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ASSESSING THE VERTICAL MANAGEMENT REFORM OF CHINA'S ENVIRONMENTAL SYSTEM

Progress, conditions and prospects

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Introduction

Despite China's rapid economic development over the past 30 years, the country's current patterns of economic growth are not environmentally sustainable. From the severe smog that blanketed Beijing in early 2017 to the serious industrial pollution of major waterways such as the Yangzi and Yellow rivers, China is experiencing an environmental crisis in the making. In response, the Chinese Government has recognised the need for exigent environmental reforms. In a bid to mitigate and reduce environmental degradation, the central government has put in place a range of policy initiatives, having also enacted a series of national plans, policies and laws since the late 1990s (Sims 1999). These policies largely focus on enhancing administrative capabilities to improve environmental protection and legislation, with a clear emphasis on coordinating a 'win-win' balance between economic development and environmental

protection (Zhang, Wen & Peng 2007). To this end, the structure and institutional authority of the country's chief environmental agency was considerably strengthened through the transformation of the State Environmental Protection Agency (SEPA) into a fully-fledged Ministry of Environmental Protection (MEP), which was renamed as the Ministry of Ecology and Environment (MEE) in 2018.

China's system of environmental management and the implementation of environment-related policies, however, still suffer from sizable challenges and inefficiencies, as problems of noncompliance and the inconsistent enforcement of laws and regulations persist. This, in part, stems from issues relating to the nature of national legislation, local protectionism, as well as local bureaucratic and enforcement procedures. Some scholars have concluded that environment laws in China are of a low legislative quality, have too many general instructions and that they are basic and difficult to enforce (Wang 2009). Additionally, the lack of attention to environmental indicators in the 'cadre evaluation' system has led to limited capacity in local Environmental Protection Bureaus (EPBs) because of insufficient funding and personnel for monitoring and enforcement (Wang 2013; Jin, Andersson & Zhang 2016). The lack of coherence among environmental regulations, conflicting interests at different levels of administration, and insufficient technical capacity and resources further complicate the ability of state environmental protection authorities to carry out their duties (Van 2006).

It is within this context that demands have arisen for stronger steps to be taken to tackle endemic problems of weak enforcement. During the Fifth Plenary Session of the 18th Communist Party of China's (CPC) Central Committee in October 2015, the CPC pledged to update the current system of governance among the different levels of environmental protection authorities, and to adopt a new vertical management system that has since come into effect under the auspices of the country's 13th Five-Year Plan (2016–20). 'Vertical management' refers to a system in which an agency implements policies within a hierarchical, internal process, and negotiates its roles and duties in relation to other environmental protection authorities. Here, agencies and departments situated on the lower rungs of the chain of command are required to report directly to those on the upper rungs, as opposed to local governments at the same level (Li 2016).

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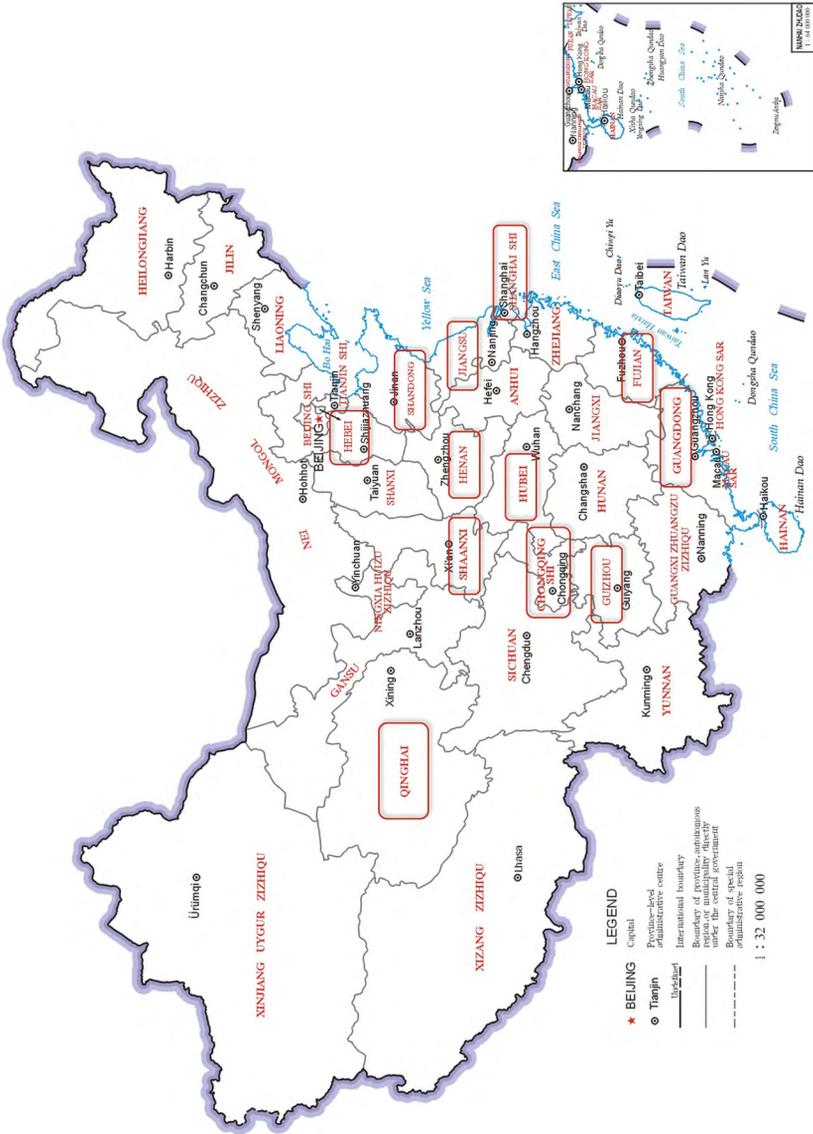


Figure 9.1. Vertical management pilot provinces in environmental protection system

Source. Fanrong Meng and Zitao Chen

Following the development of this system, 12 provinces across the country have since applied to be vertical management pilot regions. These provinces are Hebei, Shanghai, Jiangsu, Fujian, Shandong, Henan, Hubei, Guangdong, Chongqing, Guizhou, Shaanxi, and Qinghai (Figure 9.1). This chapter interrogates the key drivers behind these provinces' application to become vertical management pilot provinces and explores the key elements of China's vertical management reform alongside a review of the evolution of the country's system of environmental management. We then consider whether this reform can potentially fix problems related to administrative inefficiency within the bureaucratic system and improve policy efficiency. As explained later, by applying a qualitative comparative analysis (QCA) method, the chapter compares official field data and documents from 31 provinces across China to reveal the significance of internal and external determinants in informing provincial decisions to apply for the vertical management pilot.

The evolution of China's environmental management system

Prior to transforming into the MEE, MEP had been the sole national body responsible for environmental management. First established in 1974 as a unit under the State Council, with a staff of 20 people, a reorganisation in 1998 led to the creation of SEPA, which came directly under the State Council. In March 2008, as a significant step towards improving environmental management, SEPA was elevated to the ministerial level. The MEP's functions included preparing and implementing national policies, legislation and regulations related to water and air quality, solid waste management, nature protection and nuclear/radiation safety.

The MEP was also in charge of formulating environmental quality criteria and pollutant discharge/emission standards at the national level, organising environmental quality monitoring, and collaborating with local environmental authorities to initiate enforcement activities. It coordinates plans for addressing trans-boundary environmental problems and organising scientific research and development.¹ Apart from the MEP, a range of environment-related issues was further managed separately by other ministries and agencies of the State Council. For example, the

¹ See www.mee.gov.cn/zjhb/zyzz/

National Development and Reform Commission (NDRC) has played a key role as the agency responsible for developing and implementing Five-Year Plans. In this capacity, the NDRC integrates environmental issues into China's overall planning system, and into sector-specific policies such as those on energy.

Even so, the primary responsibility for implementing environmental policy remains at the sub-national – that is, provincial and local – level. There are around 2,000 EPBs with approximately 60,000 employees at the provincial, prefecture/municipal, district/counties and township administrative levels. Other administrative units of local governments that are engaged in environmental policy implementation include the Environmental Protection Committees of the local People's Congress, the Environmental Protection Commissions of local governments, mayor offices, planning commissions, finance bureaus and a range of industrial bureaus. These all play important roles in endorsing local environmental regulations, coordinating EPBs' work with other government organs, taking key decisions on large investment projects involving industrial development and environmental protection, integrating these projects into local economic and social development plans, as well as managing pollution-discharge fee systems, among other functions.

Historically, the Chinese system of governance was characterised by the division between the vertical line, which means that the agencies of bureaucracy are directly controlled by their functional administrative superiors (*Tiao*), and the horizontal line (*kuai*), in which the agencies are also administered by the local government rather than the higher levels with certain functionalities. In this system, a municipal-level EPB reports to its 'vertical' superiors (i.e. the provincial EPB and MEP) while also being subject to the leadership of its 'horizontal' boss (i.e. the mayor of the municipality). Currently, different departments within local governments shoulder the responsibility of carrying out environmental protection, and sub-units within the environmental agencies are responsible for reporting individually to the government. It is the local government offices that appoint the heads of these agencies and provide financial support. China's environmental reform program has been carried out under this 'parallel management system' for the past 35 years and it is clear that the system is responsible for some of the main structural obstacles to effective environmental policy implementation at the local level.

The first is the interference of local protectionism and weak environmental compliance assurance. The central government has increasingly delegated responsibilities to local governments for addressing local problems, and they are expected to draw upon and allocate local funds for this purpose. This encourages governments to defend local industries in order to secure revenues, even at the cost of environmental enforcement – basically, engaging in a form of local protectionism. This becomes particularly problematic when the goals of environmental protection conflict with the targets of economic development (Ma & Ortolano 2000). While EPBs had received guidance from the MEP, they remained institutionally and financially subordinate to provincial and local governments. Thus, the actions of EPBs were directed more by sub-national governments than by the MEP, as local governments tended to favour economic development over environmental considerations, with EPBs also ranking low in the government hierarchy. Pressures to demonstrate economic growth are powerful and compelling (Wang & Lin 2010). Even with the introduction of a wider range of environmental targets in socioeconomic planning, and despite innovations in the evaluation system for government officials, there was an ever-present risk that ‘fake data’ might be produced to preserve the political status quo.

The second structural obstacle to effective environmental policy implementation concerns budget allocation. China’s decentralised administrative system means that most EPB financial resources come directly from the local government (Jahiel 1998; Ma & Ortolano 2000). As a result, EPBs are often weak with minimal funding and limited authority (Lo & Leung 2000: 677; Ma & Ortolano 2000: 81). Since the late 1990s, EPB authority has improved somewhat nationally – this is especially the case in richer coastal areas – but funding continues to represent a major constraint. Until 2003, EPBs were dependent on the revenue from the pollution levy to finance their operations.

Without adequate funds, EPBs have been unable to carry out sufficient inspections, or to execute sanction decisions. The remainder of the EPBs’ resources are taken from pollution discharge fees and are thus dependent on continued pollution. It is in this way that a lack of funding effectively hampers enforcement: staff resources and materials, such as cars needed for inspections, are in chronic shortage. With inefficient staff who are also increasingly overburdened, EPBs are often unable to carry out regular and proactive inspections of polluting enterprises, and are forced to rely heavily on receiving complaints before investigating.

Third, fragmented authority and blurred accountability further hinder cooperation among local government agencies. The fragmented nature of China's bureaucratic system has been debated since the 1980s, and continues to hamper effective environmental management even now (Brombal et al. 2015). China's environmental protection and conservation efforts are managed by different government departments. For example, soil and water conservation activities are guided by the Bureau of Water Resources, dust management on construction sites is regulated by the Bureau of Housing and Construction, and vehicle exhaust is monitored by the Bureau of Transportation. The EPB's authority on such matters is limited by the need for it to seek consensus among its constituent members, consisting of representatives from more than 20 bureaus.

The EPB cannot compel cooperation because it lacks a formal mechanism that would otherwise allow it to do so. On the other hand, local government leaders continue to give limited attention to environmental performance and there remains an underlying bias towards GDP growth within the evaluation and rewards system for government officials. The lack of clear responsibilities and indicators for assessing local government leaders' environmental performance results in the systematic neglect of environmental protection that is seen in China today.

The fourth problem is the challenge of low implementation capabilities at the local level. The lack of knowledge and skills can result in certain national policies being misinterpreted by local governments. Partly, this lack of local capacity is due to the nature of the decentralisation process in China, where sub-national agencies are given decision-making authority but no accompanying financial resources. Even though a large number of civil servants are trained every year, training opportunities for environmental staff are unevenly allocated. In poorer counties and townships where the local government cannot even pay the salaries of their officials, training becomes a non-essential 'luxury', as opposed to a critical necessity.

Reviewing China's approach to vertical management reform

In order to reduce the interference of local governments in the work of local environment departments, overcome the institutional and procedural barriers that hinder environmental protection, and strengthen integrated management by treating both the symptoms and root causes of

environmental problems, in September 2016 the General Offices of the CPC Central Committee and the State Council published and distributed *Guidelines for the Pilot Reforms for a Vertical Management System for the Environmental Monitoring, Supervision, Inspection, and Enforcement by the Environmental Protection Branches below Provincial Level* (hereafter, the Guidelines). As one official of the MEP observed:

The vertical administration system will adjust not only the administrative jurisdiction, but also the division of powers among the local governments at different levels, the functional departments of a local government and the departments in charge of environmental protection. The system will also improve the basic mechanism of environmental governance. (Xinhua News 2016)

Following from the development of the central government's management procedures, 12 provincial divisions applied for and were selected as the vertical management pilot regions amongst 31 provinces. They were urged to carry out the reforms based on their practical circumstances, and to accomplish the reform objectives by the end of June 2017.

The main distinction between the two types of political relationships in horizontal and vertical management refers to those governed by binding orders, and those based on non-binding instructions (Figure 9.2). In horizontal management, the local party committees and governments at each level itemise the responsibilities of EPBs at their level, give full support for their initiatives, and provide supervision and inspections to enhance accountability in environmental protection tasks. On a vertical scale, the Guidelines highlight the unified supervision and management of the environmental protection departments, which is intended to improve overall efficacy. The Guidelines emphasise the regulation and establishment of environmental protection departments and teams, while optimising environmental functions at the provincial, municipal and county levels. The EPBs are primarily responsible for unified supervision and management, as well as for localised management, whereas other relevant departments are expected to take up responsibilities based on their respective jurisdictions.

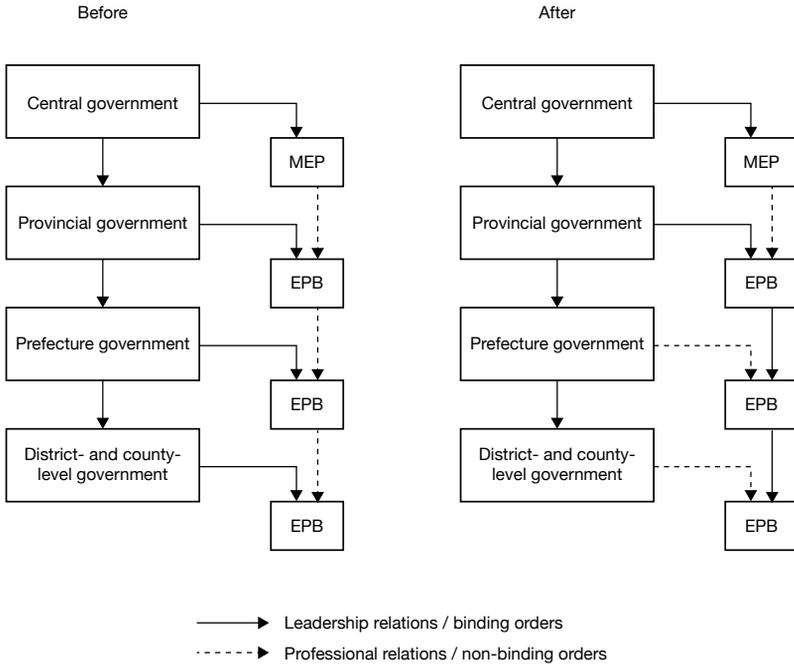


Figure 9.2. Before and after vertical management

Source: Fanrong Meng, Zitao Chen and Pichamon Yeophantong

The purpose of the reforms to a vertical management system is twofold: to address the pressing problems found in existing vertical and horizontal management systems as used in local environmental management, as well as to change the current situation where some local governments either give too much weight to economic development and make light of environmental protection; or intervene in environmental monitoring, inspection and supervision, and enforcement. This, in turn, leads to hurdles in performing environmental protection tasks, failure to observe laws, sloppiness in environmental enforcement and insufficient accountability for law-breaching activities. The key tasks and the corresponding problems are listed in Table 9.1.

Table 9.1. Key tasks in vertical management

Key tasks	Problems
Strengthen the environmental protection responsibilities of the local party committees, governments and relevant departments and urge them to fulfil such responsibilities, conduct authoritative and effective environmental supervision and inspection, and step up accountability and other measures.	Difficulty in overseeing local governments and relevant departments.
Centralise the eco-environmental quality monitoring and environmental supervision and inspection functions in order to wield such powers only at a provincial level, and manage the environmental enforcement teams at municipal level.	Difficulty in stopping the influence of local protectionism over environmental monitoring, supervision, inspection and enforcement.
Build capacity at provincial and municipal levels in making overall plans for and regulating environmental issues, and explore such measures as establishing cross-watershed and cross-region environmental protection bodies.	Difficulty in meeting the new requirements for addressing cross-watershed and cross-region environmental issues in a comprehensive manner.
Enrich the structure and staff of environmental protection institutions, and enable the environmental protection teams to be more specialised.	Difficulty in regulating and enhancing team-building among local environmental protection departments.

Source. Fanrong Meng, Zitao Chen and Pichamon Yeophantong

The integration of a vertical management system into environmental agencies is not entirely new. In 2002, Shaanxi province piloted the ‘vertical management’ of environmental bureaus at the municipal level and below, which led to ‘better law enforcement at the county level’ (Yue 2016). But the trial also met with resistance from the counties, which resented the fact that, with the concentration of authority, the original budget attached to this authority was ‘sucked upwards’. In 2006, the central government took a bigger step by creating 11 dispatch inspection centres all over China – an idea modelled on the regional offices of the US Environmental Protection Agency. These inspection centres, though based locally, report directly to, and are funded by, the political centre. But as ‘dispatch’ centres, they do not feed into the existing power structure at the local level, and are sometimes seen as interfering with local governments’ ability to exercise their legitimate authority. Since then, the MEP has made little progress vis-à-vis vertical management.

The 2008 upgrade of SEPA into a full ministry required the MEP to assuage fears of an even greater concentration of decision-making power. Accordingly, a key obstacle to pushing through the vertical management

reform was the concern that it may further fragment and undermine governance at the local level. With an increasing number of departments reporting to the top, there is a risk of excessive regulatory interference at the expense of catering to local needs.

Within the political science discipline, prior attempts at vertical management amount to experiments from which examples of best practice might be identified (Zhu 2014). The effects of a new policy cannot always be predicted, however, and it may be better, therefore, not to rely on a single approach (Ostrom 2005). Nonetheless, the experiments can potentially provide proof of principle, help shape any new policy and, thereby, provide the basis for policy diffusion.

But how is one to account for the variation in the levels of policy interest among different provinces? Some provinces are more hesitant, yet others appear to be more enthusiastic adopters when it comes to applying to be a vertical management pilot region. Provincial governments face many environmental problems but, at present, there is limited knowledge of how policymakers have responded to this problem. As more environmental problems fall under the purview of provincial governments, it is increasingly important to explore their capacity to develop comprehensive responses to those problems. This chapter explores the determinants of variations in the policy capability of these pilot provinces relative to other provinces and examines the ability of provinces to develop a multifaceted vertical management system.

Theoretical framework

Policy innovation and diffusion

Political scientists have long been fascinated by the puzzle of why local governments adopt certain policies or reforms (Dye 1966; Gray 1973; Savage 1978; Walker 1969). Policy diffusion refers to an understanding of policy innovation that emphasises the spread of novel policy approaches. New approaches are only innovative if and when they enter into widespread use and are adopted by or diffused into many jurisdictions. Diffusion theory is an established field of academic enquiry, which suggests that policymaking activity at the national level can occur either through internal processes, or by building on what has occurred in other states (Berry & Berry 1999; Gray 1994; Walker 1969).

The reasons for innovation and the mechanisms of inter-regional diffusion are complicated. Previous studies generally can be grouped under three models: internal determinants, horizontal influence and vertical interventions (Nice 1994; Elkins et al. 2006; Berry & Berry 2007; Walker et al. 2011). The internal determinants include social, economic, political and historical traditions; traits of leaders; and internal policy networks (Berry & Lowery 1987; Mintrom 1997). The major horizontal influential factors come from competition and pressure among governments (Rogers 1995; Cao 2012; Rose 2005). In contrast with these two models, the vertical intervention model emphasises the role of higher levels of government in powerful hierarchical systems, which may spread and accelerate policy diffusion to local governments through mandated measures (Newman et al. 2000; Nutley et al. 2012).

In China, vertical intervention from the superior government is more complicated than in democratic decentralised countries. The central government has strong powers and considerable influence on the behaviours of local governments and on the careers of local officials. Xufeng Zhu (2014) revealed how different diffusion patterns of innovation are adopted by subordinate local governments under various vertical intervention mechanisms that are established by the central or superior governments within an authoritarian structure. The central or superior governments may adopt two major intervention methods to impose the necessary effect: intervention via administrative command and competition using performance evaluation.

Internal and external determinants of policy adoption

Considering the above theoretical perspective, we establish two broad explanations for policy adoption in this study: internal and external determinants. Internal determinant models suggest that the adoption of policy innovation depends on a state's internal characteristics (Berry & Berry 1999). These characteristics, such as socioeconomic resources, political ideology, the severity of the problem and interest-group pressure, may influence state policymaking (Wright et al. 1987; Ringquist 1994; Williams & Matheny 1984). They are often related directly to the 'motivation to innovate, the strength of obstacles, and resource availability' (Berry & Berry 1999). In view of this literature, we test two specific aspects of the internal determinants explanation of provincial pilot reform:

- **Problem severity:** The emergence of a problem or crisis requires a change to existing circumstances and increases the likelihood of policy adoption. Moreover, the likelihood of adoption and the rate of diffusion increase if the innovation is perceived to be compatible with current circumstances and the generally accepted values and norms of the social system (Rogers 1995). We speculate that the more serious a province's environmental problems, the more likely it will adopt environment management reforms.
- **Resources:** Policy innovation and implementation often carry high costs. Researchers consistently report that larger and wealthier states adopt new programs faster than smaller and poorer states (Gray 1994; Walker 1969). Necessary legitimacy and resources (legal, financial) can facilitate the development of long-term project visions, stimulate and oversee local approaches, and support the implementation of ambitious programs (Bell & Hindmoor 2009). Thus, the availability of resources may increase the motivation of decision-makers to initiate a search for new ideas, study their effectiveness and apply them in practice (Berry & Berry 1999; Jensen 2004). The social and legal viability of the state is not the only established resource required for policy adoption. A sound ecological foundation – which in this chapter refers to the ecological restoration and conservation of land and water resources – also constitutes an essential factor in environmental policy adoption and innovation.

Aside from the internal determinants, diffusion theory also considers how external factors can likewise have a positive influence on policy adoption. In other words, states are more likely to adopt policies or programs when other governmental units have already adopted them (Berry & Berry 1999). The possible reasons are: (a) states learn about different policies from other states, (b) states compete with each other, and (c) public pressure may force a state to adopt a policy that neighbouring states have adopted (Berry & Berry 1999). Given this, we hypothesise three external determinants:

- **Horizontal competition:** Some diffusion theorists suggest that there is a greater likelihood of states adopting policy innovation if a neighbouring state has already done so (Berry & Berry 1999; Gray 1994; Mooney & Lee 1995; Walker 1969). Innovation adoption is not always predictable, as some states have a greater desire to be on the 'cutting edge' and are willing to take risks, while other states prefer to wait until an innovation is 'standard practice' before considering

adoption (Dusenbury & Hansen 2004). Competition occurs when units react to, or anticipate, the other's policy actions in an attempt to attract or retain resources. As a pilot region, a province could obtain more political and financial resources, but also face unpredictable risks. Such competition would then affect the choices of other governments.

- **Vertical learning:** Along with the pressure from other state governments, national policymaking can also be affected by upper level government units. Vertical or top-down pressure is often suggested in diffusion research, but seldom examined in an explicit manner (Berry & Berry 1999). The vertical influence model does not view learning and competition as key elements to policy diffusion, but rather situates the influence of national governments as a central factor. Therefore, it is more likely that states will adopt the policies heralded by the national government, rather than emulate the policies of other states (Berry & Berry 1999). More specifically, the vertical influence model posits that states are most likely to adopt policy innovation in response to federal mandates. In fact, adoption is even more likely when it is attached to federal funding and incentives (Berry & Berry 1999). Innovation adoption is also influenced by the national government's expectation that states conform to standards (Brown 1981). Accordingly, supporting the central government is particularly important for local officials seeking to obtain favourable consideration of their future promotion.
- **Public participation:** Popular environmental movements are usually the result of serious public concerns over social and ecological impacts, and can help to compel governments to expedite the search for solutions to environmental problems. National environmental policymaking might also be subject to pressure from interest groups, albeit this is likely to be marginal in China in contrast with Western democracies (Davis & Feiock 1992; Gray & Lowery 1996; Potoski 2001). On this view, new environment policies are likely to emerge under conditions marked by active public participation within the policymaking process.

In sum, we identify seven internal and external determinants – namely, problem severity, social development, legal development, ecological foundation, horizontal competition, vertical learning and public participation – as explanatory variables that may influence provincial decisions to apply to become vertical management pilot regions (i.e. the dependent variable).

Methods, data and measurement

We use QCA in order to empirically assess the relative weight of the determinants of policy adoption. This method is particularly well-suited for a 'small-N' research design, which allows for the examination of multi-causal analysis and the interaction of causal variables (Ragin 1987). A basic premise of QCA is that there may be multiple paths or causal combinations leading to the same outcome. It is a combination of independent variables ('conditions', in QCA terms) that eventually produces the phenomenon to be explained. Several different combinations of conditions can produce the same outcome and, depending on the context (i.e. 'conjuncture'), a given condition may have a different impact on the outcome.

This suggests how different causal paths – each path being relevant in a distinctive way – may lead to the same outcome. Hence, by using QCA, one is urged not to 'specify a single causal model that fits the data best', but rather to 'determine the number and character of the different causal models that exist among comparable cases' (Ragin 1987: 167). Although QCA is often considered a non-standard method, it is steadily gaining ground in comparative research in sociology and political science (Rihoux & Ragin 2009).

China's highest level of administrative division is at the provincial level. There are 31 such divisions spread across the country: 22 provinces, four municipalities and five autonomous regions. This study examines how these 31 divisions decided whether or not to be candidates for vertical management pilot regions within China's broader environmental protection system. We regard attempts to apply to become a pilot region as a manifestation of policy adoption. By using a mix of statistical and qualitative approaches, we identify associations between provincial conditions and policy adoption behaviour. The study utilises data from official field statistics that present the environmental and social-legal conditions of China's 31 provincial level regions.

Table 9.2 lists the indicators that were adopted from the statistical analysis, and which are used to operationalise the seven conditions of internal and external determinants. Problem severity refers to the number of serious environmental events or crises within a province. A province is classified as having a serious environmental problem that requires urgent attention and mitigation if it has experienced more than 10 serious environmental events or crises that were criticised by the MEP or which exhibit levels of air pollution above $\text{pm}_{2.5} \geq 50 \mu\text{g}/\text{m}^3$ (the national standard).

The human development index (HDI) is used as an indicator of social development and provides a composite statistic of life expectancy, education and per capita income indicators. Legal development refers to the degree to which public concerns are considered by policymakers, and is measured here by the number of local People's Congress proposals on environmental protection issues. Ecological foundation is measured with respect to whether there is an 'ecological' city, county or district within the province. Horizontal competition is measured on the basis of applications for pilot regions from neighbouring provinces. The indicator for vertical learning is measured by the number of local regulations vis-à-vis central government requirements on soil, water and air protection. Finally, public participation reflects popular participation in and influence on environmental policymaking, and is measured by the number of public petitions on environmental protection.

Table 9.2. Variable calibration and sources

Variables	Calibration	Values	Source
PS (problem severity)	Serious environmental events ≥ 10 , PM2.5 $\geq 50\mu\text{g}/\text{m}^3$	1, or 0	China Environmental Annual Statistics 2016, PM2.5 Rank of 359 cities in China in 2016
SD (social development)	Human development index (HDI) ≥ 0.70	1, or 0	China National Human Development Report 2016
LD (legal development)	Local environment laws or regulations ≥ 20 (median)	1, or 0	China Environmental Annual Statistics 2015
EF (ecological foundation)	Number of ecological cities, counties or districts in the province ≥ 1	1, or 0	List of national ecological sites by city, county and district
HC (horizontal competition)	Number of neighbouring provinces applying for vertical management ≥ 1	1, or 0	MEP website
VL (vertical learning)	Number of regulations in soil, water and air protection in the light of central government requirement \geq average	1, or 0	MEP website
PP (public participation)	Number of petitions on environment protection \geq average	1, or 0	China Environmental Annual Statistics 2012–15, Environment Report 2016

Source. Fanrong Meng and Zitai Chen

With regard to coding, there are multiple forms of QCA; however, for this study, we used crisp-set QCA (csQCA) in which variables or conditions can take only two values. Each case is evaluated according to the presence (1) or absence (0) of a condition and outcome, and this information is arranged in a truth table (Ragin 1987). QCA is a theory-driven method and the selection of conditions depends on the theoretical questions at hand. We coded the indicators for seven conditions that have been identified in the literature. The coding in csQCA necessarily simplifies the complexity of the cases because it uses a binominal scale. Even though the coding is binominal, the coding process takes into account the complexities of the different conditions.

Analysis and results

The QCA begins with the construction of a 'truth table' (Table 9.3) that registers the possible determinants expected to affect provinces' responses. For each province in our sample, these factors are recorded in accordance with the coding procedures explained above. The truth table is then *minimised* to generate Boolean equations.

Minimisation consists of a set of logical rules that reduce the complexity of the combinations of conditions and outcomes. The objective is to eliminate irrelevant factors. In other words, the QCA produces the shortest possible description of different constellations of conditions and outcomes. We used (fuzzy-set) fsQCA 2.0 software to analyse the truth tables (with our crisp-set data) to specify the different combinations of conditions linked to the selected outcome, as based on the features of the positive cases that consistently distinguish them from the negative cases. We further assess the consistency for crisp sets, which is the percentage of cases in each row displaying the outcome. Consistency scores of either 1 or 0 indicate perfect consistency for a given row. A score of 0.5 indicates perfect inconsistency. Cases with greater than 0.9 consistency are considered likely to be necessary conditions.

Table 9.3 shows that horizontal competition (HC) has 0.9167 consistency and should be considered a necessary condition for a province to apply to be a pilot for vertical management of environmental regulation.

Table 9.3. Truth table

Province	VM	HC	VL	PS	SD	LD	PP	EF
Beijing	0	1	1	1	1	0	1	1
Tianjin	0	1	1	1	1	0	1	1
Hebei	1	1	1	1	1	1	0	0
Shanxi	0	1	1	1	1	1	0	0
Inner Mongolia	0	1	0	0	1	1	0	0
Liaoning	0	1	0	1	1	1	1	1
Jilin	0	0	1	0	1	0	0	0
Heilongjiang	0	0	0	0	1	1	0	0
Shanghai	1	1	1	1	1	0	1	1
Jiangsu	1	1	1	1	1	1	1	1
Zhejiang	0	1	1	1	1	1	1	1
Anhui	0	1	1	1	1	1	0	1
Fujian	1	1	1	1	1	0	1	1
Jiangxi	0	1	0	0	1	0	0	1
Shandong	1	1	1	1	1	1	1	1
Henan	1	1	1	1	1	1	1	1
Hubei	1	1	1	1	1	1	0	1
Hunan	0	1	1	1	1	0	0	0
Guangdong	1	1	1	1	1	1	1	1
Guangxi	0	1	0	0	1	0	0	0
Hainan	0	1	0	0	1	0	0	0
Chongqing	1	1	0	1	1	0	1	0
Sichuan	0	1	1	1	1	1	0	1
Guizhou	1	1	0	0	0	1	0	1
Yunnan	0	1	0	0	0	1	0	0
Tibet	0	1	0	0	0	0	0	0
Shaanxi	1	1	1	1	1	1	1	1
Gansu	0	1	0	1	0	0	0	0
Qinghai	1	0	0	0	0	0	0	0
Ningxia	0	1	0	0	1	0	0	0
Xinjiang	0	1	0	1	1	0	0	1
Consistency		0.9167	0.7500	0.8333	0.8333	0.6667	0.6667	0.7500

Source. Fanrong Meng and Zitai Chen

We use fsQCA to identify other conditions that are likely to contribute to a province's decision regarding piloting vertical management. This software usually presents three possible solutions: (1) a 'complex' solution that relies only on the positive cases (i.e. only the provinces that applied to be pilots) and ignores the counterfactual cases, which generally leads to identifying all the conditions that commonly apply to the positive cases; (2) a 'parsimonious' solution that takes into account all the cases, both positive and negative, and identifies the more limited number of conditions that apply especially to the positive cases; and (3) 'intermediate' solutions that take into account the analyst's additional considerations about the plausibility of the two other solutions, including theoretical considerations.

The complex solution we identify is a combination of the other variables (vertical learning, problem severity, social development, legal development, public participation and ecological foundation). The parsimonious solution focuses only on vertical learning, legal development and public participation. While in both cases the consistency measure is high (0.8333), it is difficult to fully explain the basis of either of the two solutions. Accordingly, while we have not explicitly considered additional factors to develop some 'intermediate' solution, we have examined more specific combinations of the variables and identified two possible pathways, both of which reveal total consistency (1.0) and, when combined with horizontal competition, offer highly plausible solutions:

Table 9.4. Truth table final solutions

	Raw coverage	Unique coverage	Consistency
~VL*~PS*~SD*LD*~PP*EF	0.083333	0.083333	1.000000
~VL*PS*SD*~LD*PP*~EF	0.083333	0.083333	1.000000
Solution coverage:	0.583333		
Solution consistency:	0.875000		

* indicates positive intersection with condition, *~ indicates intersection with reverse condition
 Source. Fanrong Meng and Zitai Chen

Table 9.4 lists details about the two solutions. Solution consistency measures the degree to which membership in the solution (the set of solution terms) is a subset of membership in the outcome, which is 0.875. Solution coverage measures the proportion of memberships in the outcome that is explained by the complete solution, which is 0.583. Raw coverage measures the proportion of memberships in the outcome

explained by each term of the solution, and unique coverage measures the proportion of memberships in the outcome explained solely by each solution term, excluding memberships that are covered by other solution terms (Ragin 2018). Both the raw and unique coverage are low, and we discuss the implications further below.

The first path is a combination of: more horizontal competition, less vertical learning, good ecological foundation, less public participation, good legal development, poor social development and less problem severity. It is likely that such a combination presents a model driven by poor social development, where less severe environmental problems and good ecological resources cause lower levels of public pressure on environmental issues. The typical case of such a model is Guizhou, a mountainous province in south-east China with rich natural, cultural and environmental resources. Compared with other provinces, Guizhou is relatively poor and economically underdeveloped with a nominal GDP for 2015 of 1050.26 billion yuan (US\$150.04 billion) and per capita GDP of RMB29,847 (US\$4,264) (National Bureau of Statistics of China 2017). Demographically, it is one of China's most diverse provinces, with ethnic minorities accounting for more than 37 per cent of the population.

In such a multi-ethnic region, pursuing social stability and integration is an important task for the senior local officials. China's Constitution and laws guarantee equal rights to all ethnic groups and provide priority policies to promote ethnic minority groups' economic and cultural development. Under the pressure of a target-oriented responsibility system, which covers comprehensive performance indicators in economic, social and ecological fields, a common strategy for the local government is to develop their strong points and not exacerbate their weaknesses.

As Guizhou has good environmental resources and an ecological foundation, there is less risk politically within the party, administratively and with the general public in carrying out new attempts at environmental policymaking. There is also a greater likelihood of producing a positive outcome and reorganisation through environmental, as opposed to economic, policy innovation. Hence, the central performance evaluation system is possibly a key factor pushing local senior managers to design innovative environmental management strategies and carefully govern innovation processes; this may be regarded as a top-down model for policy adoption.

The other path leading to a local government's policy adoption is represented by a mix of more horizontal competition, less vertical learning, a poor ecological foundation, more public participation, poor legal development, good social development and greater problem severity. This depicts a different strategy of policy adoption that is largely driven by problem severity and having the resources to address it. The typical examples are Shanghai and Jiangsu provinces. Shanghai is the commercial and financial centre of China and, since 2011, its total GDP has been the highest of all Chinese cities, with per capita GDP of RMB 82,560 (US\$12,784) (Dongfang Daily News 2012).

Public environmental awareness is growing fast and the city has invested in a number of environmental protection projects. On 23 January 2014, the municipal government announced that three main measures would be taken to manage air pollution in Shanghai, along with surrounding Anhui, Jiangsu and Zhejiang provinces. The measures involved delivery of the 2013 air cleaning program, a linkage mechanism with the three surrounding provinces and improvement of the emergency early warning system (CNSTOCK News 2014). The sharp contrast between poor ecological protection and rich social development leads to deeper public support for and pressure on environmental issues. In this model, good social development can provide sufficient financial resources to encourage policymakers to pursue greater policy innovation. This is more akin to a bottom-up model, given the impetus for innovation does not endogenously arise from the leaders themselves.

It is interesting to note that horizontal competition constitutes the single necessary condition for policy innovation. This suggests that pressure arising from same-level competitors is the chief driver for provinces to adopt new policy. The two multiple configurations identified are not mutually exclusive but together provide plausible bases for the decisions by most provinces.

They do not, however, provide the full answer. Despite the high 'consistency' score, the analysis reveals a low 'coverage' result (0.0833), suggesting that other factors not included in the study may be equally, or even more, important. It is common in social phenomena, which are contingent by nature, to find that additional contextual conditions influence policy decisions (Gerrits & Verweij 2013). This study mainly considers macro-level factors and does not include micro-level factors, such as individual styles of leadership and motivation. For example,

the style, tenure, education and work experience of leaders may affect their policy decisions and implementation. Thus, an interesting future research avenue is to take some micro factors, such as leaders' attributes, as conditions and examine what combinations of these influence the practice of certain management strategies.

Discussion

Two general conclusions can be drawn from the above QCA of the vertical management pilot region applications of Chinese provinces. First, horizontal competition is a key factor that directly influences provincial policy adoption. Regardless of how different the internal conditions are, the provinces that had applied for the pilot reform possessed similar external conditions to neighbouring provinces that had, likewise, attempted the reform. Under external pressure, provincial leaders exhibit higher levels of motivation and tend to be more inventive in introducing new policies to win political arguments. Other jurisdictions tend to follow leading provinces that have similar preferences in terms of instruments and types of technology (Jordan & Huitema 2014). Massey et al. (2014), for instance, observed how external drivers are more prominent across Europe in the diffusion of adaptation policies on climate change issues. Biesenbender and Tosun (2014) similarly suggest that the adoption of climate policies in OECD countries is influenced by learning from international organisations, which serves as an external driver. Our study also supports these findings within the Chinese context.

Second, internal factors also influence the policy adoption process. There are two main configurations of different conditions: severe environmental problems with good social development and lagging legal development in environmental issues, or less serious environmental issues and a stronger legal foundation but with poor social development. We use the HDI to discern the degree of social development. A region scores higher HDI when the lifespan, the education level and the GDP per capita is higher. It seems that with rapid social and economic development, environmental protection has often been ignored, even with respect to legislation. The environmental Kuznets curve serves as a reminder of how economic development can initially lead to environmental degradation, but also how, after a certain level of economic growth, a society can begin to improve environmental quality, resulting in lower levels of environmental degradation (Mills & Waite 2009).

From this viewpoint, China's provinces need to adopt new methods to amend the current model of national development. As such, the pilot region applications could suggest new opportunities with regard to China's environmental governance. Stadelmann and Castro (2014) demonstrate how higher levels of GDP are positively correlated with the adoption of financial instruments, which in turn stand to motivate greater policy adoption. Conversely, for lower and middle-income provinces, local government pressure can prove to be more important than in higher income provinces. Our results also suggest, however, that there may well be other factors, not addressed in this study, that affect provincial decisions to apply to be a pilot for vertical management of environmental regulation.

Conclusion and prospects

This chapter has demonstrated how policy adoption does not depend on a single condition, but can result from a combination of internal conditions. Moreover, these configurations differ under certain case-specific or contextual circumstances. In other words, specific contexts may require, for instance, specific combinations of management and stakeholder involvement. Indeed, the patterns of policy adoption and diffusion, together with the subsequent consequences, warrant more attention. Biesenbender and Tosun (2014) have noted how the adoption of policies is dominated by learning and emulation from policy practices adopted by culturally and politically similar peer countries and that, after adoption, countries tend to modify policies again. In light of this, there is a need to further link policy content to practical circumstances, and to explore the possible (unexpected) consequences or problems associated with the emerging vertical management regions.

According to the Guidelines, the vertical management system holds the potential to transform the *kuai*-based set of authority relations to one based on centralised management, largely of personnel/budgetary allocations (*bianzhi*), cadre recruitment and allocation (nomenklatura), and revenue collection. Here, the channelling of capital happens in a more direct fashion. But, more fundamentally, local governments are ultimately accountable for environmental quality within their jurisdictions. In other words, greater accountability, clearer articulation of tasks and authority, and direct financial and policy support, contributes to reducing transaction and management costs among bureaucracies further along the line of command and, as such, improves policy efficiency. Certain risks and challenges remain, however; for instance, the fragmentation brought

about by a vertical management system could undermine local governance. This challenge could very well become one of the most urgent problems in need of mitigation.

Under the vertical management system, local EPBs below provincial level have witnessed a dramatic increase in administrative subordinates within their area of direct responsibility, particularly through their ability to control personnel and budgetary flows. Local governments can no longer directly control personnel, budgetary and related arrangements. This potentially represents a significant loss of local government leverage over EPBs. Moreover, local EPBs are not created and managed by, or responsible to, the corresponding local People's Congresses. Thus, they do not need to be approved by or even report to the local People's Congress about their work.

National and local laws stipulate, however, that local People's Congresses have supervision authority over the administrative departments within a specific locality. At the very least, centrally managed units can act as 'blind spots' for the local People's Congresses. As centrally managed EPBs become more autonomous, their relations with other local administrative departments become less important, and a sense of alienation may be unavoidable. Effective implementation of environmental policies, however, requires coordination between local departments under the local EPBs' direction. In this way, a weakened relationship among government departments could give rise to obstacles to cooperation and policy enforcement.

Only through innovations to institutional, legislative and development models can China overcome these problems and achieve sustainability into the future. The case of vertical management serves as a prime example of the politics of power decentralisation and recentralisation, while also reflecting the complex principal-agent relationship between China's central and local governments. Based on China's previous experiences in enacting total control policies, the implementation and enforcement of environmental regulation has been shown to be better guaranteed by cadre evaluation and centralised data management systems (Jin et al. 2016). As a consequence, future effective implementation of vertical management depends on three considerations: a 'top design' strategy that integrates environmental protection reform, a robust evaluation system and a well-designed regional development model.

Positive examples taken from pilot areas should be encouraged and diffused. By the same token, efforts should be made to improve the 'nuts and bolts' of the country's evaluation and accountability systems. Indeed, the vertical management system could empower local party committees and governments to shoulder greater responsibility for environmental protection through the implementation of the 'one position with dual responsibilities' and lifelong accountability systems, which means that officials who fail to meet requirements and thereby contribute to environmental damage will be identified and not be appointed to other important positions or promoted; they may also be held responsible for damages even after they have left office.

As an important local organ of state power, local People's Congresses should also play stronger roles in supervising and ensuring the execution of national laws and regulations to avoid the 'blind spot' of environmental policy implementation. Among the 12 pilot regions, Chongqing and Hebei province have taken the lead in publishing documents on the vertical management framework for environmental monitoring, inspection and enforcement. They have also teased out regulations for environmental protection obligations, measures for environmental inspection and detailed rules on the accountability of leading party and government officials for ecological damage caused.

Second, centralising the data management system can be an important entry point for refining the function and responsibility of environmental protection organisations at different levels – from cities and districts to counties and townships. The accuracy of environment-related information serves as the basis for monitoring, risk assessment, policy evaluation and further adjustment. This power should be centralised to upper level government agencies to guarantee scientific validity and fairness. Some specific functions of the state environmental apparatus, such as environmental monitoring and internal inspection, should be further appropriated to city EPBs, with these functions mainly serving as a means for higher level departments to hold their subordinates accountable. District- and county-level EPBs would retain the key functions, such as the inspection of industrial facilities, that allow them to enforce environmental regulations at the local level, but these functions would be derived from national data standards and collections.

Third, a comprehensive environmental governance network, combined with a more powerful incentive structure for public participation, should also be established. Greater policy and financial support can help to encourage government units, industry, non-government organisations and volunteers to contribute more to environmental protection. Following from this, publicly accessible information platforms should be created to provide information in order to promote public participation in policy enforcement. Governance should, therefore, be pushed to be more standardised, normalised and legalised (Jin et al. 2016).

In this regard, future research should consider how institutional reform relates to other types of policy innovation and contextual factors in forming the configurations necessary for effective environmental management performance. Answering the question of whether historical institutionalism or rational choice is more correct will also require additional analysis and theoretical elaboration in this research area. Potentially, extending this topic of inquiry towards a longitudinal study could offer more insights and possible solutions.

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