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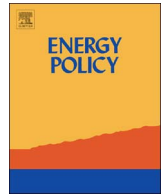
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Mind the gap! Barriers and implementation deficiencies of energy policies at the local scale in urban China



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ABSTRACT

Environmental concerns and potential social-economic impacts associated with fossil fuels have turned cities into indispensable entities for supporting energy transitions in China. Pursuing a transition towards a sustainable energy system has become a major policy concern for the Chinese central government. In response, and on the basis of a top-down and conformance-oriented system of policy implementation and evaluation, the Chinese central government has launched various policies and targets on energy efficiency and production that lower levels of government have to follow. However, the translation of top-down targets and the measurement of conformance-based targets have both proved to be problematic. This paper investigates Chinese state policy on energy efficiency through four empirical case studies. It identifies how policy design of target setting and evaluation is both impacting and driving the implementation of energy efficiency at the local urban scale. We demonstrate how local authorities are faced with constraining barriers that can inhibit the implementation of centrally issued targets and policies. These barriers may even undermine local performance in the pursuit of ambitious energy efficiency goals, resulting in potentially harmful consequences.

1. Introduction

Cities worldwide are currently estimated to use 75% of the world's energy and contribute to 70% of the global energy-related greenhouse gas (GHG) emissions from fossil fuel usage (Baeumler et al., 2012; Hillman and Ramaswami, 2010). In China, rapid economic growth and urbanisation have turned the country into the largest carbon emitter worldwide (IEA, 2013). Both phenomena are built on the foundation of fossil fuel usage, with coal and petroleum accounting for more than 80% of China's energy consumption in 2012 (EIA, 2015). As a consequence, significant environmental and health impacts are emerging, especially in urban areas (e.g., Liu et al., 2016). Moreover, at present less than one percent of China's 500 largest cities meet World Health Organisation (WHO) air quality standards (Liu et al., 2014; Zhang and Crooks, 2012). As illustrated by the example of China, cities are seen as vital research cases for energy transitions (Rotmans et al., 2001). It is research that means to understand how cities contribute to the development of sustainable urban energy systems characterised by renewable energy resources and efficient energy use (Droege, 2011).

In response to these pressures, the Chinese central government has set ambitious targets to be achieved by 2020: (1) a reduction of CO₂ emissions per unit of GDP by 40–45% relative to 2005 levels, and (2) an increase of up to 15% in the non-fossil energy share of total primary

energy consumption (State Council, 2009). A number of different energy policies have been introduced by the central government with the aim of reaching these objectives. In this paper we will investigate the Chinese energy efficiency policy framework, which is central to Chinese energy transition policy making. The implementation and attainment of energy efficiency targets at a local level is compulsory, and is steered top-down by the central government. The central government issued compulsory energy efficiency targets in the 11th (2006) and the 12th (2011) Five-Year-Plan (FYP): Energy intensity, measured as CO₂ emissions per unit of GDP, should decrease by 20% between 2006 and 2010 (State Council, 2006) and by a further 16% during the 12th FYP (2011–2015) (State Council, 2011a). The central government's confidence was high when these mandatory energy intensity targets were translated to top-down implementation schemes for lower levels of government and were supported by a strict conformance-based measuring system to validate implementation at a local level. Xu Shaoshi, Minister of China's National Development and Reform Commission (NDRC), stressed the strict implementation regime during the 8th session of the 12th National People's Congress (NPC) Standing Committee saying: “we need to keep pushing energy efficiency policies with an ‘iron hand’ to ensure these binding targets are achieved” (NPC, 2014).

The strict energy targets and strong adherence thus far to pushing

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with an ‘iron-hand’ regarding implementation, have resulted in creative but also rather problematic implementations at the local scale. To illustrate: in 2010 the local government of Anping County cut off water and electricity supplies in residential neighbourhoods, forcing hospitals to shut down health-care one day per week, and traffic lights to be switched off, to ensure that policy goals were met in the final year of the 11th FYP (China Greentech Report, 2013). Such extreme measures arise from local authorities feeling compelled to meet national FYP targets at any cost. The result is a real risk that the current use of strict central targets and top-down implementation will overlook the interrelatedness of energy systems with other local societal systems by forcing local authorities to comply with an a-priori prioritisation of energy targets above possible other essential local needs. In the meantime, academic research has convincingly shown that shifting to a sustainable energy system is a complex process involving multiple societal changes, ranging from economic and behavioural change, to the development of new technologies and the consideration of spatial changes (Kemp and Loorbach, 2006; Scrase and Mackerron, 2009). Energy production from renewables, for instance, requires much more space than production from fossil sources (Sijmons and Van Dorst, 2012). Another issue is that households, companies, trade associations, and other social organisations will have to alter their prevailing attitudes and responses towards new energy systems (Andrews-Speed, 2012). In effect, both a large variety of activities and actors have to be involved in the shift to a more sustainable energy system. These actors and stakeholders vary in their aspirations, visions, wishes, perceptions, and knowledge and may thus generate tensions and conflicts between policy priorities, notably at the local scale where diverse aspects need to be balanced (e.g., de Boer and Zuidema, 2015; Wüstenhagen et al., 2007).

Clearly then, energy issues do not occur in isolation, but are interrelated with other local issues, policy ambitions and stakeholder interests that collectively influence policy development and implementation. As such, shifting to a sustainable energy system within a local realm is ideally based on an understanding of the interrelatedness of energy systems with the local socio-economic and physical circumstances (e.g., de Boer and Zuidema, 2015). Such an understanding can be difficult to translate into centralised policy formats and initiatives, as these tend to be less capable of responding to various unique and detailed local circumstances and stakeholder interests (e.g., Burström and Korhonen, 2001; De Vries, 2000; Zuidema, 2017). Instead, it seems sensible to at least allow local authorities some flexibility in implementing central policies so as to respond to specific local circumstances and stakeholder interests (e.g., Matland, 1995). Such flexibility seems especially relevant when policies mean to impact highly different localities, such as in China. China is a large country and local circumstances vary greatly across different regions, including differences in resources used, geography, demography, and the socio-economic status and related structure of the economy. Although the Chinese energy efficiency policy framework does take some varying local circumstances into account by assigning localities different targets, it remains unclear if the framework allows for flexibility in the face of the highly different Chinese localities. Our ambition is to investigate how the Chinese energy efficiency policy framework functions when applied under very different local circumstances.

Our research departs from previous studies concerning the implementation of Chinese energy efficiency policy. Some of these studies examined what actions and measures were employed by local authorities to conform with state planning mandates (e.g. Kostka and Hobbs, 2012; Zhang et al., 2011; Zhao et al., 2014). Others paid attention to interpreting the phenomenon of policy implementation gaps (e.g., Lo, 2014a, 2014b; Wang, 2012). Nevertheless, these previous studies have predominantly zeroed in on one particular area, especially in energy-intensive and industrialised regions such as Shanxi province and Changchun city. Hence, they are only offering limited information about how the Chinese energy efficiency policy framework functions

under different local circumstances. Furthermore, these studies focus on identifying reasons for poor implementation of energy efficiency by specifically addressing the rigid, top-down target allocation system in China (Kostka, 2015; Zhao and Wu, 2016). They pay less attention to the way in which implementation is evaluated and localities are held accountable. International studies on policy implementation have shown that evaluating policy success need not just be about controlling conforming to targets, but might also assess how the targets influenced the actual work or performance of implementing authorities within different contexts (e.g., Oliveira and Pinho, 2010). Moreover, performance oriented evaluation has rarely been discussed in Chinese academic debates (e.g. Tian and Shen, 2011). Therefore, we will investigate the Chinese energy efficiency policy framework to understand how policy design on both target setting and evaluation is impacting and driving the implementation at the local scale.

Next, in Section 2 we introduce and discuss the notions of conformance and performance in relation to policy implementation. This discussion serves as background for the analysis of the Chinese policy framework on energy efficiency in Section 3. In Section 4 we introduce our methodology, which investigates how four different Chinese city municipalities have responded to national energy efficiency policies. In Section 5 we discuss the coping mechanisms of these municipalities with the energy efficiency policies and bottlenecks that local governments are suffering from. There is a reflection on the Chinese approach in our concluding Section 6, where we argue for increased flexibility in both of the targets set by the central state as well as the system of measuring policy success so as to promote an improved performance towards reaching energy efficiency targets.

2. Conceptual discussion related to policy implementation

Up until the 1970s, policy implementation was rarely on the agenda of policy scientists (e.g., O’Toole, 2000; Schofield, 2001). Instead it was largely assumed, with a high degree of certainty, that well-designed plans and policies would deliver their objectives. Starting with authors such as Pressman and Wildavsky (1973) and Derthick (1972), it became increasingly clear that policy implementation proved to be much less evident in practice than had been previously expected. A rich academic debate grew apace (e.g., Goggin, 1990), prominently featuring studies on balancing the desire for effective top-down policy delivery in the local realm with the desire to allow for locally sensible policy responses (e.g., Elmore, 1979; Matland, 1995; Sabatier et al., 1986). These studies demonstrate that degrees of local discretion in dealing with centrally stated policy ambitions indeed depend on a combination of policy design and policy evaluation.

Local discretion is firstly influenced by how central policy ambitions are expressed and assumed to be translated across multiple tiers of government. As was explained by scholars, such as Elmore (1979) and Sabatier (1986), central policies can allow for different degrees of differentiation based on variations in local circumstances. At one extreme, central policy ambitions are generic with each lower level of authority being expected to meet the same uniform targets. Alternatively, central policy ambitions can also be differentiated with different localities being expected to deliver different targets based on different local circumstances. In both cases policy implementation remains top-down, but in the latter case it is sensitive to knowledge of the detailed local circumstances. Acquiring such knowledge can, however, be problematic for central governments (Burström and Korhonen, 2001; De Vries, 2000; Fleurke and Hulst, 2006), thus implying that differentiation in targets might fail to sufficiently take local circumstances into account. Consequently, it is also possible to allow for some flexibility in central ambitions itself, as discussed by Matland (1995) and Sabatier (1986). Central policy ambitions can then be stated in more strategic or ambiguous terms in order to allow for modifications to these policies as they get translated to lower levels of authority (e.g., DeLeon and DeLeon, 2002; Yanow, 1998). In this way,

local circumstances are able to directly influence the development of local policies in a context of centrally stated policy ambitions.

This discussion of target setting also brings us to the ways in which central governments evaluate policy implementation as is expressed with the difference between conformance and performance (e.g., Mastop and Faludi, 1997; Oliveira and Pinho, 2010). To date, the research on policy implementation in relation to policy evaluation in China has received limited attention. As Tian and Shen, p.11 (2011) state, “... there has been few publications addressing the evaluation of plan implementation”. A strong focus of existing studies has been on the instrumental use of disparate evaluation criteria on conformance and performance to assess plan implementation, such as in land use (e.g., Zhong et al., 2014). However, a conceptual discussion through the lens of conformance and performance to understand policy implementation has been lacking. This discussion would also provide an alternative perspective to reflect on the Chinese strategy on energy efficiency.

Conformance follows a straight, linear logic between policy intent and policy outcomes (Faludi and Altes, 1994) and assumes a direct one-to-one relationship where outcomes of policies should directly support the objectives, intent and measures expressed in a plan or policy. Therefore, conformance essentially assumes that policy success depends on whether consequences in practice are consistent with policy-makers’ initial plan. Alternatively, ‘performance’ shifts our attention to what happens with the policy (Faludi, 2000) or plan and whether plans ‘facilitate decision-making’ (Faludi, 1989, p.138). Performance considers plans, policies and even targets as a guide for future decisions and emphasises the planning processes that occur after the initial plans and policies are adopted (Alexander and Faludi, 1989; Baer, 1997; Mastop and Faludi, 1997). Instead of conformance to stated ambitions and targets per se, performance focuses on the process of ‘getting something done’ (Macleod and By, 2007, p. 335). In this approach, outcomes do not need to adhere strictly to ambitions and targets set. Instead, success is defined by the degrees to which implementers have actively engaged with these ambitions and targets, including how they ‘perform’ within a context of both the targets and the detailed circumstances they face. Modifications to these ambitions and targets are then permissible and possibly desirable. The idea being that practice needs to be adaptive to an ever-changing and situational environment, that is confronted with many uncertainties and conflicts, whilst also loosely coupled within societal institutional settings (Laurian et al., 2004). Therefore, as de Roo, p.118(2003) argues, “the performance of decision-making is a phenomenon in planning that clearly derives from a growing recognition of the role and position of actors in various institutional contexts”. Performance thus highlights situational contexts and sees planning issues as strongly interwoven within local institutional contexts.

The choice between a strict top-down, conformance-oriented policy design and a more flexible bottom-up, performance-oriented policy design can be connected with conditions of complexity. de Roo (2003) argues that policy conformance is most suitable if the issues and circumstances faced are of limited complexity. Such issues and circumstances are characterised by relatively straightforward, clear cause-and-effect relationships and where there is little societal debate on the objectives to pursue and the interventions to take (see also Christensen, 1985; Zuidema, 2017). Under such circumstances conformance to ambitions and targets seems not only feasible, but is also considered as widely accepted. Supported by strong top-down and ‘command and control’ policy design, conformance is now often preferably used as an evaluation criterion so as to ensure that dictated objectives are achieved (Brody and Highfield, 2005; Macleod and By, 2007).

When conditions of complexity increase, cause and effect relationships become increasingly ‘fuzzy’ and there are usually multiple, interdependent and potentially conflicting goals needed to be pursued (e.g., Christensen, 1985; de Roo, 2003; Zuidema, 2017). Moreover,

participating actors, available resources, problems and potential solution strategies will differ according to specific local circumstances (see also Cohen et al., 1972). Under these circumstances it becomes attractive to balance alternative local interests and priorities based on how they are locally interrelated and context-dependent. Pursuing policy targets set a-priori to such balancing can be problematic, as it fails to take such interdependencies and contextual circumstances into account. Policies drafted a-priori can be commonly seen in a Chinese governance system. For example, Liu et al. (2012) show how Chinese environmental governance approaches “make local governments meet specific targets but ignore other environmental challenges. It creates institutional lock-in where only some urgent environmental challenges are addressed, while complex social-ecological changes can always generate new challenges” (p. 108). Thus, adopting a top-down and command-and-control policy approach with strict, centrally issued targets and compliance-based policy evaluation not only seems to be less effective but also less desirable. Instead, issues would ideally be dealt with by also allowing for a bottom-up and area-specific approach, which considers local circumstances and the interrelations between various interests and priorities (de Roo et al., 2012). However, with performance, it is the explicit intent to allow ambitions and targets to be translated within a context of local situational circumstances and to become more tailor-made to unique local contexts. Thus, performance-based evaluation is now attractive as it also defines a plan or policy as a learning process (Oliveira and Pinho, 2010) and emphasises the suitability of a plan where decision-making should be adapted to the surrounding contexts.

Obviously, degrees of conformance and performance oriented policy evaluation can be mixed, where both meeting targets whilst respecting local circumstances can be combined (e.g. Matland, 1995; O’Toole, 2000). Current Chinese practice remains strongly focused on conformance oriented evaluation and is reliant on top-down and command-and-control approaches (e.g., Tian and Shen, 2011). Pursuing energy efficiency will certainly affect pursuing other local policy priorities and the exact interrelations between energy efficiency and these priorities will also be different given the vast differences in local circumstances across China. Hence, focusing largely on conformance might well pose a risk within the current design of the Chinese energy efficiency policy framework.

Firstly, top-down target setting may fail to be sensitive to wide variations between cities, especially as the central government might not have the available knowledge of local differences to set the ‘right’ targets (Kostka, 2015). Secondly, the conformance-oriented policy evaluation might even aggravate problems and could force local authorities to prioritise the superimposed targets (e.g., energy efficiency) at the expense of other policy priorities (e.g., spatial, environment, social, economic, etc.). The adverse consequences regarding one of these other priorities might even become extreme, as the example of Anping County vividly illustrates. Finally, a focus on only conformance could possibly overlook actual local performance. For example, a city that does not conform to targets may still have made impressive improvements despite difficult local circumstances, whilst a city that does conform may have made fewer improvements and instead be benefiting from favourable local circumstances. Hence, a conformance perspective might fail to neither capture what has actually happened locally nor place local action beyond the frame of conformance. In our discussion of the empirical findings in Section 5, we will also show that each of these three issues is indeed relevant for understanding and evaluating China’s energy efficiency policy framework.

3. An urban energy transition strategy in Chinese central government

In China, energy intensity is a measure used in policies to estimate and assess energy efficiency at the national macro level, by relating the units of energy to the unit of GDP (Price et al., 2011, 2010). Energy

efficiency essentially implies using less energy in a system for performing the same function (Oikonomou et al., 2009). Various scholars advise that measuring energy efficiency based on energy intensity data can be misleading (Kapusuzoglu and Karan, 2013; Proskuryakova and Kovalev, 2015) because: “Energy intensity does not provide a basis for specific recommendations on energy efficiency development...and the direct outcome of decreasing energy intensity is decoupling economic growth from energy consumption...such decoupling does not necessarily result in achieving ultimate energy efficiency” (Proskuryakova and Kovalev, 2015, p. 458).

To achieve its energy intensity targets, the Chinese central government has developed a variety of national policies. The strongly hierarchical administrative system leaves little room for deviations from top-down issued targets. Hence, there is only limited room to negotiate targets between different levels of government or at the local level between local energy departments and other local policy departments or stakeholders (Qi, 2013). The *Action Plan on Energy Efficiency and Low-carbon Development (2014–2015)* (State Council, 2014), and other sectoral energy efficiency policies (i.e. for industry, building and transport) present good examples of this model.

Our document analysis of current Chinese national energy efficiency policies and regulations shows that these are strongly technical and standardised.¹ They provide clear details on specific quantitative targets that the lower levels of authority need to meet. Such concrete targets in the 12th FYP period, for example, dictate the specific reduction of main pollutants in air (SO₂, -8%; NO_x, -10%) and water (NH₄, -10%); and the specific energy intensity reduction in railways (-15%), commercial vehicles (-5%), and the aviation industry (-5%) (MOT, 2011). Other savings are to be realised in a 116 Mtce reduction of energy use in public buildings (MOHURD, 2012); more small fossil fuel-fired power plants needing to be shut down; and strict restriction standards being put in place for high energy consumption products, covering appliances related to lighting, heating and cooling. These national targets are mandatory for lower tiers of government. The energy efficiency targets do show some variation inspired by different regional circumstances. Nevertheless, variation arguably remains modest, focused only on provinces and with the 31 provinces classified into only five tiers (Table 1).

The exact allocation of municipal targets and the evaluation of policy implementation are based on the ‘Target Responsibility System (TRS)’. Rules of TRS mainly include (1) allocating fixed mandatory targets for lower-level authorities, stepwise, from national to provincial (see Table 1) and from provincial to municipal and county levels (Fig. 1); (2) signing ‘Target Responsibility Contracts’ layer by layer between upper administrative level governments, their subordinate authorities and key energy-consuming enterprises; and (3) evaluating the implementation outcomes on whether the required targets are met. Most importantly, the TRS dictates that local officials and enterprise leaders have to be held accountable for the implementation results: achieving the targets is a matter of importance for local leaders, who are assessed annually on their political presentation, and can be key to their political careers (Lo, 2014b; Zhao et al., 2014). The direct target ‘delivering’ and ‘accountability’ system is therefore a powerful incentive and a significant tool for compelling officials at each governmental level to conform to targets, instructions or policies issued by the central government (also Wang, 2012). Fig. 1 indicates that each government at a higher level can directly translate targets to subordinate authorities, while local governments are mainly responsible for implementing and reaching them.

¹ These include: 11th FYP Medium and long-term plan for energy conservation (NDRC, 2004); Comprehensive work plan for energy conservation and emission reduction for the 12th FYP period (State Council, 2011a); 12th FYP Energy conservation and emission reduction (State Council, 2012); Action plan on energy efficiency and low-carbon development (2014–2015) (State Council, 2014); 12th FYP Building energy conservation plan (MOHURD, 2012); 12th FYP Road and water transportation conversation plan (MOT, 2011).

Table 1

Provincial allocated energy intensity reduction targets in the 12th FYP period. Source: State Council (2011a); NDRC (2015).

| Target | Provinces | Provinces missing targets (until November 2015) |
|--------|---|---|
| 18% | Tianjin, Shanghai, Jiangsu, Zhejiang, Guangdong | – |
| 17% | Beijing, Hebei, Liaoning, Shandong | – |
| 16% | Shanxi, Jilin, Heilongjiang, Anhui, Fujian, Jiangxi, Henan, Hubei, Sichuan, Shannxi, Hunan, Chongqing | – |
| 15% | Inner Mongolia, Guangxi, Guizhou, Yunnan, Gansu, Ningxia | Ningxia |
| 10% | Hainan, Tibet, Qinghai, Xinjiang | Xinjiang, Hainan, Qinghai |

Next to target setting, the TRS evaluation framework sets procedures, rewards and penalties into quantifiable variables (State Council, 2007). Those variables are then translated into a nationwide scoring system to hold local authorities accountable according to a centrally decided benchmark. Lower level governments are allowed to add elements to this evaluation scheme, but they must also remain within the reference of the central government issued system. This means that local authorities can add stricter measures to guarantee that targets are successfully reached in addition to having to comply with the two state-issued evaluation criteria of ‘Target-Checking’ and ‘Action-Checking’ (Table 2). ‘Target-Checking’ assesses the compliance to allocated targets and comprises 40% of the total score. The remaining 60% corresponds to the second criterion, referred to as ‘Action-Checking’ (State Council, 2007). Here, local governments are assessed on how they followed mandatory tasks in order to reach their energy efficiency improvements. Examples of such measures include establishing and implementing an energy benchmarking system, monitoring energy consumption for lower-level governments, and having critical enterprises meet given targets (Table 2).

To some extent, ‘Action-Checking’ seems to capture local performance. After all, it is not directly interested in meeting the target, but rather in ‘getting things done’. However, as Lo indicates, these actions are largely focused on organisational tasks and “are symbolic, can be easily achieved, and are not directly related to the implementation of low-carbon policies” (2014a, p. 241). Even if ‘Action-Checking’ was to be seen to capture performance, the most important aspect of the TRS is that ‘Target-Checking’ is designated as a ‘veto criterion’, which means that if assigned targets are not met (non-conformance), policy implementation will always be evaluated as failed. Conformance is thus crucial for municipalities in gaining further state support and for the future career paths of local officials and enterprise leaders. This does not mean that ‘Action-Checking’ is of no relevance. In the case of conformance, a higher overall score increases the likelihood of cities to attract additional provincial or state support and opens opportunities for local leaders to be promoted. Also, in the case of non-conformance, a higher overall score might act as a buffer to reduce state or provincial pressure and negative impact on future careers. Still, what stands out is that the score received is much less relevant than meeting the targets. Even if we regard the score received as representing performance, conformance is still the main driver for local action.

4. Case and methods

The research presented here follows a qualitative case study approach: the four case study cities have been selected to cover a broad diversity of different urban conditions such as resource distribution, population size, industrial structure, and economic development. The diversity of urban conditions is intended to investigate whether the cities exhibit different responses and coping mechanisms based on

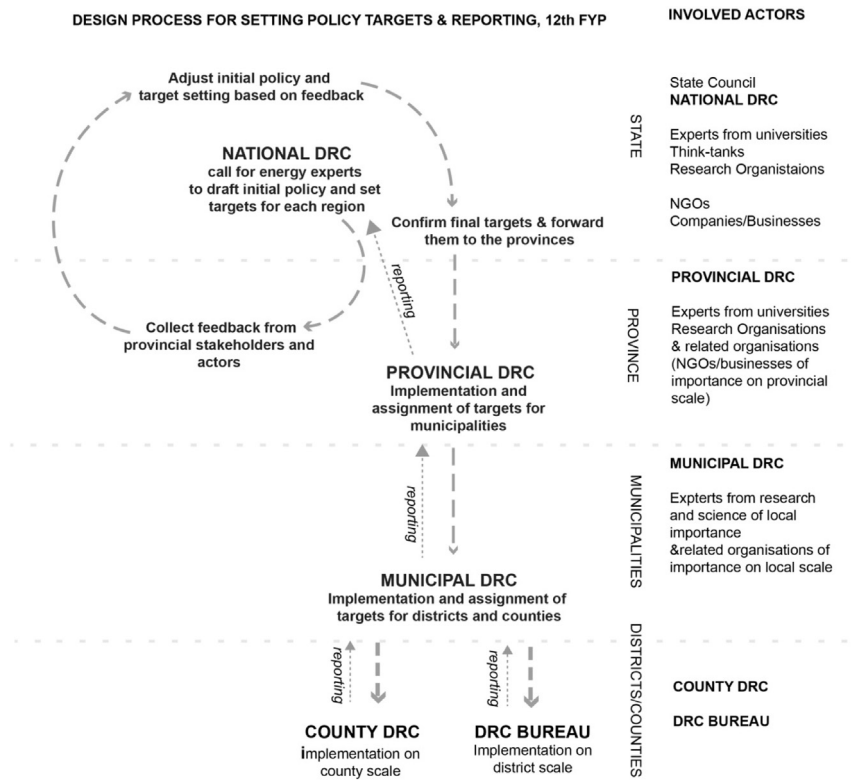


Fig. 1. Energy-intensity target setting and translation process during the 12th FYP period. Source: according to Li et al. (2013).

Table 2
TRS – Target responsibility system sets a national scoring framework for energy intensity. Source: State Council (2007).

| Criteria | Contents | Scores | Details |
|------------------------------|--|--------|---|
| Target-Checking (40%) | Reduction in Energy consumption per unit GDP | 40 | 40 points for meeting the target, 36 if finished 90%; 32 if finished 80%; 28 if finished 70%; 24 if finished 60%; 20 if finished 50%; no points below 50%. 3 extra points for exceeding the target by 10%, maximum 9 extra points. If not 100% (40 points), the overall evaluation will be 'fail' |
| Action-Checking (60%) | Adjust and optimise industrial structure | 20 | <ul style="list-style-type: none"> ● Increase the share of the tertiary industry (4 points) ● Expanding high-tech industry (4 points) ● Evaluating energy conservation in fixed assets investment projects (4 points) ● Achieving the annual targets of closing down backward production projects (8 points) |
| | Financial investment and key projects implementation | 10 | <ul style="list-style-type: none"> ● Setting up a special fund for energy conservation (3 points) ● Increasing the proportion of expenditure on energy conservation (4 points) ● Implementing major energy conservation projects (3 points) |
| | Technology investment and use | 9 | <ul style="list-style-type: none"> ● Including energy conservation technologies into annual technology development plan (2 points) ● Increasing the expenditure of developing energy conservation technologies (3 points) ● Implementing energy conservation demonstration projects (2 points) ● Promoting energy-saving products and technologies (2 points) |
| | Energy intensity reduction in key enterprises | 8 | <ul style="list-style-type: none"> ● Achieving the energy reduction targets of key energy-intensive enterprises (3 points) ● Monitoring energy intensity reduction in key enterprises (1 point) ● Achieving the targets of implementing energy-saving standards for new buildings (4 points) |
| | Law and regulation implementation | 3 | <ul style="list-style-type: none"> ● Implementing energy saving law (1 point) ● Monitoring law implementation (1 point) ● Implementing limiting standards for energy-intensive products (1 point) |
| | Target Allocation | 3 | <ul style="list-style-type: none"> ● Allocating targets to lower levels of government (1 point) ● Evaluating target attainment in energy reduction (1 point) ● Publishing energy consumption statistics (1point) |
| | Rewards and penalties | 5 | <ul style="list-style-type: none"> ● Capacity building (1 point) ● Improving energy statistics system(1 point) ● Implementing training system (1 point) ● Reward and penalty system (1 point) ● Equipping energy measuring instrument (1 point) |
| | Coordination and monitoring ability | 2 | <ul style="list-style-type: none"> ● Setting up an evaluation and monitoring system (1 point) ● Setting up a coordination working mechanism (1 point) |
| Total | | 100 | |



Fig. 2. Location of the four case study municipalities. Source: Authors.

their particular context and conditions. (Fig. 2).

Lanzhou (population: 3.61 million and Hohhot (population: 2.86 million) are located in the north west of the territory. Both cities are economically underdeveloped areas and are still heavily reliant on the traditional industrial model of high energy demand (e.g., coal, petroleum and gas). They are providing electricity and industrial materials for other Chinese areas. For example, over one-third of the annual power supply generated from fossil fuels in Inner Mongolia (where Hohhot is located) is exported to other regions, especially to the higher developed China East coast (Liu, 2015). Liu (2015) noted that carbon intensity in such fossil-rich provinces is generally over five times higher than in developed economic regions. Striving hard for increasing the GDP, both cities are challenged to balance the GDP goal with the goal of reducing energy intensity.

Yangzhou (population: 4.4 million), is located in the economically strong eastern part of the country. Its strong economic development is depending on resources from fossil-rich areas in China. Statistical data shows that 96.5% coal, 90% oil and 54.3% gas are extra-regionally supplied (Yangzhou New Energy Model City Plan, 2012). In different policies and strategies the city commits to the goal of reducing its energy intensity and its external dependency on fossil-fuel. Chengdu (population: 14.4 million) is located in mid-west China. Chengdu's economic performance is based on the service sector, which already surpassed the industry sector in 2013 (Chengdu Statistical Yearbook, 2014). Chengdu is rich in natural gas and coal resources and is thus comparatively self-sufficient regarding its energy supply.

The research is based on a document and policy analysis including legal documents, reports and Chinese research reports.² In parallel, an explorative focus group at a workshop in China was conducted for an initial screening (China Decentralized Energy System, 22–25th December 2014, Guangzhou). The policy analysis and initial screening formed the basis for the case study selection and the development of the interview guidelines for the semi-structured interviews. 25 interviews were conducted at the on-site fieldwork in November and December 2015 in the four case study cities: Lanzhou (6 interviews) Yangzhou (6), Chengdu (5) and Hohhot (5). Three interviews were conducted in National Governments and in the National Renewable

² These include: Renewable Energy and Energy Efficiency in China: Current Status and Prospects for 2020 (2010); Annual Review of Low-Carbon Development in China (2013); governmental policy documents (e.g., provincial and municipal energy conservation plans); and media reports.

Table 3

Reported data of energy intensity among the four case studies during the 12th FYP. Source: Fieldwork; Inner Mongolia Gernal Office (2012); Lanzhou General Office (2011); Jiangsu Gernal Office (2012); Sichuan General Office (2011).

| Cases studied | Given targets | Reported target fulfilment |
|---------------|---------------|----------------------------|
| Lanzhou | 17% | 26.24% (over fulfilled) |
| Hohhot | 16% | 16% |
| Chengdu | 16% | 16% |
| Yangzhou | 17% | 22.1% (over fulfilled) |

Energy Research Institute in Beijing. The interviews include 16 with different levels of government (national, provincial, municipal, district) and different departments that are occupied with energy related matters (Departments of Energy, Resources and Environmental Protection, Planning, Industrial, and Economy); 5 with academic scholars; and 4 with project managers of energy enterprises. The interviews were transcribed and a qualitative content analysis was performed with ATLAS.ti (Mayring, 2015).

5. Does that work? Bottlenecks and implementation inefficiencies at the local urban scale

In this section we identify responses and coping mechanisms present in the case study cities. We use the perspective outlined in Section 2 to illustrate the case study cities' approaches to cope with the national energy intensity policies.

5.1. Target setting

During the period of the 12th FYP, the four case study cities received the following mandatory targets for reducing their energy intensity (Table 3): Lanzhou, 17%; Hohhot, 16%; Chengdu, 16%; Yangzhou, 17%. It can be seen that only minor differences exist in target setting although major differences exist regarding the general local conditions and economic viability. To help local governments to achieve given targets, the Chinese central government provided a series of specific measures and tasks that were detailed in the 12th FYP Energy conservation and emission reduction (State Council, 2012). These tasks were compulsory and local governments were required to implement them. The selected key tasks include:

- Closing down small plants and eliminating obsolete production capacity in the areas of power generation, iron and steel, electricity, aluminium, calcium carbide, coke, coal, cement, and flat glass. For example, the plan calls for closing 20 Gigawatts (GW) of small thermal power generating capacity and inefficient production facilities responsible for 480 million tons of iron and 480 million tons of steel capacity. In addition, inhibiting the development of high energy-consumption industries and encouraging renewable energy use.
- Ten key energy-saving projects: aiming to increase energy efficiency through optimising their economic structure and by promoting more energy efficient technology. Initiatives including coal-fired industrial boiler retrofits, district cogeneration projects, petroleum conservation and substitution projects, and energy system optimisation are described.
- Top-1000 enterprises program: central government setting clear energy efficiency targets and responsibilities to China's largest energy-consuming enterprises, which are from nine sectors such as iron and steel, coal mining, textiles and paper.

Even though the case study cities were all regulated under national measures, they exhibited a high level of variation in their coping mechanisms. Our findings show that Lanzhou and Hohhot felt greater

pressure, than compared to Chengdu and Yangzhou, in coping with the above-mentioned national tasks and in meeting the given energy intensity targets.

Economically weaker cities, like Lanzhou and Hohhot, were under increased pressure by central government to catch up with other cities in terms of economic growth and thus to narrow the economic gap between themselves and the economically more advanced regions (State Council, 2011b). Hence, next to stimulating GDP growth, the cities also have to target energy reduction in their heavy industry based economy. Thus, governmental officials argued that the energy policy and targets are not reflecting local conditions and are in conflict with local capacities and policy priorities, especially fostering revenue growth and increasing the local GDP. Boosting GDP growth and creating jobs are also crucial for the local leadership, because the central government assesses the performance of the local leadership based on those criteria. The case studies illustrate that success and overachievement are beneficial for pursuing individual career pathways, which aligns with work from Jia et al. (2015). Policy targets such as job creation, GDP and revenue growth, and the improvement of local livelihoods are rigid and compulsory national targets. Non-attainment reduces both individual career prospects and potential political rewards (HUHT02, 2015).

Furthermore, the research illustrates additional local tensions resulting from the relocation of energy intensive industry to the western part of the country, such as Hohhot and Lanzhou. These relocations are expressed as outcomes of two trends: (1) the national economic policy intending to shift traditional industries to the economically weaker areas to the west, and (2) the companies market compliant behaviour in relocating companies to areas with cheaper production costs: “large-scale high-energy consumption industries and enterprises operating in developed eastern coastal areas have begun to transfer to less-developed western and northern regions due to China’s regional economic structure adjustment” (BJ01, 2015). Subsequently, for these cities the struggle to meet the national energy targets might increase, but in parallel the relocations can be beneficial for the goal of GDP growth: “increasing local economy and improving people’s well-being is our top priority rather than energy reduction” (HUHT04, 2015), and “we have to grasp the opportunity of the eastern industry transferring so as to speed up local economy” (LZ03, 2015). However, those developments might lead to local tensions: whilst national targets require shutting down energy intense and technically out-dated facilities, these cities still canvass low-efficiency industries and out-dated technological facilities with lower energy and environmental standards. Local representatives are arguing that companies facilitating that kind of technology were, and are, major taxpayers that should be supported. Furthermore, the local governments do not have the financial capacity to subsidise these companies to update their technical standards (HUHT01, 2015). Finally, these two cities are additionally burdened with extra energy expenditures to transfer the energy to economically better-developed areas such as Yangzhou. This is caused by the fact that the energy needed to transport fuel goes on the account of the production area while the consuming area goes free.

Despite already moving towards a service industry, Chengdu’s industrialisation level is still somewhere in between the eastern and western regions (Chengdu Scientific Development Report, 2013). Although with less pressure compared to western cities, local governmental officials are still challenged to achieve energy targets: “this industrial structure optimisation is a rather long-term, slow and complex process, which involves local stakeholders’ various interests” (CD01, 2015). However, energy reduction targets have to be strictly met within the given time, therefore “we worried about that if we push the agenda of optimisation too hard or too fast, it could affect social stability, employment and even GDP growth” (CD01, 2015).

In cities with strong tensions between GDP growth and attaining energy targets the need to conform to both can cause dubious last-minute practices during official inspections. Examples include the

temporary reduction of energy consumption or even shutting down high-energy industries during such official inspections. These are then re-opened once inspections have passed. “Poorly adapted energy targets and strict evaluation force us to show compliance by whatever measures” (LZ01, 2015). However, similar strategies also occurred in more economically advanced cities like Chengdu: Being easy in general but tight when inspection comes. More specifically, the government assisted to approve and operate energy-consuming projects at the beginning of the year, while once the time came to evaluate the targets, the local authority required ‘unfavourable’ factories related to steel, petrochemical industries to slow or stop production (CD02, 2015). GDPism may meet with little local government enthusiasm and motivation to push the energy efficiency policy implementation forward. Especially since the relational measure of energy intensity does not convey actual energy reduction and policy performance.

Cities like Yangzhou (high-tech industry) and, to some degree, also Chengdu (service industry) show slightly different responses to Hohhot and Lanzhou due to their different economic context. They have transferred much of their heavy industries to other locations and, combined with a slowing down of their economic growth, they are experiencing a decrease in energy consumption (YZ02, 2015). Compared to the aforementioned two cities, Yangzhou has less pressure in meeting targets for reducing energy intensity. It has achieved a certain stage of industrialisation characterised by shifting to high-tech industries and a modern service industry while the extensive development of heavy industries has slowed down (YZ02, 2015). Consequently, the required tasks and targets, such as closing down small plants and phasing out obsolete production capacity, are relatively easy to implement and achieve. It can even result in them surpassing the national targets.

Target setting by central government has been adapted between the 11th and 12th FYP (Zhao and Wu, 2016) and thus a shift took place from a generic 20% reduction during the 11th FYP to a more nuanced scheme in the 12th FYP (Table 1). The cases nevertheless illustrate a certain level of insensitivity in target setting: economic powerhouses with strong GDP growth rates and already changing industrial structures (such as Yangzhou) have to attain more ambitious targets than cities that are energy producing and rely on heavy industry for GDP growth (such as Hohhot or Lanzhou). Their coping mechanisms may reflect the potential problems arising from the present method of setting targets in Chinese energy intensity management. The top-down and relatively generic target setting approach focuses exclusively on attaining energy targets without inquiring into whether these targets provide sufficient incentives in more advanced cities. Furthermore, these targets are pursued regardless of whether or not they are realistic in the face of local circumstances in other cities. Consequently, these targets tend to conflict with policy priorities that local scale authorities also have to meet, such as their economy and employment circumstances. Policy conflicts are general and global phenomena, but the research illustrates specifics for the Chinese context: (a) GDPism: the goal to boost the GDP results in energy intensity targets being regarded as less crucial, (b) Career prospects: increasing GDP is a key criteria for individual career prospects and political career pathways, and (c) what matters is the goal attainment and policy conformance, not the actions or the process how the goal was achieved. Since non-conformance to energy intensity targets have (personal) political and financial consequences, cities resort to extreme and unreasonable measures to show their compliance with the given decisions. Consequently, the centralised system does not encourage, and even discourages, active engagement at local levels to smartly balance local multiple interests.

5.2. Bottlenecks in the evaluation of the policy implementation

As shown in Table 2, the current target measuring system consists of two main evaluation frameworks: Target-Checking (40%) and Action-Checking (60%). Target-Checking measures only the reduction

of energy intensity whereas Action-Checking offers a range of different actions and measures to achieve policy goals.

5.2.1. Target-checking

The key component of the TRS is the targeted reduction of energy intensity, which is a veto criterion of the evaluation scheme. NDRC data indicates that, until November 2015, only 4 out of 31 provinces did not achieve the energy intensity targets during the 12th FYP (NDRC, 2015). In reaching an overall success rate of 90%, with some localities even over-performing (see Tables 1, 3), the policy implementation could be considered a major success. Such over-achievement, as seen in Lanzhou and Yangzhou, is beneficial because it increases the chances to obtain rewards and additional funding from the central government, like the low-carbon city pilot project. Receiving such rewards encourages cities to raise their reputation to attract new investors and business ventures to their cities, and subsequently supports the job market and the core policy goal of GDP growth.

However, a more critical reading of the case study results could also indicate that the high success rates are a consequence of less ambitious goal setting due to less successful policy implementation during the previous FYP period, aligning with the work by (Lo, 2014a). Our case study results align with the work of Ran (2013), showing that creative data handling, downplaying failures, exaggeration of achievements and prettification of single actions and measures are common ground when it comes to target checking: “it is impossible to meet all the given targets, so we have to take whatever actions that can help us showing conformance” (LZ04, 2015). Our case study respondents argued that their imperative has been to stick to these given targets, at least to show compliance to higher levels of government, as the strict compliance-based evaluation directly affects the overall government's reputation and individual career prospects (CD02, 2015).

All four cases indicate that the tensions between career prospects, improving city reputation, GDP growth, and achieving national energy goals might lead to a somewhat creative approach regarding data management and analysis. The lack of a coherent standard for measuring energy intensity, along with ineffective energy statistic monitoring systems, creates an action space for the cities to facilitate the most promising methods to present results confirming policy conformance. Additionally, non-standardised data collection, and incomplete and mismatched data regarding industrial energy intensity, forces the cities to base calculations on whatever data they have available. For example, not every industrial enterprise can provide its exact energy consumption data, which leads to the data collected being rather selective. This mismatch exacerbates careful monitoring, adaptation and policy learning: “(...) the serious mismatch of statistical data between national and local governments has turned energy conservation into a high-pressure situation.” (NDRC, 2013). As a consequence, deciding on conformance and performance might well become more a matter of (political) choice and interpretation than that of showing evidence.

5.2.2. Performance-oriented action checking

Action-Checking (60 points) is the performance-oriented counterpart to Target-Checking in the policy evaluation system. While Target-Checking focuses on the conformance with explicit goals, cities can collect further points by performing different actions in line with national energy intensity policies (Table 2). The local officials interviewed perceive the Action-Checking part as an easy assignment. Firstly, if Target-Checking is achieved, Action-Checking is merely a less urgent matter of collecting additional points to move up the ‘leader board’. Secondly, many actions are only remotely and indirectly linked to energy conservation, whilst they are also comparatively easy to attain to score points. Hence, meeting actions can support local officials’ political careers, whilst only moderately pushing them to perform on energy intensity reductions.

As illustrated in the previous section, some cases including

Lanzhou, Hohhot and Chengdu achieved the energy intensity targets by taking dubious measures. These measures helped local authorities to easily meet the targets and show their conformance to national mandates, and thus the improper implementation process can be easily overlooked. Another example also shows the flaws of the current conformance-oriented policy evaluation. The measure of energy intensity merges economic prosperity and energy reduction, and therefore indicates the general performance and economic growth of the region:

“At the end of each year, the upper-level governments measure whether the exact target of energy intensity is achieved. Once you know how to play the game, target achieving will not be hard. For example, as long as GDP increases quicker than energy consumption, energy intensity will show a decrease. The policy implementation will then be seen as successful; however, we did not make too much effort on reducing energy usage” (CD03, 2015).

Hence, policy success can be achieved by pushing economic growth whilst performance in the initial policy domain might be comparatively poor. Additional cushioning effects might be related to the fact that Action-Checking performance does not compensate for weak achievements in energy reduction.

Apart from failing to capture ‘bad’ performance, the evaluation system also seems to fail to capture some ‘good’ performances, as the Yangzhou case clearly demonstrates. Yangzhou local government has undertaken great efforts in recent years to shift towards a sustainable energy system. They have implemented and launched different energy conservation actions and measures, such as frequent on-site research, capacity building with different relevant stakeholders to build local coalitions for a better embeddedness of actions, and improving social cohesion. These actions have resulted in considerable energy conservation measures in 2014 (YZ01, 2015), for example:

- 810,000 tce renewable energy, accounting for 7% of total energy consumption, which is above its provincial average (Jiangsu, 6.2%);
- 426 MW PV capacity for solar energy: rooftop solar water heaters in the hospitality industry, public buildings, and residential buildings; installed solar lighting in public areas, saved 438.5 Mwh a year. Consequently, Yangzhou was approved by the State Council as the ‘demonstration city of renewable energy application in buildings in China;
- Jiangsu's first large electric vehicle charging station was installed in Yangzhou, which now has a pure electric bus line and hybrid bus lines;
- 30 new energy communities have installed rooftop and wall-mounted solar water heaters, ground source heat pump cogeneration, electric vehicles, and garbage biogas. All of these efforts towards energy transition make Yangzhou a ‘demonstration city of New Energy Use in China’ (NEA, 2014).

The research illustrates that performance based actions are also conditioned by stronger economic power and capacity (e.g. funding), and a technological (e.g. cooperation and technological exchange) and knowledge-based background (e.g. expertise, tech-capacity (see also Guo, 2014)). However, those actions and measures are not assessed nor are they well-recognised within the current conformance-based evaluation system: “What efforts we have made is hard to be demonstrated within the current evaluation system, because the numbers have the final say. But, we do hope our work can be noticed and thus we might get some financial or technological support from the central government” (YZ02, 2015).

In conclusion, our research shows that local governments have developed different response and coping strategies to achieve a successful policy performance on paper: different economic and political conditions, paired with individual career interests and facilitating energy intensity in order to measure actual energy reduction,

indeed results in implementation deficiencies. It is also problematic for central government(s) to comprehensively examine how ably policy implementation is being carried out, especially as the ways in which these assigned targets are to be met can easily be neglected during policy evaluation. Consequently, negative aspects of implementation can be concealed whereas positive effects are hard to demonstrate. At this point we can conclude that the current TRS evaluation system is not only biased to conformance instead of performance, but is also unable to capture the great variety of performances in the cities studied.

6. Conclusions and policy implications

The Chinese government has drafted a broad variety of policies to reduce energy consumption, improve environmental quality and, in general, to stimulate a transition towards a more sustainable energy system. In being focused on ensuring effectiveness in local policy implementation, China relies on a top-down and compliance-oriented policy design and evaluation system. Although these top-down strategies have yielded several achievements over the last decade, the exclusive use of this approach also has drawbacks. We indeed found some similar coping mechanisms as also identified in earlier research (e.g., power rationing, data manipulation). What we add here are two key points. Firstly, we have been able to show that the Chinese energy efficiency policy framework's strong conformance-oriented perspective can provoke a 'ticking-of-the-boxes' instead of promoting actual policy performance. Meeting a target on paper does not necessarily mean that it was actually met as both available data and how this data is interpreted remains open ended. Hence, deciding on conformance might well become more a matter of (political) choice and interpretation than that of showing evidence. Meeting targets can also be based on measures that cannot be safely assumed to contribute to improving energy intensity. They can be temporal or extreme, whilst economic GDP growth can be seen as a means to create better energy intensity figures as opposed to focusing on improved energy efficiency or actual conservation itself. In other words, a strongly compliance-oriented management only tells a very simplistic story and is not necessarily showing actual levels of performance.

Secondly, we add that failing to really take varying local circumstances into account is among the causes for lower levels of performance. In some cases, the Chinese energy efficiency policy framework overlooks the hardships and extreme measures needed to meet targets (notably in Lanzhou and Hohhot). If conformance occurred, this might well be interpreted as a poor performance due to the extreme measures needed. Alternatively, not reaching targets is seen as a failure, even if the cities performed quite well but the set targets were simply unrealistic. In other cases, the Chinese energy efficiency policy framework overlooks relevant additional measures that could be taken to perform better or that are actually being taken (notably in Yangzhou). At present, the ill-adapted targets for local contexts might result in the underperformance of cities as they are not being sufficiently challenged by the targets or are not being awarded by successes attained.

Whilst some authors (e.g., Liu et al., 2012; Lo et al., 2015) do argue that conformance based targets need to increase in order to create the necessary push factor for local governments, we suggest that decision-makers should also embrace more flexibility and adaptiveness in both target setting and evaluation. Notably, such flexibility should account for differences between local circumstances and, by doing so, search for a better fit between strong top-down policy pressure and the type of actions and ambitions that are feasible given such local circumstances. In doing so, our cases illustrate the importance of a more balanced relationship between conformance and performance oriented targets so as to galvanise local authorities to perform in the initial sense of the policy. We are not calling for the flexibility to avoid or to legitimise not meeting targets. Instead, we are making a proposal for cities to act and to be judged on their actions. Valuing performance higher can

encourage cities to act, even if goals are already met, and hence can create pressure to push cities' performances as far as can be locally considered feasible (e.g., Zuidema, 2017). Additionally, performance evaluation can also avoid mishandling data or taking extreme measures. It can instead promote local authorities to do that which really matters and is also acceptable to stakeholders for pursuing energy intensity reductions. Finally, the action-oriented focus of performance measuring can also be an incentive for cities to become 'action arenas' in which stakeholders are allowed, and even motivated, to experiment and pursue different projects and actions. In such arenas, learning-by-doing and capacity building can be triggered, while provincial and state governments may benefit by learning from local approaches and tested pilots. Within such a context, learning can show which ambitions or amount of state or provincial policy pressure make most sense to drive the performance of different localities as far as is reasonable. Hence, allowing for a more performance-oriented evaluation scheme could be instrumental in the process of developing a national policy framework that becomes increasingly smarter in pushing forward a Chinese energy transition.

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