Using a qualitative case study approach, we investigated the local implementation of three important low-carbon policies to gain a comprehensive appreciation of the issue and to identify patterns of implementation behavior across different policy areas. Evidence is drawn from both semi-structured interviews with local officials and policy documents. Our fieldwork was conducted in Changchun, the provincial capital of the Jilin province, from

* Tel.: +61 430855320; fax: +61 392506885.
E-mail addresses: tslo@unimelb.edu.au, tsklo2@gmail.com.

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September to November 2012. Changchun was chosen as the site for the study because it is well known as an energy-intensive city because of both geographic and economic factors. Geographically, Changchun is located in Northeast China where winters are long and cold, and consequently space heating is a significant energy demand of the city.[1] Economically, the city has a high concentration of energy-intensive enterprises, especially in the automobile sector.[2] The scale of energy consumption in Changchun makes energy conservation and emissions reduction a pressing and challenging issue for the local governments.

Following this introduction, Section 2 explains the theoretical perspectives used in this study and discusses the previous research on the implementation of China's low-carbon policies. Section 3 introduces the three low-carbon policies that are targeted in this study. Sections 4 examine the implementation of the three policies and the presence of implementation gap in Changchun. Section 5 discusses the causes of the implementation gap, focusing on the limits of the Energy Conservation Target Responsibility System. Finally, Section 6 presents the conclusion and suggests possible solutions to closing the implementation gap.

Policy implementation

This study has been informed by policy implementation studies. Pressman and Wildavsky (1973) are often credited as having conducted pioneering work in the field of policy implementation. Implementation is a complex and contested process of "interaction, dialogue, feedback, modifying objectives, recycling plans, coping with mixed feelings and values, pragmatism, micropolitics, frustration, and muddle" (Nudzor, 2009: 502). Consequently, policies and practice are often disconnected. A substantial number of factors have been identified as influential with respect to policy implementation. O'Toole (1986) found over 300 variables in his literature review. The resulting complexity led to the call for structure by scholars like Matland (1995), who partitioned the variables into top-down and bottom-up paradigms. The top-down paradigm focuses on factors that can be manipulated by policymakers, such as organizational structures, monitoring, and evaluation. The bottom-down paradigm focuses on the realities that local implementers or street-level bureaucrats manage on a daily basis and how their experiences influence policy implementation (Lipsky, 1980).

Certain empirical research has examined the phenomenon of the implementation gap in China. Substantial implementation problems have been recently observed in diverse areas as such as the following: tourism policy (Wang & Ap, 2013), fisheries policy (Ferraro & Brans, 2012), environmental policy (Ran, 2013; Swanson, Kuhn, & Xu, 2001; Wang, Webber, Finlayson, & Barnett, 2008), one-child policy (Li, 2013), and renewable energy policy (Peidong, Yanli, Yonghong, Lisheng, & Xinrong, 2009; Schuman & Lin, 2012). In a development parallel to implementation studies elsewhere, a number of different but not mutually exclusive explanations have emerged. From a top-down perspective, O'Brien and Li (1999) argued that the implementation gap has become more common in the reform period because political decentralization and the end of political campaigns have enhanced local autonomy, and the target responsibility system is unable to enforce unquantifiable or immeasurable policy targets. Edin (2003) counter-argued that the central government can quantify and measure any policy target if it is determined to see its implementation. Thus, the lack of enforcement should be interpreted as a lack of central intention rather than an institutional defect. Consistent with the principal-agent framework, Zhong (2003) demonstrated that the monitoring and enforcement system is vulnerable to cheating and corruption at the local level, a point that is also raised by Ran (2013) in her study of environmental policy implementation. Ran further argued that the central government provides perverse incentives for local officials' non-implementation or poor implementation of its environmental policies. Two scholars have introduced the time factor into the top-down implementation gap theory. According to Gobel (2011), the central government may opt to allow local governments to develop innovative policies that may result in a temporary implementation gap until the central government decides to enforce uniform implementation. Chung (2000) observed that because of the central government's record of frequent policy change, local governments are wary of the political and economic risks inherent in rapid commitment and therefore adopt a wait-and-see attitude, only committing to policy implementation when the center's preference appears to be fixed. With respect to the bottom-up paradigm, an increasing amount of studies show that local officials are unfavorably disposed toward implementing policies that are not conducive toward economic growth (Chan, Wong, Cheung, & Lo, 1995; Tang, Lo, Cheung, & Lo, 1997). Zhou (2010) contended that conflicting central directives and unrealistic expectations contribute to collusion among local governments to compromise central policies. Wang and Ap (2013) and Ferraro and Brans (2012) identified *guanxi* (personal relationships) between local officials and local entrepreneurs as a key factor affecting policy implementation.

The empirical research concerning the implementation of low-carbon polices in China is limited. Kostka and Hobbs (2012) conducted a qualitative study in 2010 on the implementation of energy efficiency policies in Shanxi province. Rather than focusing on the implementation gap, the authors examined the strategies employed by local governments to ensure proper implementation. Three approaches, policy-building, interest-bundling, and framing, were found to be effective in bridging national priorities with local interests. Policy bundling refers to the combining of energy efficiency policies with other policies that are more closely aligned with local interests. Interest-bundling is the linking of energy efficiency objectives with the interests of different actors, for example, the offering of compensation in exchange for compliance. Framing refers to the reinterpretation of energy efficiency policies with local interests in mind. Although Kostka and Hobbs did not directly address the implementation gap in low-carbon policies, the implications of their findings are that local officials are less inclined to faithfully implement low-carbon policies that are not consistent with local interests.

Introducing the low-carbon policies

The three low-carbon policies we focused on are: the Ten-Thousand Enterprises Energy Conservation Low Carbon Program (hereafter, Ten-Thousand Enterprises Program), the Northern Heating Region Existing Residential Building Energy Conservation Retrofit Program (hereafter, Building Retrofit Program), and the Ten Cities Thousand Cars New Energy Vehicle Pilot Program (hereafter Thousand Cars Program). As shown in Table 1, these three national low-carbon policies are different in terms of targeted sectors, policy instruments, objectives, and responsible ministries. In this section, we briefly introduce the three policies with a focus on the implementation process.[3]

[1] Changchun has one of the longest winter heating seasons in China, lasting 174 days. The winter temperature in Changchun regularly drops below −20 °C.

[2] In 2010, Changchun's 28 automobile manufacturers and 416 parts suppliers produced 1.7 million vehicles, or one-tenth of the vehicles produced in the country. Overall, the car industry accounts for 63% of the city's gross industrial output.

[3] For a comprehensive overview of China's low-carbon policies, see Lo (2014).

Table 1
Comparison of the three low-carbon polices.

	Ten-Thousand Enterprises Program	Building Retrofit Program (Phase 2)	Thousand Cars Program
Targeted sectors	Enterprises and universities	Buildings	Transport
Policy instrument	Command-and-control	Subsidy	Procurement
Commenced in	2011	2011	2009
Objectives	Energy saving 250 Mtce	Retrofit 400 million m2 of building space, Energy saving 27 Mtce	1000 new energy vehicles in 25 cities
Key responsible ministry	National Development and Reform Commission; Ministry of Industry and Information Technology	Ministry of Finance; Ministry of Housing and Urban-Rural Development	Ministry of Finance; Ministry of Science and Technology

Source: NDRC (2011), MOF and MOHURD (2011), and MOF and MOST (2009).

By regulating the energy consumption of the largest energy users (industrial, transport and commercial enterprises and higher education institutions), the Ten-Thousand Enterprises Program is one of the most important low-carbon policies. The program is an extension of the Thousand Enterprise Energy Conservation Program launched in 2006, where a total of 1008 energy-intensive industrial enterprises were required to meet compulsory energy conservation targets (Lo & Wang, 2013). That program proved to be a success, and in 2011 it was significantly expanded to a much larger number of industrial enterprises, as well as a small number of enterprises in the transport, commercial and education sectors. In contrast to overseas experience where similar objectives are usually achieved through voluntary agreements or market-based instruments, such as carbon taxes and emissions trading, the Ten-Thousand Enterprises Program takes a command-and-control approach which remains the preferred environmental policy instrument in China. In essence, the program consists of the allocation of pre-specified goals to the enterprises and the evaluation of the results, with punishment in the case of noncompliance. Similar to its predecessor, the Ten-Thousand Enterprises Program not only allocates energy-saving targets to the regulated enterprises but also demands the enterprises to meet a number of energy management requirements, such as energy auditing, the collecting, analyzing, and reporting of energy statistics, the hiring of qualified energy management professionals, and the long-term planning of energy conservation. To support the enterprises, the central government provides a subsidy at a rate of 250–300 RMB/tce (ton of coal equivalent). Overall, the program is expected to deliver an energy saving of 250 Mtce over five years.

The Building Retrofit Program was launched in 2008 jointly by the Ministry of Housing and Urban-Rural Development (MOHURD) and the Ministry of Finance (MOF) to address energy conservation in the building sector, which is the second largest energy-consuming sector in China. Its proportion is forecasted to increase to 35% by 2020 because of rapid urbanization and increases in household energy consumption that are associated with rising incomes (Li & Colombier, 2009). The program targets cities in China's northern heating area because of their potential for improvement in the low-carbon built environment. Many existing buildings in northern China have poor thermal energy performance due to insufficient envelope insulation (Ding, Tian, Wu, & Zhu, 2011). Furthermore, most buildings do not have heat metering or temperature control. Residents therefore lack the incentives and means to conserve heating energy. The Building Retrofit Program is a subsidy-based policy designed to encourage energy conservation retrofits of existing residential buildings. Subsidies of up to 55 RMB/m^2 were offered to residents and energy service companies to carry out two types of retrofits: thermal insulation to building envelopes and the installation of heat metering and temperature control. Local governments are instructed to provide additional subsidies. Although MOHURD estimated that there were approximately 2 billion m^2 of building space need insulation retrofits, the program initially aimed rather modestly at retrofitting only 150 million m^2 of building space because of a lack of policy experience and the limitation in government funding. By the end of 2010, a total of 180 million m^2 of building space had been retrofitted, exceeding initial expectations. In 2011, the MOHURD announced the second phase of the program, which features a more ambitious target of renovating 400 million m^2 of building space by 2015.

The Thousand Cars Program was launched in 2009 by the Ministry of Science and Technology (MOST) in association with the Ministry of Finance (MOF) as part of a national campaign to reduce oil consumption through the electrification of road transport. Although the transport sector consumes only 8% of China's total energy, it uses approximately half of the country's gasoline and diesel fuel (Lo & Wang, 2013). Designed as a pathway to the full commercialization of electric vehicles, the program offers subsidies to a number of pilot cities for the procurement of new energy vehicles for public use, such as buses, taxis, and municipal service vehicles (e.g., garbage trucks and mail trucks). The amount of subsidy depends on the length and type of vehicle, the fuel-saving potential, and the ratios of electric motor and battery types. The maximum subsidy for hybrid electric vehicles and electric-only vehicles is 50,000 RMB and 60,000 RMB, respectively. To participate in the program, a city must submit a plan to procure new energy vehicles and establish the supporting infrastructure. Initially, there were 13 participating cities, but the number increased to 25 by the end of 2012.

All three low-carbon policies follow a typical policy process in China. The central government's ministries are the key policy-makers. Because the central ministries aim to develop unified national policies that are also sensitive to local circumstances (Zhou, 2010) and to encourage local policy experimentation, which is believed to lead to better policy results (Gobel, 2011), the policies they promulgate often leave room for flexible implementation. This flexibility is achieved by focusing on defining the key issues, objectives, and responsibilities, but leaving out specific instructions or guidelines on implementation. For example, according to the "Implementation Plan for the Ten-Thousand Enterprises Program" (NDRC, 2011), the local governments are responsible for providing financial assistance to the enterprises and conducting annual evaluations of the enterprises' performance. However, the document neither defines which level(s) of government should contribute financially and the amount of financial contribution, nor does it specify the appropriate punishment for noncompliance. These missing implementation details are decided by local governments as the policies are passed down the administrative hierarchy. The central ministries periodically review the results of implementation through examining reports from subordinate agencies and conducting inspection tours. Despite the necessity in maintaining flexibility, as we will see in the next section, local governments may abuse and undermine the policy process, resulting in ineffective implementation.

Implementing the low-carbon policies in Changchun

Ten-Thousand Enterprises Program

The implementation process of the Ten-Thousand Enterprises Program began with the top-down target allocation process. On

Table 2
The Ten-Thousand Enterprises Program's targets.

	Industry		Transport		Commerce		Education		Total	
	No. of enterprises	Target (10,000 tce)	No. of enterprises	Target (10,000 tce)	No. of enterprises	Target (10,000 tce)	No. of enterprises	Target (10,000 tce)	No. of enterprises	Target (10,000 tce)
China	14,644	25,103	546	313.7	337	35.3	554	60.8	16,081	25,512.8
Jilin	203	427.5	3	3.1	20	2.3	21	4.2	247	437.1
Changchun	45	84.4	1	1.9	4	1.5	16	3.3	66	91.0

Source: author.

December 7, 2011, the NDRC released the targets for the Ten-Thousand Enterprises Program for each province based on the number of energy-intensive industries, the energy consumption, and energy conservation potential. The provincial governments were given only one month to break down the targets to individual enterprises (NDRC, 2011). Because of the rush of time, consultation with enterprises was minimal, and in most cases, non-existent. Table 2 lists the targets of the Ten-Thousand Enterprises Program on three administrative levels (China, Jilin, and Changchun). For Changchun, a total 66 enterprises were selected to participate in the program and given a combined energy-saving target of 909,994 tce. The enterprises are diverse in their activity, ownership structure, and size. While the majority ($N = 45$, 68%) of the enterprises are industrial, a unique feature of Changchun is the large number of higher education institutions ($N = 16$, 24%), which reflects the role of the city as a center of higher education in the northeast.

Despite its great significance in terms of energy conservation, the implementation of the Ten-Thousand Enterprises Program suffers from several limitations. First of all, the municipal government has completely failed to provide financial assistance to enterprises engaging in energy conservation. Consequently, the enterprises in Changchun only have access to energy conservation funding from the central and provincial governments, which are very competitive and favor large-scale projects. Another key implementation problem is weak enforcement. On-site inspection is conducted infrequently (once every three years, rather than annually). In the absence of rigorous inspection, the assessment of compliance is mainly conducted using the self-evaluation reports submitted by the enterprises themselves without serious auditing mechanisms to ensure the reliability and accuracy of the reports. Inadequate enforcement is mainly due to a limitation in the human resources of the Changchun Energy Conservation Inspection Team (CECIT), which is in charge of the enforcement of the program. There are currently only 18 staff members working for the CECIT. In comparison, the Environmental Protection Bureau of Changchun, an agency in charge of enforcing pollution-related environmental regulations, has 51 employees. Moreover, enforcing the Ten-Thousand Enterprise is not the inspection team's only responsibility. The CECIT is also responsible for enforcing the Obsolete Equipment Retirement Program and the mandatory equipment energy efficiency standards, providing energy conservation consultation and energy auditing, and conducting the post-inspection of enterprises that received government funding in energy conservation. Service-based activities such as consultation and energy audits generate revenue and therefore take precedence over enforcement activities. The activities of CECIT also extend far beyond the geographic limit of Changchun, and the staff frequently needs to travel to other cities to perform tasks.

Another major cause of weak enforcement is that there is no penalty for noncompliance. Without proper punishment, as a CECIT official puts it, "the enterprises can choose to comply if they want to, can choose not to comply it if they do not want to". The lack of punishment for noncompliance, coupled with the other enforcement problems noted previously, means that the Ten-Thousand Enterprises Program has essentially become 'command without control', whereby decisions to pursue energy efficiency are largely left in the hands of the enterprises. One reason for the lack of punishment is that the CECIT and its superior department the Changchun Bureau of Industry and Information Technology (CBIIT) are not regulatory agencies and therefore do not have the power to punish noncomplying enterprises. However, it is unlikely that the CBIIT staff, who are clearly antagonistic toward the program and see the new responsibility as a distraction to their core mission of fostering economic development and attracting investment, would want to punish enterprises even if they are empowered to do so. There is also reservation in the design of the program, particularly the top-down target allocation approach, as a CBIIT official explained:

> The targets assigned from above are unscientific and unrealistic. Nobody in the government knows the true potential of the enterprises in terms of energy conservation. If we do not know what the enterprises can achieve, how can we enforce the program? We can make demands of the enterprises, but we cannot punish them for something they cannot achieve.

Building Retrofit Program

Implementation of the Building Retrofit Program in Changchun started in 2008. In the first two years of its implementation, the scale of operations was very limited because of the modest target Changchun received from the provincial government (to retrofit 3.6 million m^2 of buildings in three years, which was further broken down to 1 million m^2 in 2008, 1 million m^2 in 2009, and 1.6 million m^2 in 2010). However, the municipal government was unable to meet these conservative targets in both 2008 and 2009 (Table 3).

Table 3
Targets and results of the Building Retrofit Program in Changchun.

	Targets as of 2008 (10,000 m^2)	Targets as of 2010 (10,000 m^2)	Post-2010 targets (10,000 m^2)	No. of building renovated	Floor area renovated (10,000 m^2)
2008	100			n/a	90
2009	100			n/a	62.7
2010	160	200		1155	600
2011		200	500	2287	1060
2012		200	1000	1702	1221

Source: author.

The implementation was mostly confined to two projects. The first was conducted by the state-owned enterprise First Auto Works, which owns and operates a large number of apartments for its employees. The second project was carried out by an energy service company in a residential neighborhood. The local government's involvement with the implementation was minimal at the time.

Local implementation efforts significantly improved with the arrival of a new provincial party secretary, Sun Zhengcai, in December 2009. Sun's arrival coincided with the coldest winter the province experienced in over five decades, resulting in skyrocketing complaints over insufficient heating. In Changchun, complaints over heating increased by approximately 80% that winter. The adverse weather exposed the extent of insufficient heating in the province, which prompted Sun to make heating a top government priority. In June 2010, the provincial government announced the goal of renovating 15 million m^2 of old buildings with insufficient insulation in three years. It also established the Warm Housing Project Leading Group, headed by the provincial governor, to provide leadership of the project. From 2010 to 2013, the provincial government issued 95 policy documents that are related to the program. Such frequency and regularity were unprecedented in Jilin. Furthermore, the provincial government held numerous seminars and inspection tours, leaving no doubt about the political importance of the program. In June 2010, the municipal government of Changchun released its own implementation plan, which established the policy objective of renovating 6 million m^2 of building in three years (2010–2012). The target was fulfilled in one year instead of three. In 2011, the municipal government announced a more ambitious target to renovate 5 million m^2 that year, and again significantly exceeded it by renovating approximately 10 million m^2. The target for 2012 was further increased to 10 million m^2. Encouraged by the achievement in Changchun, the provincial government announced the ambitious goal in 2012 of finishing 70% of the renovation work by 2015, equivalent to renovating 120 million m^2 of building area. This goal is significantly more ambitious than the central government's target, which is to complete 35% of the work by 2015.

The massive scale of this implementation would not be possible without two policy innovations. The first innovation is to make the government, rather than homeowners or energy service companies, the key actor of building retrofits. This innovation is important because without the government taking the lead, it can be very difficult for homeowners themselves to obtain consent in a timely manner from every homeowner of an apartment building. Currently, the government is in charge of selecting buildings to renovate, finding contractors to carry out the work and providing quality control. In this government-led model, the role of the homeowners becomes passive. In fact, once their apartment is chosen by the government, homeowners do not have the right to refuse. Another key adjustment is funding. Originally, the program was intended to be financed either directly by homeowners or indirectly by energy service companies. Now, the government becomes a key financial contributor. Table 4 shows the expenses and funding sources of a typical building retrofit project in Changchun. The financial contribution of the central, provincial, municipal, and district governments are 22.8%, 48.8%, 14.9%, and 7.5%, respectively. Homeowners are required to contribute relatively little (6.1%).

The success of the Building Retrofit Program in Changchun illustrates the advantage of China's flexible policy process, and that effective implementation is possible when local enthusiasm is high. However, the success is limited to part of the program. By framing the policy as a solution to the heating problem rather than energy conservation and climate change (most notably, the policy is now known in Jilin as the "Warm Housing Project"), the provincial government has effectively changed the policy objectives and has diverted attention away from the goal of energy conservation. Subsequently, the focus of implementation in Changchun has been entirely placed on improving thermal insulation of buildings, whereas the installation of heat metering and temperature control has been very much neglected, left in the hands of district heating companies who lack incentives to carry out the reform at their own expense. Consequently, very few of the buildings that received a retrofit have had heat metering and temperature control systems installed, and those did were left unused. This problem did not escape the attention of Jiang Weixin, the Minister of MOHURD, during an inspection tour in Changchun in 2012. While Jiang highly praised Changchun's work in building retrofits, he reminded the local officials of the imperative of the heat metering reform to energy conservation and the need to increase the usage of heat metering (Changchun Bureau of Public Utility, 2012).

Table 4
Expenses and funding sources of a building retrofit project in Changchun.

Expenses	RMB/m^2
Administrative and design	4.00
Wall insulation	74.88
Wall painting	11.69
Roof insulation and water proof	32.11
Door and windows	31.03
Funding sources	
Central government	35.00
Provincial government	75.00
Municipal government	22.94
District government	11.47
Homeowners	9.31

Source: author.

Thousand Cars Program

The implementation process of the Thousand Cars Program began in 2008 when the MOST invited cities to submit proposals for procuring new energy vehicles for public use. Because Changchun has a large car manufacturing sector, the program was perceived by local officials as an opportunity to enhance the competitiveness of the local automobile enterprises and help to prepare them for the future. The municipal government of Changchun submitted a proposal to purchase 1000 new pure or hybrid electric public vehicles, which are approximately 25% of the total buses in Changchun, and to provide the accompanied infrastructure including 15 electric vehicle charging stations by the end of 2012. The proposal was accepted by the MOST in 2009 and, in the same year, the municipal government of Changchun established the New Energy Vehicle Demonstration City Leadership Group, headed by the mayor, to oversee the implementation. The Office of New Energy Vehicles under BIIT is responsible for implementation.

Despite the initial enthusiasm surrounding the initiative, the implementation of the policy has been slow and inadequate. In 2010, the first 100 hybrid buses and 20 electric-only buses were ordered. However, the electric-only buses were abandoned after a few months of operation because of technical difficulties associated with suboptimal battery performance in severely cold temperatures. The electric vehicle charging station built to support the electric-only buses was left underutilized. In 2011, another 100 hybrid vehicles were purchased, but no electric-only buses were ordered. In 2012, the government failed to purchase any buses, leaving the city 800 vehicles short of the target. In October 2012, a new pilot project involving two electric buses (the buses were provided by the manufacturer free of charge) was launched, and a new electric vehicle charging station was built to support the trial.

This development suggests that the municipal government has not entirely given up on developing new energy vehicles, but instead chooses to adopt a more cautious approach.

Technical difficulties, most notably the failure of the electric-only buses due to problems with batteries, were identified as a key issue in the interviews. Furthermore, the cost of new energy vehicles, even when subsidized by the central government, remains at least twice as expensive as a conventional bus of a similar size. Building infrastructure for electric vehicles can also be expensive. Under the current agreement, the State Grid, a state-owned grid company, is responsible for providing the necessary technologies, but the local government needs to provide land and buildings. The construction cost of an electric vehicle charging station is approximately 20 million RMB. Even with the central government's subsidies, it is still a substantial investment for the local government and at issue is whether the money should instead be spent on improving public transportation.

The limits of the Energy Conservation Target Responsibility System

There are many economic and political causes for the ineffective implementation in Changchun, both at the local and national levels. In our view, given the power of local government leaders in controlling local functional departments vis-à-vis central ministries under the *tiaokuai* administrative system,[4] their lack of political interest in low-carbon city initiatives goes a long way in explaining the implementation gap. It is widely accepted that a defining feature of local politics in post-reform China is the overwhelming commitment to the pursuit of economic growth, also referred to as GDPism or growth fetishism (Gong & Wu, 2012; Yang & Wang, 2008). Because Changchun is perceived as a relatively "backward" city, the local leaders are under strong pressure to catch up economically to the more developed cities. The lack of interest among local government leaders in implementing low-carbon policies, in turn, leads to the intermediate causes of ineffective implementation, such as the limitations in administrative, human and financial resources. In this regard, the implementation of low-carbon policies is similar to those of the wider environmental governance, where multiple studies have shown that development-focused local governments are generally not interested in enforcing the environmental standards defined by the central government (Ran, 2013).

However, there is one crucial difference between low-carbon governance and environmental governance. In 2007, anticipating that local governments would have little interest in implementing low-carbon policies by themselves, the central government introduced the Energy Conservation Target Responsibility System (ECTRS) to ensure local compliance with energy conservation (Lo & Wang, 2013). The ECTRS establishes political incentives for local governments to implement low-carbon policies primarily through the allocation of energy conservation targets. The punishment for failing to meet the targets includes disqualification from consideration for annual honors and the incurring of investment restrictions. The result of the evaluation is also used in the annual and end-of-term performance evaluation of local officials, thus directly influencing their career paths. The power of the ECTRS in shaping local government behavior was vividly demonstrated in the second half of 2010, when a number of local governments that had fallen behind their targets dictated drastic measures to industries and businesses. For example, in areas such as the Hebei, Anhui and Guangxi provinces, the supply of electricity to enterprises, households, and public facilities (e.g., schools and hospitals) was severely constrained, causing reduced productivity and social instability. Our fieldwork in Changchun also suggests that the ECTRS is well-established and the threat of punishment is real. The municipal and district officials that we interviewed confirm that achieving the energy conservation targets is of paramount importance. For instance, a district-level DRC official stated, "if you don't meet the energy conservation targets two years in a row, you don't even need to wait for your evaluation, you can just resign." However, the seemingly powerful ECTRS has failed to provide sufficient political incentives for local officials in Changchun to implement the low-carbon policies. To understand this limitation, we now take a closer look at the problems associated with the design and enforcement of the ECTRS.

The first problem with the ECTRS comes from the scoring system the central government uses to evaluate local governments' performance in energy conservation. As shown in Table 5, the weighting of the scoring system is divided into two parts: 40% to the attainment of energy conservation targets and 60% to the achievement of certain energy conservation actions. While 60% of the marks are related to the action of local governments, most procedural criteria are symbolic, can be easily achieved, and are not directly related to the implementation of low-carbon policies. Many points are given to organizational tasks such as convening meetings, devolving responsibilities, and decomposing energy conservation targets to lower levels of government. The wordings are also too vague and amorphous, making it very easy to earn marks. For example, points are awarded for "capacity building," "monitoring enterprises' energy consumption," and "promoting energy conservation," which local governments can claim to fulfill with minimal effort. Because of these problems, local governments can come through the evaluation process with outstanding results without the need to seriously implement low-carbon policies. In the 2012 ECTRS evaluation, Changchun attained 92 marks out of a possible 100 marks, and no cities in the Jilin province scored fewer than 85 marks (Jilin Daily, 2013). Tellingly, the evaluation report flagged a series of problems despite the very high scores, most notably the lack of emphasis on and insufficient investment in energy conservation and climate change.

Second, as the key component and the only veto criteria of the ECTRS, the energy conservation targets are too weak to provide adequate incentives to implement low-carbon policies. The target for Changchun during the 12th Five-Year Plan (2011–2015) is a 16% reduction in energy intensity, down from the 22% target in the 11th Five-Year Plan (2006-2010). The weak energy intensity target is not unique to Changchun or even Jilin, but nationwide. The immediate reason for the less ambitious target is that China had a difficult time achieving the 11th Five-Year Plan target (a 20% reduction in energy intensity), eventually attaining a 19.1% reduction in energy intensity after a great deal of effort by the central government in 2010. However, as this study and other recent research indicate, the difficulties are at least in part due to the poor implementation of low-carbon policies. Therefore, a lower target only aggravates the problem by reducing local government incentives for energy conservation. It has also been argued that, because much time and effort was spent in the 11th Five-Year Plan in establishing institutions, fine-tuning policies, and investing in energy conservation technologies, China now has better institutional and technological capacities to at least maintain if not pursue a stronger energy conservation targets (Price et al., 2011). Overall, the potential for energy conservation in the industry sector remains high (Ke, Zheng, Fridley, Price, & Zhou, 2012). Rooms for energy savings in the

[4] The local functional departments in China are under the dual leadership of the central ministries (*tiao*) and local governments (*kuai*). The most powerful authorities are the local governments because they are responsible for the salary and personnel decisions of local functional departments.

Table 5
Energy Conservation Target Responsibility System evaluation scoring table.

Category	Item	Details
Energy conservation targets (40 marks)	Reduction in energy intensity (40 marks)	40 Marks for meeting the target, 36 marks if finished 90%; 32 marks if finished 80%; 28 marks if finished 70%; 24 marks if finished 60%; 20 marks if finished 50%; no marks below 50%. 3 extra marks for exceeding the target by 10%, maximum 9 extra marks
Actions (60 marks)	Organization and leadership (2 marks)	1 Mark for monitoring and evaluating local energy intensity; 1 mark for coordinating the work on energy conservation, including a clear division of responsibility and periodically convening at meetings to study major issues
	Target decomposition (3 marks)	1 Mark for the decomposition of energy conservation targets to lower levels of government; 1 mark for evaluating the fulfillment of energy conservation targets; 1 mark for publishing energy consumption statistics
	Economic restructuring (20 marks)	4 Marks for expanding the tertiary industry; 4 marks for expanding the high-tech industry; 4 marks for evaluating the energy impacts of investment projects; 8 marks for completing the Obsolete Capacity Retirement Program
	Investment in energy conservation (10 mark)	3 Marks for establishing an energy conservation fund; 4 marks for increasing the proportion of expenditure on energy conservation; 3 marks for implementing major energy conservation projects
	Energy conservation technologies (9 mark)	2 Marks for including energy conservation technologies in the annual technology plan; 4 marks for increasing the proportion of expenditure on energy conservation technologies; 2 marks for organizing demonstration projects of energy conservation technologies; 1 mark for promoting energy-saving products, technologies and services
	Management of energy-intensive enterprises (8 mark)	3 Marks for completing the key energy-intensive enterprises' energy conservation targets; 1 mark for monitoring key enterprises' energy conservation; 4 marks for achieving 100% compliance rate of energy efficiency standards for new buildings; 2 marks for 80% compliance rate
	Energy law and regulations (3 marks)	1 Mark for implementing the Energy Conservation Law; 1 mark for monitoring the implementation of the law, and 1 mark for implementing energy efficiency standards for energy-intensive products
	Groundwork for energy conservation (5 marks)	1 Mark for capacity building; 1 mark for collecting energy statistics; 1 mark for procuring energy consumption measurement equipment; 1 mark for promoting energy conservation; and 1 mark for rewarding energy conservation actions

Source: State Council (2007).

transport and building sectors, which have been largely untapped during the 11th Five-Year Plan, are also significant and growing because of rapid urbanization and motorization (Colombier & Li, 2012; Loo & Li, 2012).

Third, the use of energy intensity (defined as units of energy per unit of GDP) instead of absolute energy consumption as a policy objective is problematic. As noted by Ran (2013), there is no national standard of the measurement of energy intensity, and consequently, "the target can be met relatively easily because there are different methods for measuring energy consumption per unit of GDP, and local officials can use any method they prefer" (Ran, 2013: 26). Another problem with using energy intensity as the objective is that as long as GDP grows faster than energy consumption, energy intensity will continue to decline. This problem gives local governments an option to meet the objective through economic development, especially in less energy-intensive areas such as high-tech industries, property development, and the tertiary sector, rather than implementing low-carbon policies.

The fourth and final problem is the lack of reliable local energy statistics. The assessment of local governments depends on accurate, reliable and comprehensive local energy statistics. However, the limited capacity and rampant data manipulation have turned the compilation of local energy statistics into a numbers game (Ran, 2013). This problem was highlighted by the NDRC in its report on energy conservation that was aptly titled "The Grim Situation of Energy Conservation and Emissions Reduction" (NDRC, 2013), which states that "the mismatch between local and national statistics is seriously undermining the attainment of the national energy conservation target." NDRC data reveal the extent of the problem: from 2011 to 2012, national energy intensity declined by 5.5% according to data from the National Bureau of Statistics (NBS). However, according to aggregated local statistics, national energy intensity declined by 7.7% during the same period. In other words, the NDRC report suggests that local governments have overstated their achievement in energy conservation by 40%. In Changchun, we found that the collection of energy statistics is underdeveloped and many data are simply not available. The municipal statistics bureau still relies on the direct reporting system developed during the central planning era, which only collects data from industrial enterprises above a certain size. As of 2012, there were approximately 1600 enterprises in Changchun that regularly reported energy consumption, accounting for approximately 65% of the total energy consumption of the city. The local statistics bureau collects little energy consumption data outside of these 1600 enterprises. The areas that lack reliable energy data include industrial enterprises below the designated size, the commercial sector, the transportation sector, and the residential sector. Although the NBS demanded in 2007 that local statistics bureaus conduct random sampling surveys on energy use (State Council, 2007), this mandate has yet to be implemented in Changchun. Consequently, the energy

statistics that are used in the assessment of the ECTRS are, at best, an estimate. Another related problem is that the local government is in charge of personnel and budgetary allocations of the local statistics bureau, which gives them ample opportunities to influence local statistics.

Conclusion: closing the implementation gap

Undoubtedly, the central government of China has formulated a wide variety of low-carbon policies to address climate change and energy security. However, the effectiveness of these policies depends on local implementation, a part of the policy process of which the central government only has indirect control. Our study in Changchun has demonstrated that, with the exception of the part of the Building Retrofit Program that coincides with local interest, the implementation of low-carbon policies in Changchun has been ineffective. The inadequate implementation results in lost opportunities to control carbon emissions at an early stage, leaving the task more difficult and expensive in the future. We have argued that a key cause of the implementation gap is the lack of political interest in the implementation of low-carbon policies among the local government leaders, which reflects problems with the design and enforcement of the Energy Conservation Target Responsibility System.

It is interesting to compare the findings in this study to Kostka and Hobbs (2012). Compared to Changchun, the local officials in Shanxi appeared to take a more serious stance with respect to energy efficiency and experimented with novel strategies to make low-carbon policies successful. The difference in timing may be a factor in explaining the different findings. Kostka and Hobbs conducted their fieldwork in 2010, when the pressure to complete the energy conservation targets was intense. Political pressure on energy conservation has since declined, partly because of the five-year planning cycle and partly because the energy intensity targets introduced in 2011 are weaker. Geography is another factor. Shanxi is a major coal producer with a high concentration of heavy industry. Contrastingly, while Changchun has a strong industrial sector, the sector is dominated by high-end manufacturing industries that are less energy-intensive, and therefore not as seriously disadvantaged by the energy conservation programs. These differences highlight the importance of the local context in determining policy implementation and the difficulties in making sweep-generalizations in a country as diverse and complex as China. But at the same time, the municipal government of Changchun processes some common characteristics of all Chinese local governments in general, such as the freedom to flexibly implement policies without much interference from the central government, the incentives to prioritize local interests over national issues, and the stronghold over local functional departments. Therefore, this study reflects some of the basic problems with the current approach to low-carbon urbanism in China.

In conclusion, we consider some possible solutions to close the implementation gap. The ECTRS scoring system should become stricter, more specific, and more related to the implementation of low-carbon policies. Most importantly, replacing the energy intensity target with an energy consumption cap would increase pressure on local government to implement low-carbon policies effectively. The energy consumption cap was first proposed by the central government in 2011, but has yet to be implemented because of resistance from local governments that are concerned that the cap would constrain their room for economic development (Lo, 2013). We believe that the cap should be restrictive enough to provide incentives and that, as a compromise, financial assistance should be offered to less developed areas to help them meet the cap through energy conservation and the deployment of renewable energy. Luckily, the central government possesses a sound financial position and should be able to increase its amount of green investment. Failing these propositions, the energy intensity target for the 13th Five-Year Plan (2016–2020) must be increased to 20%, if not higher.

The imposition of a strict energy consumption cap or energy intensity target without an effective monitoring system is likely to result in the increased frequency of cheating by local governments. Presently, local statistics bureaus are controlled by local governments rather than the National Statistics Bureau, making it difficult for the central government to implement reforms to the statistical system and easier for local governments to manipulate statistics to suit their purposes. Centralizing the statistical system can strengthen the central government's control over the statistical system, allowing it to improve the qualification and number of statistical staff and to remove a key source of local data manipulation.

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