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Local Climate Governance under the Shadow of Hierarchy: Evidence from China's Yangtze River Delta

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ABSTRACT

This study examines the making of local climate governance in the Chinese setting where central-local inter-governmental relations continue to play critical part in almost every policy domain. Through analysing the climate responses of the three provincial-level governments at the Yangtze River Delta (YRD), the paper argues that the process of "experimentation under hierarchy" is relevant to understanding the evolving of the subnational climate regime in the YRD region. We find the preponderance of the central authorities in initiating national climate strategies and galvanising responses at the local level. Meanwhile, provincial governments have been able to leverage climate plans and actions to achieve their own gains. These findings suggest that any optimism about subnational climate activism in a Chinese setting has to be mixed with caution. In fact, the shadow of hierarchical authority structure lingers and plays important part in the initiation of subnational response and spurring climate responses and innovations from below.

中央政府与地方政府的关系一直是中国各政策领域的关键问题。本研究这种语境下中国地方气候治理政策的形成。文章分析了长三角三省的气候应对，指出应从“层层尝试”的过程理解长三角的地方气候治理，其中既有中央政府在制定国家气候战略方面的优势，也有地方政府的积极响应。而省政府则从气候规划中收获效益。研究发现表明，对中国中央政府以下的气候治理活动都需保持谨慎乐观。权力层级无处不在，并在地方应对以及激发自下而上的气候应对及创新中起着重要作用。

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Introduction

China's climate policy and governance continues to attract scholarly interest and intense scrutiny among policy practitioners and researchers. In response to multiple environmental stresses and after nearly three decades of high-speed economic growth powered in part by wasteful energy consumption and uncontrolled greenhouse gas emissions (GHGs), the central authorities proclaimed China's climate strategy in the late 2000s and introduced a series of initiatives aimed at bringing down emissions levels significantly by 2020. These include, for example, pilot low-carbon province/city schemes, domestic cap-and-trade market of emissions quotas, developing a greenhouse gas inventory and stepping up environmental legislation at the local level (NDRC 2011b, 2012a).

While these initiatives invariably inject a considerable dose of optimism about China's attainment of emissions reduction targets and the transition to a low-carbon economy, few studies to date have

examined the making of local climate governance in the Chinese setting, especially the inter-governmental (i.e. central-local) dynamics (except for example Kostka and Hobbs 2013; Ran 2014; Kostka 2014). In fact, successful climate initiatives from the centre would inevitably depend on the extent to which the central mandates could successfully translate into local practice (Qi *et al.* 2008, Qi and Zhang 2014). Empirical assessment on the latest developments, however, has been far from adequate.

Some research tends to focus on particular localities and/or technical aspects of climate initiatives, such as their operational efficiency and economic added value (Xu and Ma 2009, Zhou *et al.* 2013, Liu X., *et al.* 2013). Such studies inevitably downplay the political and economic contexts from which local climate responses emerge, evolve and execute, which were addressed in recent advances on Chinese subnational politics that find much activism among local authorities in one way or another. Some local authorities have actively assisted local businesses vying to host Clean Development Mechanism (CDM) projects (Schröder 2012). Some others have also devised mitigation measures to promote local energy system restructuring (Liu L., *et al.* 2013; Liu X., *et al.* 2013). In developed regions, officials are generally well aware of the scientific basis of climate change and plausible adaptation responses informed by the quality inputs of the scientific community (Li 2013, Duan and Hu 2014).

These findings appear to lend credence to the multi-level governance scholarship that affirms the relevance of subnational authorities in climate governance. It points to the diffusion of decision-making powers to subnational governments and formations of horizontal networks between them. City governments are no longer passive agents implementing the national and/or international initiatives; increasingly they influence policy formation and deliberation of the higher authorities and form city networks that facilitate knowledge transfer and learning (Li *et al.* 2011, Lee and Koski 2015). They also partner with business, NGOs and local communities in devising innovations and experimentations in response to climate challenges (Betsill and Bulkeley 2006, Kern and Bulkeley 2009, Kern 2014).¹ This results in a governance system involving authorities of different levels and interactions between state and non-state actors (Broto and Bulkeley 2013).

These insights, however, have been largely informed by more advanced economies' experiences (Bulkeley 2010, Hopkins 2010, Cunha *et al.* 2012, Hanssen *et al.* 2013, Dhakal 2014, Cheyne 2015), with little works to date examining settings like China where the dual trends of "political centralization" and "economic decentralization" have generated interesting dynamics between local authorities and the central government in almost every policy domain (Huang 1996, Cai and Treisman 2006). To be sure, central-local dynamics has been a fundamental determinant underlying much of the environmental governance challenges in China (Zweig 2002, Qi *et al.* 2008, Qi and Zhang 2014). Local government as rational actors are motivated to promote economic growth, attract investment and maximise tax revenues. Recent contributions like Kostka (2014) have further investigated the influences of provincial environmental leadership in shaping the extent to which the central mandates would be thoroughly implemented. Ran (2014) unpacks the perverse political, fiscal and moral incentive structures the local governments experience and discusses how they have discouraged full compliance of central policies and "rewarded" non-compliant behaviours. As such, environmental quality would often time be relegated into a secondary concern by the local authorities.

While these assessments hold true across a broad range of environmental issues, climate change presents unique challenges. Climate issues are inherently complex and carry considerable scientific and policy uncertainties beyond the scope and capacity of management of local governments. Yet the central authorities are often treated as an indispensable policy actor in introducing and defining the national climate agenda, formulating the coping strategies in the first place, and taking leads in national-level responses that would help spur local actions (Wübbecke 2013). Our study of the Yangtze River Delta (YRD) provincial governments' policy responses to tackle climate change, however, has revealed a more nuanced dynamics between the central and local authorities that call into question the "multilevel governance" and "central-government in command" positions discussed above. Local climate innovation is not scant among the three provinces. Jiangsu, for example, issued a provincial climate legislation, the first of its kind in China. Zhejiang was the forerunner in developing a greenhouse gas inventory as early as 2011 and also hosts a large CDM centre, whereas Shanghai has been venturing

out a pilot carbon trading programme since 2011. Capacity and partnership building, another aspect of climate innovation, is also found in all three localities.

These development generate an important analytical puzzle that we seek to address: Are policy breakthroughs or institutional innovations within individual YRD provinces largely reactions to central policy signals, or bottom-up initiatives originated by the local climate authorities?

Through interviews with central and local officials/non-officials and review of policy documents, an approach not uncommon in policy studies with emphasis on China where access to top policy elites is usually limited, we analyse the local climate governance of the three provincial governments of the YRD area and unravel the policy dynamics between the central and local authorities in the making of local climate policy. We argue that subnational climate activism does not make irrelevant hierarchical governance, which builds upon the various degrees of command and control by central authorities, including direct imposition of policy requirements, inter-governmental negotiations, and compliance induced by the threats of interventions from the above (Weibust 2014). Whereas provincial climate actions come forth in part due to the central government's explicit requirements, more than often they were devised locally under the "shadow of hierarchy," in which the central policy guidance becomes political backdrops for negotiation between the two levels of governments over specific local actions to be introduced and implemented (Heilmann 2008b, Weibust 2014).

The next two sections discuss the literature on local experimentation, and the method and sources of the study. This is followed by a brief sketch of national climate initiative and local actions. It highlights how provincial authorities have reacted to central mandates and developed local responses on their own terms as policy experimentations sanctioned by Beijing. Lastly, it summarises key findings and discusses their implications to China's climate policy and governance.

Local Experimentation under Hierarchy

Local governments in China have a long history of engaging in open-ended experimentation to identify viable policy solutions. Theories such as "regional decentralized authoritarianism" (Xu 2011), "local state corporatism" (Oi 1992, 1999, Chung 1999) and "economic localism" (Zheng 1999) have shed light on the competition between localities and local activism in generating practicable local solutions. In an attempt to synthesise these diverse insights across different policy domains, Heilmann (2008a) further argues that the dynamic interaction between local initiatives and strong central leadership is vital to explaining the oscillating dynamics of policy-making in China. He theorizes that "experimentation under hierarchy," a process of which "central policy-makers encourage local officials to try out new ways of problem-solving and then feed the local experiences back into national policy formulation," would help cushion the unknown impacts of political uncertainty and policy ambiguity as experienced by the local/societal policy actors (Heilmann 2008b, p. 1, Heilmann and Perry, 2011).

In such a process, the central policy-makers have been the critical source to encourage experimentation by the provinces in order to address the pressing policy challenge the country faces, and these locally-generated initiatives, if deemed successful and relevant, would eventually be scaled up to the national level policy-making and considered as role models for other localities. In other words, the seemingly "decentralized policy tinkering" by the subnational governments is more than "freewheeling trial and error or spontaneous policy diffusion." Instead, they spur policy solutions that would be fed into the national policy agenda and deliberation, and might eventually be extended to larger scales (Heilmann 2009, p. 458). The strategy helps reduce the political costs incurred by the central policymakers if the local experiments failed since the local authorities taking the leads would be blamed as "scapegoats" (Heilmann 2008a, p. 21) and the local initiative would be "phased out silently, rather than terminated by public formal administrative decisions or documents (Heilmann 2008b, p. 28). These contribute to a high degree of policy-making adaptability with a system of flexible policy inputs beyond the centre (Heilmann and Perry 2011).

The apparently "disorderly" or "guerrilla-style" policy trial and experimentation involving both the central authorities and their local counterparts has found applications across a number of policy

domains such as the rural de-collectivisation, opening-up of the economy, and reform in state-owned enterprises. Recent studies of the environmental policy domain have also lent support to the “experimentation under hierarchy” perspective. Teets and Hurst (2015, p. 9) postulates that responses to environmental challenges, which pose little political risks and are not tied to particular ideological factions/groupings, would easily be endorsed by the central authorities, and diffused top-down to the lower levels of the administration; the subnational governments would be encouraged to devise solutions that fit their specific contexts.

The processes of eco-city development and renewable energy adoption have also demonstrated the importance of the central authorities as the origin settling on the policy agendas and priorities, conveying its support to and endorsing local initiatives. Chen (2016), pp. 153–154 argues that the introduction of renewable energy sources to China represented Beijing’s effort to incorporate ecological modernisation— specifically the advances of energy technologies to cope with the worsening ecological crises— with an “intervention regime” that combined “extensive policy experimentation with long-term policy prioritization” (Heilmann 2009). Miao and Lang (2015) similarly explores Beijing’s initiatives to foster “environmentally friendly and resources-conserving” cities, showing the critical importance of central supports in ensuring successful local experiments.

Given the problem natures of climate change (specifically, high level of complexity and uncertainties) and political imperative of taking timely responses to address local environmental changes, one would expect the local governments to exercise foresighted tinkering under a shadow of a hierarchical authority structure when contemplating local climate governance. There is, however, virtually no study exploring this issue.

The present study of the YRD seeks to fill in this research gap. The YRD is chosen for several reasons. The YRD area is primarily made up of Shanghai and 15 other cities in neighbouring Jiangsu and Zhejiang provinces within an area of 101,915 km². Thanks to the market reforms that have occurred since the late 1970s, the YRD economy has experienced rapid transformation and restructuring. Despite the remarkable economic might, YRD is also one of the most vulnerable areas to the adverse effects of climate change in China. There has been a clear temperature uptrend over the past few decades and an increasing frequency and intensity of extreme weather events in the YRD area (Xu and Ma 2009).

As a result, a diverse array of climate actions, including the mitigation measures, adaptation response and locally initiated climate innovations, were adopted by the YRD governments, which might not fit neatly with the expectations of multi-level governance literature that seem to have overstated the policy autonomy of subnational authorities, and somehow downplayed the hierarchical perspective regarding the vertical exercise of power. Indeed, while the central authorities continue to play an important part in galvanising climate policy formulation of the YRD governments, this does not entirely dictate the substantive contents of local climate responses that are also mediated by provincial developmental priorities and economic interests. Indeed, the assertive local-led climate actions have transformed the YRD provincial governments into policy agents shaping the policy-making of higher authorities. This finding echoes Kostka and Hobbs (2013) and Ploberger (2013) that investigate local adoption of specific green policies. At the more general level, it suggests that in face of “shadow of hierarchy,” the local authorities have been able to retain some maneuverability over policy innovation, generating important initiatives that would feed into national climate policy-making.

Method and Sources

The lack of discussion about how the central-local relationship affects China’s local government’s climate strategy indicates the necessity of considering climate action/inaction from provincial-level governments, especially in light of the emergence of various mitigation, adaptation and climate innovation measures by YRD provincial governments.

This study adopts a two-pronged qualitative research strategy that tries to understand climate policy-making and specifically the perceptions and assessments of central and provincial government

officials during the formation, development and implementation of local climate policies. Specifically, we carried out in-depth examination of the three provincial-level government authorities in YRD area which are always the primary driver of policy changes. Provincial government authorities include actors such as environmental protection bureaus (EPBs), finance bureaus and development and reform commissions (DRCs). These actors are either directly in charge of designing provincial climate strategy or play a major role in promoting certain climate experimentation such as the development of a carbon trading market.

Publicly available policy documents of the local and central authorities as well as secondary literature on China's climate governance were examined. These provided the essential background information and helped identify gaps to be filled by the interviews, most of which were conducted by the authors in their multiple visits to Beijing, Shanghai and Nanjing between June 2012 and March 2013. In Beijing, four interviews with officials at the NDRC were carried out. At the local level, five department heads or their deputies in Shanghai and Jiangsu provincial environmental protection bureaus (EPBs), and development and reform commissions (DRCs) who are familiar with local climate initiatives were interviewed. For officials that were unavailable to be met in person (as in Zhejiang's case), the first author corresponded with them by emails or phone calls. This also applied to all follow-up queries in response to later policy changes.

While generalizability of such multi-method inference is bound by the veracity of information provided by our interviewees, the approach offers rich insights of policy-making dynamics by actors directly involved in the process, which is seldom made possible by survey or documentary review exclusively (Solinger 2006, Read 2010). As well, the practice follows the approach of similar case-study based investigations in China, including for example the analyses of David Held, Charles Roger and Eva-Maria Nag and Lisa Williams on the larger national policy formulation, as well as discussions by Thomas Johnson on Shanghai's climate initiatives and Zhao and his collaborators on government-firm relations at local China (Johnson 2010, Held *et al.* 2013, Williams 2014, Zhao *et al.* 2014).

And in order to ensure validity, the officials' views were cross-checked against public accounts and the responses of other interviewees whenever possible. This is especially useful in assessing views of central and local officials on the issues of their shared concerns. Views were also exchanged with three other researchers at the Energy Research Institute in Beijing to try to obtain additional insights beyond the official rhetoric.

YRD's Climate Vulnerability and the Making of China's National Climate Policy

YRD is one of the most vulnerable areas to the adverse effects of climate change in China (Zhen 2013). Shanghai, Jiangsu and Zhejiang are all exposed to various climate challenges (Tan *et al.* 2010). It is worth noting that local EPB and DRC officials of Shanghai and the two neighbouring provinces are evidently aware of the climate challenges and are conversant with the scientific aspects of climate issues (Interviewees 1, 2, 7 and 9, government officials 2012, 2013). A recent survey of Jiangsu officials has found that even officials holding economic development-related portfolios have formed a strong demand to acquire more scientific understanding and are especially interested in the technical know-how of operating their own carbon market (Duan and Hu 2014). This raises expectations of the state of climate governance in the YRD area. However, local climate responses remain very much informed by central's climate agenda. We try to assess that whether local climate activism, if any, is a derivative of the provincial developmental priorities and interests.

In terms of institutional arrangement for climate governance at the central level, the National Coordination Committee on Climate Change, founded in the late 1990s, was elevated to a leading group chaired by the Premier in June 2007, making it the top policy coordinating and decision-making panel on climate affairs. The Department of Climate Change was inaugurated under the NDRC in 2008 to house the leading group and orchestrate China's climate action. Also in 2007, the central government laid out China's first climate strategy and publishes annually *Policies and Actions for Addressing Climate Change* ever since.

A separate national adaptation strategy was released in 2013, stressing seven critical areas including agriculture, water resource, forestry management, public health and coastal zones protection. The central authorities also proclaimed voluntary reduction goals. Before the Copenhagen climate conference in 2009, China announced that the country's carbon intensity (i.e. carbon emissions per unit of GDP) would be reduced by 40–45% from the 2005 level by 2020 (Qiu 2009). This was followed in 2011 by a more ambitious target to lower carbon emissions per unit GDP by 17% below the 2010 level within a four-year timeframe (Tsang and Kolk 2010, Held *et al.* 2013). To deliver these climate commitments, each province was allocated a mandatory and specific carbon reduction task (Interviewees 4 and 5, government officials 2012). The three YRD provincial governments, for instance, are expected to cut down carbon intensity by 19% by 2015 (State Council of China 2011).

As the central climate initiatives were introduced, provincial authorities responded. Next sections analyse the institutional setups of local climate governance and examine the development of local climate strategies and responses, marked by local developmental priorities and interests, and climate innovations individual provincial authorities have pursued in reaction to central's policy signals and support. These have resulted in a localised and uncoordinated pattern of climate responses.

YRD's Climate Policies and Actions: Central Initiatives met Local Priorities

The dynamic interactions between the central government and its local subordinates show that substantive contents of the provincial climate plans in YRD have been mediated by local developmental policy priorities and interests and have varying emphases in mitigation and adaptation (Interviewees 5 and 6, government officials 2012).

A closer look of the provincial climate plans reveals that mitigation efforts were rolled out with the purpose of not only dovetailing with low-carbon development strategies that the central authorities set out, but they were also inextricably related to larger objectives of promoting local energy and industrial system restructuring. These co-benefits of climate actions have found strong appeals to local governments and constitute the prime motivations of much climate experiments worldwide (Koehn 2008). In the YRD's context, they ascended to the top of local agendas from the mid-2000s after the NDRC promulgated in 2006 nationwide targets of energy conservation and reductions of sulphur dioxide and chemical oxygen demand in the Eleventh-Five Year Plan (2006–2010) that were legally binding to all provinces (NDRC 2006).

Although the plan made no mention of climate change or greenhouse gases, as the national climate strategy issued the next year would, provincial authorities had quickly come to see the two together and realise that reducing energy use would inevitably necessitate tackling carbon emissions (Interviewees 1, 2 and 7, government officials 2012, 2013, Liu L., *et al.* 2013; Liu X., *et al.* 2013). Both the Jiangsu and Zhejiang climate plans had extensive coverage that reviewed the emissions from fossil fuel and industrial uses, which accounted for respectively 98% and 94% of CO₂ emissions in 2007. Steel and cement production, which constituted the entirety of Jiangsu industrial emissions, faced deep cuts (Interviewees 3, government officials 2013). Respective totals of 6.96 and 25 million tons of production capacity were phased out between 2006 and 2009. The province also announced that it would voluntarily reduce the provincial energy and carbon intensity by 17% and 7% below the 2007 level by 2015, in order to catalyse changes of the local economy dominated by heavy industries (Jiangsu Provincial Government 2009, Zhejiang Provincial Government 2010).

Likewise, the Zhejiang authorities sought to rebalance the provincial industrial structure, aiming that by 2012 its secondary and tertiary sectors would contribute evenly at about 47–48% to the economy and that a quarter of industry value-added would come from high-tech sectors (Shanghai Municipal Government 2010). In Shanghai, mitigation was inseparable from the city's "industrial structure optimization" and urban renewal campaigns in advance of the World Expo of 2010. Nearly every public or private organisation was bound by specific targets. Over 600 polluting firms were shut down and 65% of new buildings were to be fitted out with some energy saving facilities (Ru *et al.* 2010, Shanghai Municipal Government 2012).

Besides industrial objectives that motivated much of the mitigation efforts the YRD provinces were also driven by the massive economic stakes in clean energy projects investment. In addition to shifting the area away from a coal-dominated energy system to one with diverse sources, including renewables like solar and wind, the intense interest of local governments in promoting the development of new strategic industries, which included the energy saving and environmental protection as slated by the central authorities in the aftermath of the financial crisis, has been an indispensable force for local policy commitment and billions worth of investment in renewable sources.

Zhejiang and Shanghai DRCs had expected double-digit growth in these “new sectors” in the late 2000s. One Jiangsu DRC official shared the same sentiment and opined that the province “has found new growth point [in renewables] in view of the decline of the traditional manufacturing sector.” (Interviewees 2, government officials 2013) In a few years’ time, Zhejiang and Jiangsu have emerged as two leading sources of offshore wind power in China, with at least 18,000 MW exportable from Jiangsu alone. The Jiangsu government was committed to boost significantly the wind turbine generating capacity from 150 to 1000 MW during the 2010 and has been the only provincial government in the country subsidising photovoltaic (PV) firms and solar power use, which has helped make it home to half of the ten largest PV manufacturers in the world and contributed two thirds of the sector’s national output in 2013 (Jiangsu Provincial Government, 2009; Climate Connect 2010).

Zhejiang and Shanghai, by contrast, have much smaller renewable sectors, but both have aimed at substantially increasing the share of clean sources in the provincial energy mixes. Shanghai turned to wind power well before it outlined its climate action with a five-year plan to increase the wind power output from 25 to 300 MW by 2010. Zhejiang also witnessed a remarkable growth of wind and hydro power share, seeing the sector makeup 10% of provincial energy supply by the end of 2013. A special financing scheme was also recently introduced to promote investment in clean energy projects (Zhejiang Provincial Department of Finance 2014). Shanghai’s enthusiasm for mitigation technologies in buildings, transport systems and urban infrastructure was also driven by its quest to upscale the city (Interviewee 7, government official 2012, 2013).

There are, of course, other mitigation strategies like afforestation that expand provincial carbon sinks, but they were featured much less prominently in the climate plans of the YRD governments and conceived as supplementary to emissions controls and renewables by officials. But as the foregoing analysis suggests, local mitigation activities have been largely responses to energy conservation and industrial concerns since the 2000s; recent interest in renewable sectors was motivated by the local economic interests in the industry.

Unlike mitigation shaped by developmental priorities and interests, adaptation among YRD governments has been largely driven by local officials’ understanding of provincial vulnerabilities without engaging too much private sectors and civil society that would readily provide inputs like expertise, technologies and feedback on policy design and implementation to the authority (Schroeder, Burch and Rayner 2013). Indeed, in similar ways as how the “fragmented” local bureaucratic structure hinders effective implementation of environmental policies (Ran 2014), the involvement of multiple local government agencies in charge of climate adaption has invariably filled the local plans with sometimes different policy objectives. Although provincial DRCs remain the lead agencies in local climate governance, specific programs have been primarily overseen by local functional bureaus like those in charge of agriculture, water and land resources.

Shanghai, for example, responded primarily to extreme weather events and sea level rises through better weather forecasting technologies, a heat health warning system, and a four-level flood control system consisting of multiple floodgates, levees and an urban drainage system (Shanghai Municipal Government 2013). Yet these are reactive in nature and reflect a lack of holistic vision in city planning as Thomas Johnson suggested (Johnson 2010). Subsidence contributed to by groundwater extraction and the massive construction boom of the 1990s and beyond, which has exacerbated the city’s vulnerability to sea level rise, has been overlooked. Indeed, Shanghai DRC officials reported debate within the government over how to best delimit concrete adaptation measures and have been disinclined to develop a separate adaptation strategy in the way the central authorities have. In their view, adaptation

is best handled by various local bureaus with relevant expertise and professionals (Interviewees 7 and 8, government officials 2012, 2013).

In contrast, neighbouring Jiangsu and Zhejiang have appeared to fare better with their standalone climate plans. They have attended to challenges arising from seasonal flooding and extreme weather by engineering fixes like Shanghai has done, and have launched several programs to promote agricultural resilience. Jiangsu was among the first province in China to introduce an irrigated agriculture intensification project in order to improve water productivity and crop yields with extensive inputs from the domestic scientific community and financing facilities from the central authorities and the World Bank (Jiangsu Agricultural Resource Development Bureau 2008).

Both provinces turned their attention to water resources, coastal areas and forest management (Jiangsu Provincial Government, 2009, Zhejiang Provincial DRC 2013). Yet some officials have conceded that existing adaptation measures have been conceived by the local bureaus running the programs as means to address non-climate related challenges such as agricultural reforms and mitigating natural hazards (Interviewees 2, 9 and 10, government officials 2012, 2013). Indeed, given the presence of multiple local agencies involved in the devising of local plans, DRC officials of both provinces have only a rough sense of how their existing responses might actually strengthen the overall provincial adaptive capacity to climate events in the longer term. This also generated considerably difficulty for environmental NGOs to influence effectively the policy-making process even though Shanghai is in some aspects comparable to the Guangdong Province with quite many well-connected and resourceful green groups taking leads in policy advocacy and negotiating with the states (Wu 2014).

As a result, adaptation is seldom “mainstreamed” in the YRD provincial agendas as mitigation, since from the outset the latter has been tied to larger goals of reducing energy intensity as demanded by the central authorities and motivated by the local economic quest for competitive edge in the renewables and industrial development. This has led to localised responses with little, if not no, collective endeavors, and a lack of mutual learning and experience sharing to confront adaptation challenges in the YRD area as the next section turns to.

Local Climate Experimentation under the Central's Shadow

Local policy innovation is often seen as one important ideational source in which local authorities disseminate policy knowledge, learn from the others' experience and engage in joint projects in the Western contexts (Betsill and Bulkeley 2006, Kern and Bulkeley 2009). The policy breakthroughs within individual YRD provinces, however, are reactions to central policy actions or signals, rather than bottom-up initiatives originated by the local climate authorities (and climate scientists/activists), whom lack strong motivation to go beyond the scope and expectation of the central authorities.

In ways consistent with the “experimentation under hierarchy” perspective, only those practices that appear to be recognised by the central authorities flourish and there has been little effort to share lessons with and learn from neighbouring provinces. As such, policy diffusion between YRD provinces along the horizontal pathways postulated by Teets and Hurst (2015) has barely existed. And climate-related innovation in the region were often time results of the top-down political gesture and commitments to galvanise initiatives of local agents in responses to pressing policy concerns the central authorities confront. These localised experimentation that meets the central mandates and promotes local economic/development agendas has helped the central authorities to assess the experiments' practicability and implementation challenges.

A prominent example concerns the implementation of low-carbon development at the provincial level. While the notion is not novel at all to some local environment officials, explicit discussion in connection with local development appeared in the 2009 national climate policies that signalled support for local experiments (NDRC 2009b). Shanghai was quick to integrate the idea into the World Expo 2010, branding it the first expo featuring low-carbon living. This was followed by the NDRC-sponsored low-carbon city/province programme in July 2010 which that named Hangzhou, Zhejiang's provincial capital, in the first round of pilots together with 12 other localities. Shanghai joined the

ranks two years later. Jiangsu also named four cities and 20 other industrial zones and firms that were to experiment with the concept and released the first provincial level low-carbon development report in 2013 (NDRC 2011b, 2012a).

Besides these attempts to anchor low-carbon development in local settings, a related aspect of climate innovation involves capacity and partnership building. Yet these remain localised and confined to the province involved in such initiatives. Both Jiangsu and Shanghai do so with foreign parties, thanks to strong backing from and connections through the central authorities. Jiangsu has linked up with the German Society for International Cooperation (GIZ) in a multi-year project from 2010 with focuses on awareness building; capacity development of the local governments, industry and building sectors; and knowledge transfer between the local partners and GIZ through pilots and demonstration projects (Jiangsu Provincial DRC 2013).

Shanghai secured the World Bank's financial support of about 104 million USD and technical assistance to transform the Changning District into an exemplar of green innovation, furnished with the latest technologies in building, transport system and energy uses in February 2013 (The World Bank 2013). In addition, the city became part of the transnational climate network when it joined the C40 Large Cities Climate Leadership Group as an observer in 2007. Short of many international connections on climate affairs, Zhejiang founded its own climate research centre in June 2012, following the creation of the National Center for Climate Change Strategy and International Cooperation as a research unit affiliated with the NDRC in 2010. This spurred some interest from Jiangsu and Shanghai to create similar units in their jurisdictions (Zhejiang Provincial DRC 2012). The province was also the forerunner in developing a greenhouse gas inventory in 2011 on the advice of the NDRC and National Bureau of Statistics (Zhejiang Provincial DRC 2013).

In addition, the three provincial governments have made advances in institutional development beyond the standard setups of local climate leading groups and DRC climate units across China. In what seemed to be the very first step to incorporate market-based mechanisms with the state governing institutions, emissions trading have been ventured out in selected localities with NDRC's support. The market-based mechanism was carefully orchestrated by the central authorities as a means to strengthen state environmental governance. Shanghai was designated as the testing ground of carbon trading in 2011 (NDRC 2011a). NDRC's interim measures on voluntary emissions reduction trading in June 2012 catalysed the development of the city's carbon emissions regulations in November 2013, which governs various facets of emissions trading like quota allocations, monitoring, and reporting arrangements. Shortly afterwards, the Shanghai Environment and Energy Exchange settled the first carbon transaction (NDRC 2012b). Jiangsu provincial government and legislature has pioneered local climate legislation under the auspices of NDRC's climate change department and the National People's Congress since 2011. A number of industrial standards were passed and the provincial climate legislation, the first of its kind in China, is now undergoing public consultation and review (Jiangsu Provincial Government 2013).

Notwithstanding these developments, the local governments remain very much driven by and dependent on the policy momentum of the central authorities and in most cases their initiatives have generated little interest beyond the province(s) involved. Neighbouring local authorities have stopped short of emulating the climate innovation of others, even though this is not unusual in other domains of local environmental management (Li *et al.* 2011). While regional climate governance collaboration is rare at horizontal level, Beijing has accumulated experience from Shanghai and Jiangsu, along with other pilot regions, and indicated its intention to introduce carbon trading nationwide. Indeed, the involvements of market-based arrangements have only appeared to strengthen the climate governance of the central authorities.

These seem intriguing as the policy (and technical) leadership of the NDRC is far from absolute in which its local counterparts cannot dispute the central initiatives and the local governments retain considerable autonomy in determining the scope of climate responses, best shown in the previous section that analyses how local priorities shape mitigation measures. They could also call for the expansion of the scale of the policy pilots, and seek technical advice from above and their neighbours.

Yet still the local climate officials in YRD have appeared to be dependent on the centre and lukewarm to sharing their policy lessons.

Discussion and Summary

This study analyses the local climate governance of the three provincial governments of the YRD area and unravels the policy dynamics between the central and local authorities in the making of local climate policy. It provides an empirical basis of understanding the motivations behind local authority's climate activism. As in other China-focused studies, it finds the preponderance of the central authorities in initiating the national climate strategies and galvanising responses at the local level (Guo *et al.* 2013). Provincial governments, however, have been able to leverage the climate plans and actions as expected from the above to achieve their own gains. Notably this is made possible by “bundling” and associating climate responses with other developmental agendas and co-benefits; and mitigation measures are energy-oriented and by-products resulting from the restructuring of local industrial and energy policies as specialists of climate governance have identified (Koehn 2008, Broto and Bulkeley 2013).

Preoccupations with energy efficiency and industrial upgrading have weighed significantly in shaping the way YRD provincial authorities understood the issues from the outset; the turn to renewable energy sources is deemed to be critical with regard to promoting development of new strategic industries. Adaptation responses, by contrast, are more localised, stemming from the different interpretations of individual provinces of their vulnerabilities. Climate innovation pursued by local climate authorities also seems to be dependent on central policy signals and support. This has resulted in uncoordinated climate responses in the YRD area, short of any collective endeavors among the provincial authorities.

These subnational dynamics and their interplays with the central authorities suggest the downsides of locally-driven policy experiment under hierarchy. While the process has encouraged innovation from the bottom-up, which combines “decentralized experimentation with ad hoc central interference” and results in the selective integration of local experiences into national policy-making” (Heilmann 2008b, p. 29), the YRD's experience of climate governance suggests that any optimism about subnational climate activism in China has to be mixed with caution. The aggressive climate actions in the YRD area are a refraction of both the central policy push and local interests, underpinned by the largely uncontested motivation to sustain local growth and development in the local economy. At a more fundamental level, this was reinforced by the “perverse” incentive structure the local officials experience, especially the careerist motivation of provincial leaders and environmental officials, as well as the prevalent view that environmental polices shall serve economic development and the latter would always assume a higher priority in policy-making (Kostka 2014, Ran 2014).

Accordingly, contrary to the expectations of the prevailing “multi-level governance” model, the subnational governments in the YRD area have yet to take assertive climate actions that transform themselves into truly autonomous policy agents. Still, generation of local initiatives has unfolded under the established hierarchical authority structure, of which the provincial authorities have become rather “passive” in awaiting for the receptive political and policy signals that emerge from the “shadow of hierarchy.” It is such central and local dynamics that constitute an important part in the initiation of subnational response and spurring climate responses and innovations from below.

But these do not entirely mean the local governments are deprived of any policy autonomy in practice, best evidenced in their mitigation plans with strong imprints of local agendas and initiatives to foster local interests. On the other hand, while the possibilities of regional climate responses common to other national contexts, like emissions trading markets, technology transfer or, at the minimal level, policy coordination, seem remote at the moment, it remains curious why climate affairs stands as an exception against the backdrop of the multi-sectoral collaborations taking place through the inter-provincial and city networks in the region— a topic that would warrant a full-length investigation in another paper. Equally interestingly and importantly, the NDRC appeared to have shied away from taking the policy leadership even though it is in the best position to do so, posing puzzles to

understanding and theorizing inter-governmental interplays in subnational climate governance in China and beyond.

Note

1. Following Teets and Hurst (2015, p. 23), the paper sees “experimentation” and “innovation” as synonymous terms, both referring to the process of which “new policy solution [are] developed in the specific context.”

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