Policy choices, central-local relations and policy learning : a case study of the pricing policies for wind energy in China (from 1994 to 2009)

Daphne Ngar-Yin Mah, Peter Hills

SciencesPo.

Governance and Globalization
Sciences Po in China

Working Paper Series
20[1]

Policy Choices, Central-Local Relations, and Policy Learning: a Case Study of the Pricing Policies for Wind Energy in China (From1994 to 2009)[2]

政策选择、中央－地方关系和政策学习：中国风电定价政策案例研究（1994 年－2009 年）

Daphne Ngar-yin Mah
Senior Research Associate, The Kadoorie Institute, The University of Hong Kong
Peter Hills
Director and Professor, The Kadoorie Institute, The University of Hong Kong

May 2010

[1] The Governance and Globalization Working Paper Series is published by Sciences Po with generous support of the French Ministry of Foreign Affairs. Copyright as well as responsibility for arguments developed in this paper remain with the author.
[2] Paper presented at the International Workshop: "Institutional Change and Environmental overnance: Comparing the Dynamics of Central-Local Relations in Environmental Policy Making" Tsinghua University, School of Public Policy and Management,Beijing, December 11-12, 2009.

Abstract

Wind energy, like other forms of renewable energy, has the potential to contribute to a more sustainable energy future but it has remained a fringe energy source. The acceleration of wind energy development is difficult and depends on the choices of policy options, policy formulation and other policy-making processes. It is therefore of policy and scholarly interest to examine whether policy learning, a process by which policy stakeholders adjust a policy in response to past experiences and new information (Hall, 1993), may improve the efficacy of the policies for wind energy.

In this paper, we assess the role of policy learning in improving the efficacy of energy policies by examining the evolution of the pricing policies for wind energy in China since 1994 when China's first pricing policy for wind was introduced. A distinctive feature of the wind pricing policies in China was the prolonged debate regarding the relative merits of two competing policies – the tendering policy (a policy of price liberalization) and the fixed-price policy (a policy of price regulation). It is in this Chinese context that this paper contrasts the developments of three distinctive phases of pricing policies for wind energy between 1994 and 2009, and compares the local policy responses in three Chinese provinces, Guangdong, Shanghai and Xinjiang.

This paper adopts a case-study approach. The analysis of this paper focuses on the policy changes *at the national level*, including the move away from the tendering policy to a fixed-price policy in 2009, and the *diversity of local policy responses* that ranged from the introduction of a local fixed-price policy in Guangdong to the local implementation of the tendering model in Shanghai and the introduction of a *de facto* fixed-price policy in Xinjiang.

Our findings suggest that technical and conceptual forms of policy learning have taken place in China in relation to the policies for wind energy, but the progression towards a high-order of policy learning, social learning, was severely constrained under the established fabric of central-local relations. This paper shows that policy learning improved policy coherence. Another benefit of policy learning is a better understanding of the unintended policy outcomes and the underlying incentive structures among policy stakeholders. The progression of policy learning was achieved through a number of enablers, including knowledge creation, institutions for knowledge accumulation and information disclosure, and the emergence of an issue network. However, overcentralisation, the inertia against institutional changes and the failure to recognize the need for a more deliberative decision-making process, which all emerge from the current central-local tensions in China's governance system, were identified as the key barriers to the policy learning process.

The Authors

Ms Daphne Ngar-yin Mah is a senior research associate of The Kadoorie Institute at the University of Hong Kong (HKU). She is also a PhD candidate at HKU. She was awarded the Chevening Scholarship in 1999 and holds an MSc in Environmental Management from the University of Nottingham in the UK. Daphne's research interests include environmental governance, sustainability issues, comparative environmental policy processes, renewable energy, and China environmental studies.

Prof. Peter Hills is the Director and Chair Professor of the Kadoorie Institute, The University of Hong Kong. His research interests centre on the relationship between environmental and sustainability issues and the policy-making process. He has acted as a consultant to various international organizations, including The United Nations Development Programme, The United Nations Economic and Social Commission for Asia and the Pacific, The Asian Development Bank, and The European Union. He has served on many of Hong Kong's major statutory and advisory bodies in the environmental and urban planning fields. Planning and Management. He is a member of the international editorial boards of *Policy and Politics*, *Local Environment*, *Business Strategy and the Environment*, *Sustainable Development*, *The International Journal of Sustainable Society*, and *The Journal of Environmental Planning and Management*.

Introduction

The current fossil fuel-dominated energy systems in both developed and developing countries have led to acute environmental challenges that range from serious air pollution to acid rain and human-induced climate change impacts. Renewable energy, such as wind energy and solar power, generally are inexhaustible and emit low emissions. However, although renewable energy is capable of making a significant contribution to the transition towards more sustainable energy systems, it has remained a fringe energy source (Jefferson, 2008).

The barriers to the growth of renewable energies are many. A major constraint is that they are generally more expensive than conventional energy (Tester *et al*., 2005). They are often intermittent in nature creating additional challenges for energy system reliability. Furthermore, current energy markets are biased against renewables because of the "lock-in" effect of the established technologies. As the conventional energy technologies are already mature and have achieved economies of scale, it is often difficult to achieve a short-term transition to renewable energy sources (UNEP, 2006).

In view of these barriers, public policies have been introduced by governments to support renewable energy. These policies for renewable energy are usually justified on a number of grounds, including the need to rectify externalities, to remove market barriers, to overcome institutional barriers, and to meet strategic needs such as enhancing energy security (OECD, 1997; Sawin and Flavin, 2004). While there is empirical evidence suggesting that renewable energy could not be extensively developed without some form of public policy support (Sawin and Flavin, 2004), using public policies to accelerate development of renewable energies has been proven difficult, and policy outcomes are mixed.

China is part of the global trend of formulating policies to accelerate the deployment of renewable energy. As extensively documented elsewhere (MIT, 2007; Wehrle, 2008; World Bank, 2007; Zhao, 2006), China's impressive economic achievements in the past three decades have come at a cost of serious environmental degradation. China's coal-based energy system, which provides 80 percent of the electricity by burning coal (IEA, 2007c; Tian, 2008), has created not only pollution problems, but raised concerns about energy security and social instability. There have been growing commitments from China's top leaders to use laws and policies to accelerate the development of renewable energy.

Wind energy is one of the prioritized renewable energy sources in China because it is relatively cost competitive with conventional energy sources (IEA 2007c), and it has potential for wide-scale application as already demonstrated in some countries such as Germany and Denmark (BMU, 2009; GWEC, 2009b, c; Teske *et al*., 2007). Benefiting from the enactment of the Renewable Energy Law in 2005 and the associated supportive policies that cover pricing, R&D, grid access and other policy domains, wind energy in China has experienced impressive growth. The installed capacity of wind energy in China doubled each year from 2004 to 2008, and reached 12.8 GW by the end of 2008 (CHECC, 2008; EF, 2009; Martinot and Li, 2007). There are 152 commercial-scale wind farms in 20 Chinese provinces, equipped with approximately 6,500 wind turbines (end 2007) (CHECC, 2008; IEA, 2007b; Li, 2008). China now ranks fourth in the world in terms of the number of wind installations (GWEC, 2009a).

Although promising, the outlook for wind energy in China is clouded by various factors. Wind is still a fringe energy source contributing only 0.16 percent of the country's total electricity generation and 0.78 percent of the total installed capacity (end 2007) (SERC, 2009).

It is against this mixed picture for wind energy in China that the pricing policies for this renewable energy source have been one of the most critical policies in shaping the evolutions of wind energy in China. Since the first pricing policy for wind was introduced in China in 1994, there were some drastic and interesting developments in pricing policies at both the national and local levels. A distinctive characteristic of the pricing policies for wind in China was the prolonged debate between the choice of two policy options, the tendering policy (a policy of price liberalisation) and the fixed-price policy (a policy of price regulation). As noted elsewhere (Li, et al., 2007; Mah & Hills, 2008), the adoption of the tendering policy by the central government in 2003 has succeeded in accelerating the scale of new wind installations in China,

but the policy was ended recently in July 2009 when the central government decided to replace it with a nation-wide fixed-price policy. Another interesting development in China in relation to the wind pricing policy is an emergency of a wide variety of local responses. At the provincial levels, the localities had introduced different pricing policies. Guangdong, for example, pioneered local fixed-price policies. Shanghai on the other hand used a two-tier pricing policy. Xinjiang, in contrast, used a *de facto* fixed-price policy.

These interesting developments in pricing policies for wind energy at both the national and local levels in China have given rise to a number of important questions that need to be answered: what are the impacts of the national policies on the localities? How do the localities contribute to the policy-making process for pricing policies? In addition, perhaps more importantly, what are the responses of the Centre and provinces when there are conflicts between national priorities and local interests? What are the mechanisms that can resolve the conflicts for better policies? What are the conditions that work or do not work, how and why? By answering these questions, this paper aims to provide a better understanding of how the efficacy of renewable policies in China can be improved.

Our initial research into the governance aspects of wind pricing policy in China, as reported in Mah and Hills (2008), was an attempt to shed light on central-local relations, power struggles and tensions in policy-making for wind energy. The initial research however did not provide many insights into what mechanisms can resolve the central-local relations, and may improve the efficacy of wind energy policies. To carry our work forward, we therefore conduct this case study of pricing policies for wind in China, and adopt the concept of policy learning to develop a conceptual framework of our analysis.

Policy learning is a policy-making process that emphasises policy adjustment in response to past experiences and new information (Hall, 1993). Specifically, this paper will develop a framework to build connections between the concepts of policy learning and central-local relations, and applies these concepts to the examination of the evolution of pricing policies for wind energy in China.

This paper has three main objectives. First, it will examine the evolution of the pricing policies for wind energy in China, at both the national level and in three Chinese provinces, Guangdong, Shanghai and Xinjiang, from 1994 onwards. Second, it will assess the extent to which policy learning took place in China. Third, it will conceptualise the workings of policy learning in the central-local tensions in the Chinese context in relation to wind energy policies. Specifically, this paper seeks to identify and examine the key drivers, barriers and enablers of the policy learning process.

This paper concern with the following research questions: has policy learning changed over time, and if so, has it improved or deteriorated? Who were the key policy agents of learning? How did these agents interact and learn? Why did the agents interact in the observed ways?

This paper adopts a case-study approach and has two dimensions of analysis. A case-study approach is well suited to provide answers to “how” and “why” questions (Yin, 2003), and is therefore a useful research methodology to understand how and why policy learning works or does not work in Chinese provinces in the context of wind pricing policies. The first dimension of analysis is a longitudinal analysis focusing on the national-level policy changes. This contrasts the developments of three distinctive phases of pricing policies for wind energy between 1994 and 2009. The second dimension analysis focuses on the local levels, and it compares the local policy responses in three Chinese provinces, Guangdong, Shanghai and Xinjiang in relation to the pricing policies for wind energy.

Guangdong, Shanghai and Xinjiang are selected for this case study for a number of reasons. Guangdong in the southeast coast, Shanghai in the east coast, Xinjiang in the northwest inland provide a geographic representation of Chinese provinces. In addition, the provinces have remarkable differences in their economic, political and social conditions (Chung, 2003; World Bank, 2006; Tang, et al., 1997; Cheung 2002). A comparison of the three provinces thus offers a valuable opportunity for a better understanding of the contextual factors influencing the ways wind pricing policies evolved.

The analysis presented here draws on data and information derived from desktop research, site visits and interviews with prominent stakeholders. Face-to-face interviews were conducted in Beijing, Guangdong, Shanghai and Xinjiang between 2005 and 2009. Interviews were conducted with government officials, senior executives from energy utilities, wind farm developers, wind turbine manufacturers, academics, NGOs, industrial associations and consultants.

As some interviewees agreed to be interviewed only anonymously, this study indicates interviews by number. The first two letters indicate the location (BJ for Beijing, XJ for Xinjiang, SH for Shanghai and GD for Guangdong), the two digits indicate the interview numbers, and that followed by the year of interviews. The list of interviews is provided in Appendix 1.

In the rest of this paper, we first provide an overview of the environmental governance and policy-making systems in China in which wind energy policies are embedded. We then discuss the conceptual framework of policy learning and its relevance to the pricing policies for wind energy in China. This paper then presents the principal findings, with the focus on examining the dynamics of the policy learning process in China, and the central-local relations as barriers and opportunities for policy learning. The final section of the paper discusses the implications of the findings.

Policy-making for wind energy in China: its governance-political characteristics and **the incentive structures**

This section discusses the governance-political features in China that characterizes the policy regime for wind energy, and examines the influences on the incentive structures of the key political players in the policy-making system for wind energy. Wind energy started to have a more important role in China's energy system in 1986 when the first wind farm was built in Shandong Province (Greenpeace, 2005). Since then wind energy has experienced substantial development in terms of scale while the environmental governance and political systems have been transformed along with China's economic reforms. As documented elsewhere (Tao and Mah, 2007), the environmental governance system in China has been reshaped by two major forces: the market reforms and decentralization.

The emerging environmental governance system is distinguished by the increasing role of the local governments, as well as economic and societal actors in governing for the environment and sustainable development in China (Wu & Wang, 2007; Tao and Mah, 2007). It is, however, important to note that, the emerging roles of these non-state actors are to a large extent constrained by the central government (Ho, 2001; Lu, 2005; Schwartz, 2004).

In the power sector, the power market reforms have led to fundamental changes in term of the ownership, market structure and regulatory systems. Once solely owned by the then State Power Corporation, the power sector now consists of two monopolised state-owned grid companies, five major state-owned power generation companies (which are commonly known as the Big Five), and a number of private independent power producers (Mah and Hills, 2008). Another major development in China's power sector is the establishment of the State Electricity Regulatory Commission (SERC) as a new regulatory agency of China's power sector in 2003 (Pearson, 2005).

In addition to the governance characteristics, China's political system also possesses a number of distinctive features that may influence energy policies including wind energy policies. One of the most important features is the tradition of using provinces as policy "laboratories" to test more innovative approaches to economic reforms and major policy changes (Nee and Matthews, 1996; Wright, 2000). Another distinctive feature is the "groping along" approach, or "groping for stone to cross the river" approach, which tend to favour incremental change rather than radical change (Nee and Matthews, 1996; Wright, 2000; Naughton, 1995).

The literature also documents a wide range of problems in China's policy-making system: the fragmentation of administration (or commonly referred as the "tiao-tiao-kuai-kuai (lines-and-blocks) organization" in China), the principal-agent problems, the problem of regional and local protectionism (Lieberthal and Oksenberg, 1988; OECD, 2008; James, 2002; Wedeman, 2001,

2003). Specifically, the policy style of bargained incrementalism in combination with the lack of accountability and transparency have raised concerned that the established policy-making system may not be sufficiently responsive to meet the challenges confronting this transitional state (Wright, 2000; Yan, 2001; OCED, 2005).

It is within these dynamic governance and political contexts that the policies for wind energy have developed some distinctive features. These include:

(1) The central government has retained strong control over the power sector

The Centre dominates the power sector, a strategic sector in the Chinese economy (Mah and Hills, 2008). Under China's administrative and political systems which have been extensively, the National Development and Reform Commission (国家发展和改革委员会 *Guojia Fazhan he Gaige Weiyuanhui*, NDRC) is the agency overseeing the power sector, including the wind energy sector (Mah and Hills, 2008; Figure 1 in the appendix). The NDRC has retained a commanding role in wind energy policies, as well as the price-setting and project-approval powers of all wind farm projects. All new wind farms, in regardless of their scale, large or small, are required to seek pricing approval from the central government on their on-grid price, that is the selling price of electricity from a grid-connected wind farm to a grid company. Furthermore, all wind farm projects with a scale of 50 MW or above have to obtained project approval from the NDRC (NDRC, 2006c). However, it is interesting to note that Centre has delegated power to provinces to approve small projects – those with an installed capacity below 50 MW.

Furthermore, the central government exercises strong control over the wind energy sector through the State-owned Assets Supervision and Administration Commission (SASAC). SASAC has the power to appoint and remove top executives of SOEs. The central government has a powerful influence over the wind sector through SOEs because 80 percent of total installed capacity is from wind farms owned by SOEs (Interview BJ/03/2009).

(2) The Chinese provinces have some policy autonomy, but there are constraints

Policy-making for wind energy at the provincial level is strongly influenced by the national policy framework. While the policy autonomy of the Chinese provinces are delegated and constrained by the Centre, it is interesting to note that the provinces play some relatively minor, but subtle roles in the policy-making process for wind energy. One of these subtle roles is the "policy laboratory" function. Guangdong, for example, pioneered China's first fixed-price policy in 2001 while Shanghai pioneered China's first green electricity market in 2005 (SH ECSC, 2009; Mah and Hills, 2008). Furthermore, as provinces are the only local states which have power to make legislation, they have important role to play in rule-making, and implementing central legislation and policies at the local levels (Qi, Ma, Zhang, & Li, 2008).

Although provinces can only approve small wind farms of below 50 MW, they were able to play a key role in China's wind energy development. The aggregate size of these small projects has been substantial, contributing approximately 50 percent of the new wind installations in 2007, and 60 percent in 2008 (Interview BJ/03/2009). This suggests that wind farm developers tended to favour small projects to avoid red tape from the central government.

(3) The SOEs are the key players

As noted above, up to 80 percent of wind turbines in operation in China are owned by the SOEs. The central government has showed its emphasis on nurturing Longyuan, a subsidiary of China Guodian – one of the Big Five, as the national champion of the wind power generation industry. By mid 2009, Longyuan has built more than 50 wind farms with a total installed capacity more than 3 GW – about one fourth of China's total (Longyuan, 2009).

(4) There is an emergency of societal actors in the policy-making process for wind energy

Mah and Hills (2008) document that an issue network comprised of a middle-ranking reformist government official, Greenpeace China, Energy Foundation, Chinese Renewable Energy Industries Association and a number of renowned Chinese wind experts played important roles in the policy process.

(5) The introduction of national policies for renewable energy and the impacts on incentive structures

The introduction of a number of national policies for renewable energy has created new incentives to the key policy stakeholders, including the state-owned power companies, grid

companies and local governments, to new wind installations. The renewable energy mandate introduced in 2007 is a good example of those policies. The mandate requires major power generation operators, predominately the Big Five to produce a minimum of renewable energy mandate of 3 and 8 percent by 2010 and 2020 respectively (NDRC, 2007a). The political obligation imposed on the Big Five has been widely perceived as a key driver for them to build new wind farms.

Another example is the renewable energy surcharge introduced in 2006. The renewable energy surcharge is in effect a national cost-sharing system for wind energy. A renewable energy surcharge has been imposed on all electricity consumers in China since 2006. The surcharge was first set at 0.001 yuan/ kWh, and recently revised to 0.004 yuan/ kWh in November 2009. Under this surcharge system, provinces rich in wind energy can collect money by selling wind energy to wind-impoverished provinces. Some provinces, in particular those with the potential to earn money by selling wind energy such as Xinjiang, are therefore given a strong economic incentive to increase local new wind installations. Xinjiang, for example, received 43 million yuan subsides from other provinces under this cost-sharing system (NDRC, 2008).

Policy learning as a conceptual framework

Although policy learning is a concept originating from studies of organizational learning in the context of public policy (Busenberg, 2001), it has come into focus in environmental studies as a mechanism to facilitate governance for the environment and sustainable development (Hills, 2006).

Policy learning is a process by which policy makers and policy stakeholders deliberately adjust the goals, rules and techniques of a given policy in response to past experiences and new information (Hall, 1993). The relatively intensive policy changes of the pricing policy for wind energy in China in recent decades appear to suggest that policy adjustment, learning-by-doing and other key theoretical insights of policy learning are highly relevant to our analysis.

The analysis of policy learning in this paper is embedded in the broad context of environmental governance. As Hills (2006) contends, “one of the most striking features of 1990s was the emergence of governance as a key issue in debates about the design and implementation of a wide range of public policies” (p.496). Governance is about steering the economy and society to reach collective goals (Pierre & Peters, 2000). Governance is linked with the emergence of new environmental policy instruments (Jordan et al., 2003). Such instruments are not only seen as *outcomes* of new approaches to policy making but also as part of the governance *process* itself. (Hills, 2006, p. 496) (emphasis added by authors).

As such, our analysis frames policy-making for wind energy as a problem of governing rather than an economic, political or technological problem. Governance is a purposive guiding process in which a social system coordinates, steers and manages itself (Paquet, 1999). A core concept of governance is moving away from government to governance as governments can no longer rely on themselves to solve contemporary social problems. The literature on environmental governance sees a need for state, society and market to work together. This paper sees the development of wind energy as a complex process in which state, societal and market players, who are interdependent but who often have competing interests and differential power, interact and influence the evolution of wind energy policies.

Central to the concept of policy learning is the differentiation of three types of learning, technical, conceptual and social learning. They evolve progressively from one another. Technical learning is a weak form of policy learning that consists of a search for new policy instruments with no adjustment of policy objectives (Gouldson, et al., 2008). Technical learning generally is technocratic and it occurs without fundamental discussion of policy objectives or basic strategies (Bennett and Howlett, 1992; Fiorino, 2001; Gouldson *et al*., 2008; Hall, 1993). Technical learning therefore often leads to harmonising regulation and the formulation of more supplementary rules (Fiorino, 2001; Glasbergen, 1996).

Conceptual learning moves forward from technical learning and it is an intermediate form of policy learning. It is a process in which policy goals are redefined, problem definitions are debated, and problem-solving strategies are adjusted. This intermediate-level of policy learning is therefore "more radical and far-reaching" than technical learning (Glasbergen, 1996, p. 182).

Social learning, as the strongest form of policy learning, is the mode of policy learning that has increasingly, and significantly, come into scholarly focus (Glasbergen, 1996). In contrast to technical and conceptual learning, social learning emphasizes the social context and social forces in shaping the policy process. Social learning emphasizes the interplay between societal actors that improve policies (Glasbergen, 1996). Social learning therefore requires more open and responsive communication (Glasbergen, 1996) and emphasizes cooperative relations among and between actors (Fiorino, 2001).

The differentiation of the three progressive forms of policy learning has given rise to an important question: what are the benefits of progressing towards social learning in relation to sustainable development? The literature on policy learning suggests policy learning can improve policies. With its emphasis on reflexive, participatory, dialogic and adaptive approach in policy-making, policy learning can be a useful mechanism to realign interests and resolve conflicts and hence improve efficacy of environmental policies (Gouldson, et al., 2008).

What, then, are the conditions that make policy learning work, or fail to work? A number of drivers, enablers and barriers of policy learning have been identified in the literature. As noted by Voß and Kemp (2006), a key driver of policy learning is reflexivity. Reflexivity has a core role particularly in social learning – the strongest form of policy learning, because social learning assumes there is no complete knowledge or complete control in the course of societal changes (Voß and Kemp, 2006).

Dialogue is another enabler of policy learning. The literature on policy learning suggests that there are many ways to enhance the effectiveness of dialogue. The building up of long-term relations, the creation of a communication environment that encourages respect and equity in expressing dissent views are examples of ways to improve dialogue (Blackmore and Ison, 2007). Dialogue, however, can be obstructed by the presence of a policy monopoly, reiteration or re-establishment of preconceived ideas, and the lack of time to build trusting relationships (Blackmore and Ison, 2007).

The literature on policy learning also sheds important light on who matters. Some studies suggest that state actors are the key agent of learning (Etheredge and Short, 1983) while other studies suggest that societal actors and issue networks have important roles to play (Heclo, 1978; Sabatier, 1988). Although the literature may have diverse views on whether the state or societal actors are the key agent of learning, it is the role of societal actors who can span the state-society divide that have increasingly come into scholarly focus. The literature suggests that political actors such as NGOs and international networks who have access to information, ideas, and positions outside the formal state apparatus have an important role in the progression towards stronger forms of policy learning (Heclo, 1978; Bennett and Howlett, 1992). The literature has also identified a special type of "spanning" actor who can cross the state-society divide in policy-making (Mah and Hills, 2008; Bennett and Howlett, 1992). "Policy middlemen" can make a difference because they are sensitive to windows of change, and can have access to external players and ideas as well as formal powerful institutions (Bennett and Howlett, 1992; Heclo, 1974).

Although the theoretical insights of the concept of policy learning is likely to be useful in guiding our analysis, policy learning however is a complex process and many of the workings are yet to be understood in the literature. The literature is particularly limited in relation to renewable energy policies and in developing countries such as China. In addition, most of the existing literature on policy learning in China has a rather narrow focus on knowledge and technology transfer (see for example Bennett *et al.*, 2001; Buckley *et al.*, 2004; Hu *et al.*, 2005). More robust studies that integrate the theoretical perspectives of policy learning and empirical analysis in the context of China have been scant, with a few exceptions such as the work by Gouldson *et al*. (2008). To partly fill these gaps, this paper applies the theoretical insights of policy learning to an analysis of the evolution of the pricing policies in China.

Pricing policies for wind energy in China: the three distinct phases, and the diversity of local responses

As Figure 1 indicates, there were three distinctive phases of the national-level policy changes for the pricing policies for wind energy in China from 1994 onwards. In the corresponding time period, there was a diversity of the local responses in the three selected provinces, Guangdong, Shanghai and Xinjiang. We will now provide an account of the evolutions of the pricing policies differ in the three phases, and between the central and provincial level.

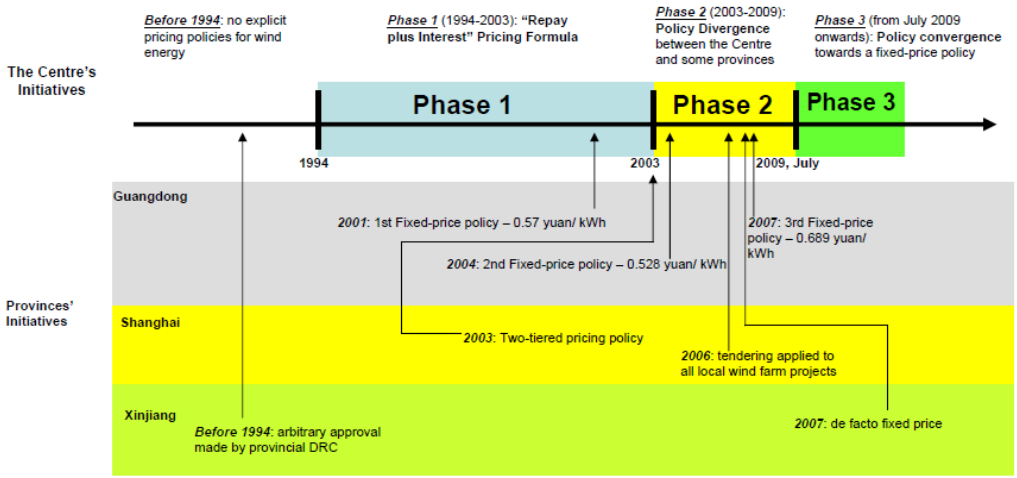

Figure 1: The national-level choices and local diversity in response to the three phases of the pricing policies for wind energy in China

The three distinct phases at the national level

Since the introduction of the first pricing policy for wind energy in 1994, policies in this area have experienced a number of important developments. Three distinctive phases of the pricing policies can be identified. *Phase 1* started in 1994 when China introduced its first pricing policy for wind energy, the "repay plus profit" pricing formula. *Phase 2*, from 2003 to July 2009, was a period of *policy divergence* in which the central government shifted over its choices over the two competing pricing options: the tendering and fixed-price policies. This phase also showed a difference between the central government's choice and local preferences in the choice of pricing options. *Phase 3*, starting from July 2009 onwards, is a phase of *policy convergence* between the Centre and provinces as a nation-wide fixed-price policy has been introduced. These three distinctive phases of the pricing policies are illustrated in Figure 1, and are elaborated in greater detail as follows:

Phase 1 (from 1994 to 2003): "Repay plus profit" pricing formula

Although China built its first wind farm as early as 1986 (Greenpeace 2005a), it was only until 1994 that China first introduced a pricing policy explicitly to promote wind energy. In 1994, the then Ministry of Electric Power (MOEP) issued an administrative regulation that introduced a "repay plus profit" pricing formula for wind energy: the on-grid price for wind energy was set at a level that would repay capital costs with interest plus a reasonable profit (Lema and Ruby, 2007;

Mah and Hills, 2008). This first pricing policy was introduced in a context when wind energy in China was small in scale (with less than 15 MW in 1994 (Lema and Ruby, 2007). This repay plus profit pricing policy was able to create some incentives for steady but slow growth in new wind installations during the period of Phase 1 (Mah and Hills, 2008).

Phase 2 (from 2003 to July 2009): Policy *divergence* over tendering and fixed-price policies between the national choice and local preferences

Phase 2 is distinguished by the differences in the policy choices between the central agencies, and also between the central and provincial governments, indicating that policy choices may differ horizontally across government agencies and also vertically between the central and local governments.

The most important development in Phase 2 was the introduction of the tendering policy for wind energy, first as pilots in 2003, and later as a nation-wide policy in 2006 – when the NDRC issued a new regulation that stated that all wind farm projects, in regardless of their scale of installed capacity, should be tendered. However, the tendering policy ended in July 2009 and was replaced by the fixed-price policy, as our paper will discuss later.

Another feature of Phase 2 is the occurrence of a dual-track pricing system – while the national tendering projects are organized, some provinces used the traditional price-approval approach to scrutinize on-grid price applications from local, small-scale wind farms. However, the central influence was still evident in those local projects because the tendered prices of national tendering projects have served as a key reference for those local projects (Li, *et al*., 2007).

On the other hand, the policy choices also differ between the central and provincial governments. During Phase 2, while the central government has shifted over its choice over the two competing pricing options, some provinces have showed their own preferences in the choice of pricing options. Guangdong pioneered China's first fixed-price policy in 2001 while Shanghai adopted its own two-tier pricing policy for wind. Xinjiang used a *de facto*r fixed-price policy. We will discuss these local policies in greater detail later in this paper.

Another distinctive characteristic of Phase 2 is the emergence of a number of unintended policy outcomes following the introduction of the tendering policies. One example is that the SOEs have turned into aggressive bidders (Mah and Hills, 2009; Climate Group, 2009; Li *et al.,* 2006). As we noted above, the aggressive behaviour of the Big Five, which has been largely driven by the renewable energy mandate imposed on them, has depleted the economic viability of some wind farms (Interview BJ/01/2009)

In addition, there is a much less documented, but also important, unintended outcome. It has been widely acknowledged among Chinese wind experts that there has been a spate of "pseudo-tendered" wind projects (「假招標」) in Chinese provinces since 2006 (Interview BJ/02/2009). These were tendered by the provincial governments rather than the central government. Although there is no government statistics available about the scale of these "pseudo-tendered" wind projects, a number of sources from the NDRC and Chinese wind experts noted that has been a widespread phenomenon, commonly found in a number of provinces, including Inner Mongolia, Heilongjiang, Jilin and Hebei.

These alleged pseudo-tendered projects differ from those tendered projects coordinated by the central government in two important ways. These wind farms are small in scale – with a majority of them at a scale just below 50 MW in order to stay within the provincial 50-MW project-approval authority. Another distinctive feature of these "pseudo" projects is that their on-grid prices are "pseudo" in a sense that the prices are allegedly set through under-the-table negotiation among local governments and developers. These projects therefore have a relatively high tendered price while the tendered price for centrally-led tendered wind farms tended to have prices driven down by the SOEs. In Hebei, for example, the local tendered price was 0.61 yuan/ kWh, but the tendered price of a national tendered project also in Hebei was only 0.54 yuan/ kWh (Interview BJ/03/2009).

Why, then, did these pseudo-tendered projects emerge in recent years? And how do they influence the development of wind energy in China? It has been widely perceived by wind energy experts in China that this phenomenon has revealed that that a number of poor-coordinated wind energy policies have realigned the interests of the local wind farm developers, local governments and grid companies against the national objectives.

For the SOEs, the MMS policy has driven them to invest in wind as much as possible in the shortest time, so they look for projects that can bypass the red-tape of the central government. For the local governments, under the new national cost-sharing system for renewable energy, they have every reason to fight for a higher on-grid price for the local wind farms. It is because high on-grid price will be shared by all electricity consumers across China (by way of a surcharge) while the economic benefits of the wind farm, in terms of local GDP, will be shared only *within* the province. However, the interests of the central government and the electricity consumers are less protected in this case. Consumers now pay more for wind, and the small local tendered projects tend to under-utilise the wind resource as prime wind sites are cut into small wind farms. This may damage prime wind sites as wind farm planning coordination and wind-siting may not be optimized (Interview BJ/02/2009).

Phase 3: Policy *convergence* towards a fixed-price policy (from July 2009 onwards)

Phase 3 is distinguished by the introduction of a nation-wide fixed-price policy in July 2009 to replace the tendering policy. This new policy appeared to end the debate over the choice between the tendering and fixed-price policies. Four categories of fixed benchmark prices, ranging from 0.51to 0.61 yuan/ kWh, are set in association with four regions in China. The categories are determined by consideration of a number of factors including the richness of wind resources and administrative feasibility. A major objective of this new pricing policy is to ensure profit incentives and thus economic viability of investment in wind farms. While it is too early to observe the effectiveness of this new feed-in tariff policy, industrial experts, key government officials and a number of other key stakeholders suggest that there has been a widespread support for this policy (Interviews BJ/01/2009; BJ/02/2009; BJ/03/2009).

Local responses in Guangdong, Shanghai and Xinjiang

While the development of the three phases of the pricing policies is instructive in providing a longitudinal analysis of the policy evaluation, there is another interesting dimension of analysis, that is comparing how the local responses differed in parallel to the national policy changes. In the sections that follow, we will provide an overview of the diversity of the local responses in three selected Chinese provinces, Guangdong, Shanghai, and Xinjiang.

Guangdong: a pioneer of the fixed-price policy ahead of the action of the Centre

As we noted briefly above, Guangdong, in the southeast China, is well known in China for its pioneering of the fixed-price policy for wind energy. In 2001 Guangdong introduced its fixed-price policy, the first of its kind in the country, by pegging the on-grid price of wind energy to the average electricity selling price of the grid company (Guangdong DPC *et al*., 2001). In 2004, Guangdong introduced its second fixed-price policy by setting the on-grid price for wind energy at 0.528 yuan/ kWh (Garrah Hassan, 2005). Guangdong introduced its third fixed price policy for wind energy three years later in December 2007 by revising the fixed price further upward to 0.689 yuan/ kWh (GD PCA, 2007).

Guangdong's second fixed-price policy in 2004 was widely perceived among Chinese wind energy experts as a bold policy initiative because the central government had already indicated its interest in tendering policy through the introduction of the tendering pilot projects in 2003. It caused more attention in the industry in 2007 when Guangdong introduced its third fixed-price policy as the central government had made their preference over the tendering policy explicit by introducing a nation-wide tendering policy already in 2006. Rather than following the central

policy, Guangdong has not only chosen to retain its local fixed-price policy, but revised its third fixed-price upward to 0.689 yuan/ kWh to create strong profit incentives for wind investment.

As reported elsewhere (Mah and Hills, 2008), by its fixed-price policies, Guangdong was able to create some profit incentives which stimulated investment in wind farms by its fixed-price policies. One notable impact of the conducive effects of market incentives is the relatively rapid increase in new installed capacity of wind farms within twelve months of the implementation of the province's third fixed-price policy. A large number of smaller wind farms were built, but their aggregate scale has grown at a pace much faster than those driven by the central government's tendering policy.

Shanghai: a national policy followed; locally-grown two-tier policy abandoned

While Guangdong has pioneered the fixed-price policy, Shanghai introduced its own local pricing policy, but not a fixed-price policy. Rather, Shanghai introduced a "two-tier" pricing policy for wind energy. This two-tier pricing policy was a locally grown policy which originated in 1990s when Shanghai used this policy to encourage investment in an oil-fired power plant which was originally designed as gas-fired power plants. Shanghai adopted this policy for wind energy in 2003 when it built its first wind farm in Fengxian (奉贤).[3] This locally grown policy however was abandoned in 2006 when Shanghai decided to follow the central policy of tendering. Shanghai issued a local regulation in 2006 which states that all local wind farms have to be tendered (Shanghai DRC, 2006).

The locally grown two-tier pricing policy for wind energy guaranteed the wind farms a basic grid price (which is linked with the installed capacity) plus an "adjustable" price that varies depending on the actual amount of electricity generation (Interviews SH/1/2008; SH/2/2008). While it is difficult to draw direct linkages between the changes in the pricing policy and the scale of new wind installations (i.e. whether the two-tier policy or the local tendering policy speeded up or slowed down the investment in wind in Shanghai), the two-tier policy was widely perceived among local wind farm developers and governments as a useful policy to create some profit incentives for wind farms (Interviews SH/1/2008; SH/2/2008).

Xinjiang: a *de facto* fixed-price policy

Like Guangdong, Xinjiang was not interested in using the tendering policy at the local levels. But unlike Guangdong and Shanghai, Xinjiang did not show its capacity in policy innovation. Xinjiang also did not explicitly confront the central policy as Guangdong has done. Rather, Xinjiang used the conventional "project-approval" path - several of its new farm proposals were submitted to the NDRC's Department of Price for on-grid price approval. In 2007, four wind projects in Xinjiang were granted the same price, at 0.51 yuan/ kWh, by NDRC's Department of Price. It is evident that this is a fixed-price policy because the four wind farms in Xinjiang, although located in two different wind districts and owned by three wind farm developers, thus suggesting that there could be some cost differences, were granted a flat price (NDRC, 2007; Interview XJ/01/2008).

Xinjiang was not alone in using this *de facto* fixed-price policy. As a matter of fact, NDRC's Department of Price approved a total of 72 wind farms (including the four in Xinjiang) in eight provinces in 2007 with each province granted its own *de facto* fixed price (NDRC, 2007). The absolute number and the geographical coverage of these wind farms indicate this pricing practice has been applied relatively extensively and commonly across China, rather than on an individual basis. This pricing arrangement is regarded as *de facto* - although the central government had not yet introduced a fixed-price policy at that time, NDRC's Department of Price did implicitly implement this competing policy choice through its administrative approval procedures.

[3] http://www.zskjj.gov.cn/show.asp?newsid=3763

Discussion

A case study of the pricing policies for wind energy in China suggests that some progression of policy learning has taken place at both national and local levels. The findings suggest that while the policy learning process brought some benefits to policy-making, major limitations obstructing the progression towards the highest-order of learning – social learning – were also present. Benefits of policy learning were made possible by the creation of new knowledge, integration of policies and realignment of interests of different stakeholders. On the other hand, overcentralisation, the inertia against institutional change and the failure to recognize the need for a more deliberative decision-making process, which all emerge from the current central-local tensions in China's governance system, were identified as the key barriers to policy learning process. We will now discuss these major findings in greater detail.

(1) Policy learning for wind pricing policy in China: its progression from technical to conceptual learning, and its limitations in advancing further to social learning

The longitudinal analysis across the three phases of the pricing policies at the national level, and the examination of the policy development across the three Chinese provinces, Guangdong, Shanghai and Xinjiang, both suggest that some degree of policy learning took place in our cases. On the basis of Glasbergen's (1996) distinction between technical, conceptual and social forms of learning, we found that while technical and conceptual forms of policy learning are clearly evident in our cases, there were only some early signs of social learning.

The introduction of the "repay plus profit" pricing policy in Phase 1 is a good example of *technical* learning because this policy played a key role in harmonising the pricing policies across different types of energy projects, but showed no evidence of conceptual or social learning. There was also no serious reflection on problem definitions and policy goals.

The changes in pricing policies in Phase 2 on the other hand provide evidence of conceptual learning. The worsening environmental conditions in China coupled with China's 'fourth generation' leadership headed by President Hu Jintao coming to power has created a new policy window for the central government to reflect about the need for more radical policy options which could drive down costs of wind and accelerate new wind installations. It was at this time that the policy options were widened in a sense that the competing alternatives of the pricing policies for wind energy, including tendering and fixed-price policies were put on the policy agenda and debated by the central government. There were some early signs of social learning, as an issue network, led by Greenpeace, was involved (Mah and Hills, 2008). However, these signs were weak. The issue network was able to make some contribution in the early stages of policy-making, their involvement was not institutionalized, and hence was ad-hoc in manner. The issue network played consultative and advisory roles, but it had no power to make decision. The issue network shared no power with the NDRC who made the final decisions on policy choices.

The abandonment of the tendering policy and the adoption of the fixed-price policy in Phase 3 has showed some stronger, although still limited, evidence of social learning. The decision to abandon the tendering policy in July 2009 was to a large extent "forced" by a bottom-up dynamic of change that emerged from a spate of pseudo-tendered projects in some provinces – an unintended policy outcome of the national tendering policy. As we noted above, these small pseudo-tendered projects have become rampant and uncontrolled particularly in some provinces like Hebei and Inner Mongolia where wind resources are rich (Interview BJ/03/2009). The central government decided to abandon the tendering policy in part because it lacked effective measures to eradicate these pseudo-tendered projects. In other words, it was to a large extent the uncontrolled growth of the pseudo-tendered projects that forced the central government to adjust its policy strategies (Interviews BJ/01/2009; BJ/02, 2009).

At the provincial level, it is interesting to note that policy learning took place in a similar trend as that at the national level. There was a progression from technical to conceptual learning with some early signs of social learning, and there are also barriers to the progression towards

the highest form of learning. However, there are some subtle differences of the ways policy learning took place in the provinces.

It is interesting to note that the three provinces have made different progress in the policy learning process. Guangdong appeared to have progressed farthest among the three selected provinces that we studied. It is evident that Guangdong was able to progress from conceptual to social learning. Guangdong's persistence in it own local fixed-price policy showed the province's ability to formulate and implement more radical policy strategies. The policy-making process in Guangdong also appeared to be more permeable to local wind energy experts and other non-state actors. In particular, the presence of Greenpeace and the associated issue network is an early sign of social learning, indicating the policy-making process in this province is more permeable to social forces. Shanghai, in contrast, has showed its ability in policy innovation adopting its local two-tier pricing policy for wind energy. However, its abandonment of its locally-grown two-tier pricing policy in 2006 to give way to the tendering policy showed Shanghai had limited ability in debating competing policy options. As such, our assessment concludes that Shanghai has advanced to conceptual learning, but not yet to social learning. Xinjiang, as we noted above, has showed evidence of technical learning while conceptual or social learning has been minimal. Table 1 below illustrates the progression of policy learning in the three phases of the pricing policies from a longitudinal perspective, and in the three selected provinces at the local levels.

Our findings suggest that while the progression from technical to conceptual learning has taken place in the cases, advancing further to social learning was severely constrained. What then, are the dynamics of change in the policy learning process? What benefits did policy learning bring to policy-making for wind energy in China? What are the enablers and barriers of the process? We will now discuss our observations in relation to these issues.

		Technical learning →	Conceptual Learning →	Social Learning
National Level	**Phase 1**	●	○	○
	Phase 2	●	●	◔
	Phase 3	●	●	◐
Provincial Level	**Guangdong**	●	●	◔
	Shanghai	●	●	○
	Xinjiang	●	○	○

Table 1: The pricing policy for wind energy in China:
The progression from technical to social learning

●: Strong evidence

◐: Mild evidence

◔: Weak evidence

○: Indiscernible evidence

(2) The major dynamics of learning and the benefits

There are three major dynamics of change that can be identified. The first dynamic of change is that new knowledge can offer policy legitimacy for a radical policy change. Although wind energy data is essential to many important aspects of the development process of wind energy in China, such data have been lacking (Mah and Hills, forthcoming), and this was even more so back in 2003 when the central government chose to implement tendering pilot projects rather than fixed-price policies for wind energy. The lack of wind data deterred the central government from choosing the fixed-price policy in 2003 in part of administrative reasons. The lack of basic wind data made it difficult for the central government to fix a price that could balance economic viability while avoiding "windfall profit". Politically, a fixed-price policy was also not an attractive option to the central government because a fixed-price policy tends to increase tariff levels, and thus is politically sensitive. In contrast, tendering tends to drive tariff levels down.

The political preference started to favour a fixed-price policy only in recent years when the central government introduced a national renewable energy surcharge in 2006. How, then, did the surcharge system alter the policy choices of the central government? The key contribution of the surcharge system is that it has given rise to a new institution for data collection and information disclosure which in turn facilitate policy-making for wind energy. As we noted above, this surcharge in effect is a national cost-sharing system. Provinces rich in wind energy can sell wind energy to other provinces under the coordination of the NDRC. The surcharge system therefore is a new institution that not only mandates the submission of data, but more importantly, is also one that creates economic incentives for wind farm developers and grid companies to submit wind energy data. Through this institution, key wind data now can be

collected by the central government include the actual installed capacity and actual wind energy yield. The reliability of the data is also enhanced through cross-checking from two data sources, one from the wind farm operators and the other from the grid companies (Interview BJ/01/2009).

In essence, the new knowledge is crucial for the central government to justify a more radical policy choice in the midst of high public skepticism about tariff increases in China. As Shi Pengfei, a wind energy expert in China, noted, the availability of a relatively comprehensive wind dataset has created "a prerequisite that allows the fixed-price policy to be introduced in China" (Interview BJ/01/2009). This observation on institutional change suggests that new institutions for knowledge creation and accumulation and information disclosure are a key change required to break the inertia that may obstruct the policy learning process.

The second dynamic of change is that a force of change from below was able to achieved political significance by ways of the aggregation of individual decisions (Beck, 1996; Holzer and Sørensen, 2003; Forester, 2008). The Chinese provinces, which hosted a growing number of "pseudo-tendered" wind farms, were able to create a broad coalition of proactive policy changes. This observation appears to indicate that a critical condition that seemed to facilitate policy learning is the local, horizontal link-up in localities to accelerate the needed policy changes at the national level.

The third dynamic of change is learning from policy "failures" to better realign the interests of the policy stakeholders. It is evident in this case study that policy making for wind energy is a complex process, and is one that involves a great deal of uncertainty in policy outcomes while knowledge, in this case the availability of wind resource data, is limited. Unintended outcomes from pricing policies in the past include the aggressive bidding behaviour of some SOEs in the national tendered wind projects, and the emergence of a spate of local pseudo-tendered projects tendered by provincial governments. It is evident that learning from the unintended policy outcomes, and more importantly, the underlying incentive structures of the policy stakeholders was a key part of the policy learning process. As a senior government official from the NDRC noted, "we cannot change people's behaviour directly, but we can provide new incentives to encourage behavioural change" (Interview BJ/03/2009). Policy learning appears to be an iterative process in which understanding the unintended policy outcomes are required *continuously* to improve policy design.

The fourth dynamic of change is that the emergence of an issue network. The issue network led by Greenpeace was able to keep a radical pricing option alive, even though after the NDRC had chosen the tendering policy. Another important contribution of the issue network is that Greenpeace was able to gain credibility for the fixed-price policy through networking with mid-rank government officials in the NDRC, and the mainland and international experts on wind energy (Interviews BJ/02/2009; BJ/04/2009).

(3) The central-local tensions as the barriers of policy learning

Although this paper has shown that there is considerable potential for policy learning, we also suggest that three types of tensions emerged in the established fabric of the central-local relations which appeared to constrain policy learning. The three types of tensions are tensions between centralization and decentralization, tensions between the organisational traditions and the institutional changes need for policy learning, and tensions between the Chinese policy style of "groping for stone to cross the river" and the need for a deliberative decision-making system.

The first type of tension is *the tensions between centralization and decentralizatio*n. Our cases suggest that there was a strong tendency of centralization, and in some cases over-centralisation, which tended to standardize provincial policies. The uniformity of local policies was counter-productive to a large extent. A good example to illustrate the potential problem of centralization on wind energy policies is that local initiatives of policy innovation in Shanghai and Guangdong were dampened. Shanghai abandoned its local two-tier pricing policy. Guangdong deliberately modulated the price level when it introduced its second fixed-price policy in order to avoid central intervention. In both the cases, it is evident that the strong influence from the central government constrained policy innovation in localities. It is also of policy concern that

local needs, local contexts and local opportunities were not seriously taken into account by the central government when they made the choices about the pricing policies for wind energy.

The second type of tension is the *tensions between the organisational traditions and the institutional changes required for policy learning*. The well documented sectoral fragmentation, or "tiao-tiao-kuai-kuai" problem of the Chinese government agencies was also present (see for example Lema and Ruby, 2007; Wu and Wang, 2007), and obstructed policy learning for the wind energy policies. China's fragmented energy bureaucracy involves three key agencies at the central level, the newly-established National Energy Administration (NEA), the NDRC's Department of Price and the SERC. NEA, which replaced the NDRC's Energy Bureau, while still under the management of the NDRC, has been elevated to status of a half-level ministry (副部級), is responsible for the planning and policy formulation of renewable energy. But a major constraint on NEA's ability is that the price-setting power of energy, including wind energy, remain the purview of NDRC's Department of Price (Interview BJ/02/2009).

China's fragmented energy bureaucracy has impeded environmental governance in relation to wind energy policies. In particular, the conflicting interests between NDRC's Department of Price and the NEA has resulted differences in policy preferences over the tendering and fixed-price policies. The Department of Price is responsible for approving price applications and therefore tends to favour a fixed-price policy as this is a Department of Price-led approach for approving wind projects. In contrast, the NEA is responsible for coordinating the tendering projects and therefore tends to favour tendering policies as tendering is an NEA-led approach. The problem of departmental fragmentation has obstructed policy coherence and policy learning as the pricing policies evolved over the past years (Li, *et al*., 2007).

The third type of tension is the *tensions between the Chinese policy style of groping for stones to cross the river" and the need for a deliberative decision-making system.* The Centre's decision to choose the tendering policy in 2003 is another example of Chinese policy style of "groping for stone to cross the river (摸着石头过河)". Central to this policy style is the learning-by-doing approach in circumstances of uncertainty in policy-making. Wind energy data, which is essential for using the fixed-price policy was seriously lacking in China in 2003. The use of the tendering policy since 2003 in China may be regarded as a pragmatic approach. However, some Chinese industrial experts and wind farm developers have pointed out that this experimental approach was not without cost. A major negative impact resulted is that while learning was active in *ex pos*t phase of policy-making, not much learning was able to take place in the *ex ante* phases. As such, the policy adjustment process was time-consuming. The under-emphasis on deliberation in decision-making, and the over-reliance of the "groping along" approach should be of policy concern.

Furthermore, the Chinese decision-making system in relation to wind energy was relatively open, but only during the early stages of the policy process. The system remained closed towards the final stages when the NDRC decided to choose the tendering policy for nation-wide implementation in 2006. Why the fixed-price model was not chosen despite general support from the Chinese wind experts and industries was not explained to the public or deliberated in an accountable manner (Mah & Hills, 2008).

To sum up, policy learning did take place in China in relation to the pricing policies for wind energy. On the basis on Glasbergen's (1996) differentiation of technical, conceptual and social forms of policy learning, China was able to progress from technical to conceptual forms of learning. However, the progression has been confronted by major barriers to progress further to social learning.

On the basis of the analytical guide developed by Maarleveld and Dangbégnon (1999), the policy learning processes that was under way in China are summarized in Table 2. This table shows the ways policy learning for wind pricing policies involves a broader participation of stakeholders, what were learnt in the process, how and with what benefits.

Who?	1. The Centre: NDRC's Department of Price, National Energy Administration, research institutes (in particular Energy Research Institute) 2. Provinces: provincial Development and Reform Commissions 3. Societal players: NGOs (including Greenpeace and Energy Foundation), Industrial Association (e.g. CREIA – give a "cover-up" for mid-rank reformist officials)
Learnt what?	1. Widened policy options 2. Improved data 3. New knowledge 4. Unintended policy outcomes – and the underlying incentive structures
How?	1. ***Trial by error***: Experimentation that matched with local contextual opportunities 2. ***Policy transfer*** from previous policy experience 3. Creation of political significance by ways of ***provinces' aggregation*** – a key force for policy convergence 4. ***Institutional set-up*** and ***reinforcing policies*** (resulted from Renewable Energy Surcharge): data accumulation and information disclosure
What benefits?	1. Interests realigned for collective goals 2. Policy coherence 3. Policy legitimacy for radical policy change 4. The strengthening of local implementation

Table 2: How policy learning for the pricing policy for wind energy took place in China

Conclusion: policy learning and environmental governance

This paper has focused on various dimensions of policy learning in relation to the transition towards a more sustainable energy system in China. Using the example of pricing policies for wind energy in China, this paper has illustrated that despite a progression from technical to conceptual learning, further advancement to social learning – the highest-order of learning - was seriously constrained. The limitations of policy learning in relation to wind energy should be of concern because as we have demonstrated, the policy-making process for wind is complex and one that involves a great deal of unintended policy outcomes with highly dynamic incentive structures among policy stakeholders. Our observations appear to suggest that a more decentralized, deliberative policy-making system could improve the efficacy of wind energy policies in China. Our identification of the tensions in the central-local relations that have obstructed the policy learning process for wind energy suggest that to improve efficacy of wind energy policies China may have to examine its central-local relations. It appears that the central-local relations may need to be reshaped so that China's environmental governance system can better incorporate the emerging roles of localities and societal actors in improving wind energy policies. The central government appears to have over-centralised policy-making for wind energy, and this has resulted in standardizing local policies that has not only dampened local creativity in policy-making (in Shanghai and Guangdong), but also create unintended negative outcomes (such as the aggressive bidding behaviour of some SOEs, and the emergence of a spate of local "pseudo-tendered" projects in some provinces).

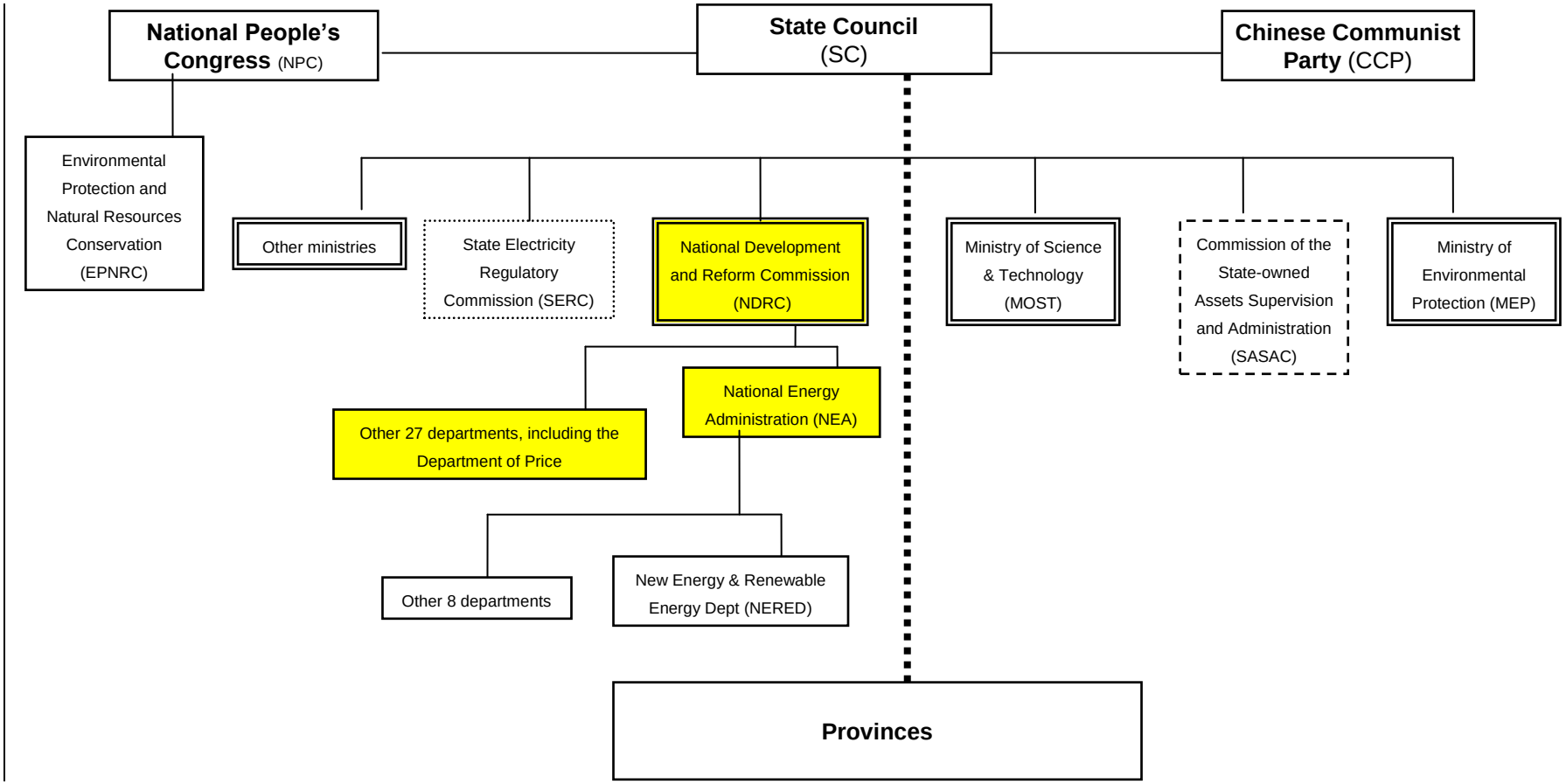

Figure 1: China's bureaucratic structure for the policy-making of wind energy
(Source: author; Data: website of the Central People's Government of the People's Republic of China, from www.gov.cn, accessed on February 10, 2009)

Code	Interviewees Background	Types of interview	Date of interview
BJ/01/2009	Shi Pengfei, Vice President, Chinese Renewable Energy Industries Association; Senior Engineer (Professor), China Hydropower Engineering Consulting Group Co.	FI	Oct, 2009
BJ/02/2009	A Chinese wind energy expert who is affiliated to the National Development and Reform Commission	FI	Oct, 2009
BJ/03/2009	A senior official, New Energy and Renewable Energy Department, National Energy Administration, National Development and Reform Commission	FI	Oct, 2009
BJ/04/2009	Liu Shuang, Campaign, Greenpeace China	FI	Oct, 2009
SH/1/2008	A senior executive of Shanghai Electric Power Company	FI	Jun , 2008
SH/2/2008	An anonymous mid-rank official, Energy Development Department, Shanghai Municipal Development and Reform Commission	FI	Jun , 2008
XJ/01/2008	Yu Wuming, former general manager of Xinjiang Wind Energy Company; the deputy director of NWTC; and a expert to Xinjiang government	FI	Oct, 2008

List of Interviews

*The interview formats included face-to-face interview (FI) and telephone interview (TI).

References

1. Bennett, C.and Howlett, M. (1992). The lessons of learning: reconciling theories of policy learning and policy change. *Policy Sciences, 25*(3), 275-294.
2. Bennett, D., Liu, X., Parker, D., Steward, F. and Vaidya, K. (2001). Technology transfer to China: a study of strategy in 20 EU industrial companies. *International Journal of Technology Management, 21*(1-2), 151-182.
3. BMU. (2009). *New Thinking - New Energy: Energy Policy Road Map 2020*. Berlin: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.
4. Buckley, P., Clegg , J.and Tan, H. (2004). Knowledge transfer to China: policy lessons from foreign affiliates. *Transnational Corporations, 13*(1), 31-72.
5. Busenberg, G. (2001). Learning in organizations and public policy. *Journal of Public Policy, 21*(2), 133-152.
6. CHECC. (2008). Accomplishment of Wind Power in China 2007: Statistics Report (*2007 niandu Zhongguo fengdian jianshe chengguo: tongji baogao*). Beijing: China Hydropower Engineering Consulting Group Co. (CHECC) .
7. Cheung P. 2002. Guangdong under reform: social and political trends and challenges. In *Rethinking China's Provinces,* Fitzgerald J (eds). Routledge: London; New York; 125-152.
8. Chung, C.-P. (2003). The defense of Xinjiang: politics, economics, and security in central Asia. *Harvard International Review,* 25(2): 58-62.
9. EF. (2009, January 15). China blasts through wind energy target. *Environmental Finance*.
10. Dudek, D., Qin, H. and Zhang, J. (2006). Problems and actions of China environmental governance: a case study on SO_2 emission control and emission trade (in Chinese). *Research of Environmental Sciences, 19,* 44-58.
11. Etheredge, L. and Short, J. (1983). Thinking about government learning. *Journal of Management Studies, 20*, 41-58.
12. Fiorino, D. (2001). Environmental policy as learning: a new view of an old landscape. *Public Administration Review, 61*(3), 322-334.
13. Forester, J. (2008). Participation as Dialogue, Debate, and Negotiation: Entangled Promises and Practices In S. Odugbemi & T. Jacobson (Eds.), *Governance Reform Under Real-world Conditions: Citizens, Stakeholders, and Voice* (pp. 232-241). Washington, D. C.: World Bank.
14. GD PCA. (2007). Notifications of Improving the Grid Price Mechanism of Wind Energy Projects (《 關於完善風力發電項目上網電價機制的通知》, 粵價[2007]294 號). Guangdong Price Control Administration. Retrieved December 12, 2008
15. Glasbergen, P. (1996). Learning to manage the environment. In W. Lafferty & J. Meadowcroft (Eds.), *Democracy and the Environment: Problems and Prospects* (pp. 175-193). Cheltenham, UK; Lyme, US: Edward Elgar.
16. Greenpeace. (2005). Wind Force 12: A blueprint to achieve 12% of the world's electricity from wind power by 2020. Amsterdam: Greenpeace International. Retrieved July 20, 2005, from http://www.greenpeace.org/international/press/reports/windforce-12-2005
17. Gouldson, A., Hills, P. and Welford, R. (2008). Ecological modernisation and policy learning in Hong Kong. *Geoforum, 39*(1), 319-330.

18. Guangdong DPC, Guangdong ETC and Guangdong Price Control Administration. (2001). Circular No. 587: Regarding the Acceleration of Wind Development in Our Province (《关于促进我省风电发展的意见》(粤计基[2001]587 号). Retrieved December 17, 2008, from http://www.pyda.gov.cn/dangan/media/MediaTMP/200512/512091031500001393/a2-017-2001-001.txt
19. GWEC. (2009a). China. Retrieved April 27, 2009, from http://www.gwec.net/index.php?id=125
20. GWEC. (2009b). China. Brussels: Global Wind Energy Council. Retrieved April 7, 2009, from http://www.gwec.net/index.php?id=125
21. GWEC. (2009c). Energy supply security. Retrieved May 6, 2009, from http://www.gwec.net/index.php?id=138
22. Hall, P. (1993). Policy paradigms, social learning, and the state: the case of economic policymaking in Britain. *Comparative Politics, 25*(3), 275-296.
23. Heclo, H. (1974). *Modern Social Politics in Britain and Sweden: from Relief to Income Maintenance*. New Haven: Yale University Press.
24. Heclo, H. (1978). Issue networks and the executive establishment. In A. King (Ed.), *The New American Political System* (pp. 87-124). Washington, D.C.: American Enterprise Institute for Public Policy Research.
25. Hills, P. (2006). Governance for environmental planning and sustainable development: Asian perspectives. In A. Huque & H. Zafarullah (Eds.), *International Development Governance* (pp. 495-513). Boca Raton, FL: Taylor & Francis.
26. Ho, P. (2001). Greening without conflict? Environmentalism, NGOs and civil society in China. *Development and Change, 32*, 893-921.
27. Holzer, B. and Sørensen, M. (2003). Rethinking subpolitics: beyond the 'iron cage' of modern politics? *Theory, Culture & Society, 20*(2), 79-102.
28. Hu, A., Jefferson, G. and Qian, J. (2005). R&D and technology transfer: firm-level evidence from Chinese industry. *The Review of Economics and Statistics, 87*(4), 780-786.
29. IEA. (2007b). *Fossil Fuel-Fired Power Generation: Case Studies of Recently Constructed Coal- and Gas-fired Power Plants*. Paris, France: International Energy Agency, Organisation for Economic Co-operation and Development.
30. IEA. (2007c). *World Energy Outlook 2007: China and India Insights*. Paris: Organisation for Economic Co-operation and Development / International Energy Agency.
31. James, E. (2002). How can China solve its old-age security problem? The interaction between pension, state enterprise and financial market reform. *Journal of Pension Economics & Finance, 1*(1), 53-75.
32. Jefferson, M. (2008). Accelerating the transition to sustainable energy systems. *Energy Policy, 36*(11), 4116-4125.
33. Lema, A. and Ruby, K. (2007). Between fragmented authoritarianism and policy coordination: Creating a Chinese market for wind energy. *Energy Policy, 35*(7), 3879-3890.
34. Li, J. (2008, June 2). Opinion: China's wind power development exceeds expectations. Washington, D.C.: *Worldwatch Institute*.

35. Li, J. *et al.* (2006). *A Study on the Pricing Policy of Wind Power in China*. Beijing: CREIA, Greenpeace, GWEC.
36. Li, J. *et al.* (2007). *China Wind Power Report 2007*. Beijing: China Environmental Science Press.
37. Lieberthal, K. and Oksenberg, M. (1988). *Policy Making in China: Leaders, Structures, and Processes*. Princeton, New Jersey: Princeton University Press.
38. Longyuan. (2009). Company Profile: Longyuan Group Power Group Corporation Limited. Retrieved December 2, 2009, from http://www.clypg.com.cn/en/tabid/330/Default.aspx
39. Loo, B. (2004). Telecommunications reforms in China: towards an analytical framework. *Telecommunications Policy, 28*(9-10), 697-714
40. Lu, Y. (2005). *Environmental Civil Society and Governance in China (Briefing Paper: ASP BP 05/04)*. London: Chatham House.
41. Maarleveld, M. and Dangbégnon, C. (1999). Managing natural resources: A social learning perspective. *Agriculture and Human Values, 16*(3), 267-280.
42. Mah, D. and Hills, P. (2008). Central-local relations and pricing policies for wind energy in China. *The China Review, 8*(2), 261-293.
43. Mah, D. and Hills, P. (forthcoming). Collaborative governance for sustainable development: a comparative study of wind resource assessment in Xinjiang and Guangdong Provinces, China. *Sustainable Development*.
44. Martinot, E. and Li, J. (2007). *Powering China's Development: the Role of Renewable Energy*. Washington, D.C.: Worldwatch Institute.
45. Mertha, A. (2005). China's "soft"centralization: shifting tiao/kuai authority relations. *The China Quarterly, 184*, 791-810.
46. MIT. (2007a). *The Future of Coal - Options for a Carbon-constrained World*. Cambridge, MA: MIT.
47. Naughton, B. (1995). *Growing Out of the Plan: Chinese Economic Reform, 1978-1993*. Cambridge: Cambridge University Press.
48. NDRC. (2006c, January 5). *Management and Regulation of the Management of the Electricity Generation Related to Renewable Energy (Kezaisheng nengyuan fadian youguan guanli Guiding).* Retrieved November 10, 2008, from http://www.sdpc.gov.cn/nyjt/nyzywx/W020060206509871367189.doc
49. NDRC. (2007a). The 11th Five-year Plan for Energy Development (in Chinese). Beijing: National Development and Reform Commission.
50. NDRC. (2007). Regarding the approval of the on-grid prices of wind energy projects in Hebei, Heilongjiang and other provinces (NDRC Price [2007] No. 3303) (Guanyu heding Hebei Zhangjiawan、Heilongjiang Wuergulishan deng fengdian xiangmu shangwang dianjia de pifu (Fagai Jiage [2007]3303 Hao*)*. Retrieved from http://www.ndrc.gov.cn/jggl/zcfg/t20080218_193008.htm.
51. NDRC. (2008). *National Development and Reform Commission, State Electricity Regulatory Commission About January to September 2007: Notice on the Proposal of Additional Subsidies on Tariff and Quota Transaction of Renewable Energy (Guojia Fazhan Gaigewei*、*Guojia Dianjianhui guanyu 2007 nian 1-9 yue: kezaisheng nengyuan dianjia fujia butie he peie jiaoyi fangan de tongzhi)*. Beijing: National Development and Reform Commission; State Electricity Regulatory Commission. Retrieved July 22, 2008, from http://www.ndrc.gov.cn/zcfb/zcfbtz/2008tongzhi/t20080407_202765.htm

52. NDRC and ERI. (2004). *Study on Renewable Energy Law (kezaisheng nengyuan lifa yanjiu baogao) (in Chinese)*. Beijing: National Development and Reform Commission.
53. Nee, V. (1992). Organizational dynamics of market transition: hybrid forms, property rights, and mixed economy in China. *Administrative Science Quarterly, 37*(1), 1-27.
54. Nee, V. and Su, S. (1996). Institutions, social ties, and commitment in China's corporatist transformation. In J. McMillan and B. Naughton (Eds.), *Reforming Asian Socialism: The Growth of Market Institutions* (pp. 111-134). Ann Arbor: The University of Michigan Press.
55. OECD. (1997). *Diffusing Technology to Industry: Government Policies and Programmes*. Paris: Organisation for Economic Co-operation and Development.
56. OECD. (2005). *Governance in China*. Paris: Organisation for Economic Co-operation and Development.
57. OECD. (2008). *OECD Investment Policy Reviews: China - Encouraging Responsible Business Conduct*. Paris: Organisation for Economic Co-operation and Development.
58. Pearson, M. (2005). The business of governing business in China: institutions and norms of the emerging regulatory state. *World Politics, 57*(2), 296-322.
59. Pierre, J. and Peters, G. (2000). *Governance, Politics and the State*. Basingstoke, Hampshire: MacMillan Press.
60. Qi, Y., Ma, L., Zhang, H. and Li, H. (2008). Translating a global issue into local priority: China's local government response to climate change. *The Journal of Environment and Development, 17*(4), 379-400.
61. Sabatier, P. (1988). An advocacy coalition framework of policy change and the role of policy-oriented learning therein. *Policy Sciences, 21*(2-3), 129-168.
62. Sawin, J. and Flavin, C. (2004, June 1-4). *National policy instruments: policy lessons for the advancement & diffusion of renewable energy technologies around the world.* Paper presented at the Renewables 2004 - International Conference for Renewable Energies, Bonn, Germany.
63. Schwartz, J. (2004). Environmental NGOs in China: roles and limits. *Pacific Affairs, 77*(1), 28-49.
64. SERC. (2009, January 20). The Supervision Report on the Purchase of Renewable Energy and the Implementation of the Pricing Policy (No. 7 Report, 2008) *(Ke zaisheng nengyuan dianliang shougou he dianjia zhengce zhixing qingkuang jianguan baogao - erling lingba nian diqihao).* Beijing: State Electricity Regulatory Commission. Retrieved June 28, 2009, from http://www.serc.gov.cn/zwgk/jggg/200901/t20090120_10879.htm
65. Shanghai DRC. (2006). *Provisional Management Measures of Shanghai Municipality on the Preliminary Works of Wind Energy Projects (Shanghaishi fengli fadian xiangmu qianqi gongzuo zhanxing guanli banfa).* Retrieved November 21, 2008, from http://www.shanghai.gov.cn/shanghai/node2314/node2319/node12344/userobject26ai13668.html
66. SH ECSC. (2009). *Green Electricity*. Shanghai: Shanghai Energy Conservation Supervision Center. http://www.sh-greenpower.org (accessed April 2, 2009).

67. Tao, J. and Mah, D. (2009). Between market and state: dilemmas of environmental governance in China's sulphur dioxide emission trading system. *Environment and Planning C: Government and Policy, 26*.
68. Teske, S., *et al*. (2007). *Energy Revolution: A Sustainable China Energy Outlook*. Beijing: Greenpeace and European Renewable Energy Council.
69. Tester, J., *et al*. (2005). *Sustainable Energy: Choosing Among Options*. Cambridge; Massachusetts; London: The MIT Press.
70. Tian, J. (2008). *Implementing Energy Efficiency Programs in China's Power Generation Sector: Case Study of a Recent Policy Initiative*. Manila: Asian Development Bank.
71. UNEP. (2006). *Global Environment Outlook Year Book 2006*. Nairobi, Kenya: United Nations Environment Program.
72. Voß, J.-P. and Kemp, R. (2006). Sustainability and reflexive governance: introduction. In J.-P. Voß, D. Bauknecht & R. Kemp (Eds.), *Reflexive Governance for Sustainable Development* (pp. 3-30). Cheltenham, Glos, UK; Northampton, MA: Edward Elgar.
73. Wang, Z., Ren, D. and Gao, H. (2009). *The Renewable Energy Industrial Devleopment Report 2008*. Beijing: Chemical Industry Press.
74. Wedeman, A. (2001). Incompetence, Noise and Fear in Central-Local Relations in China. *Studies in Comparative International Development, 35*(4), 59-83.
75. Wedeman, A. H. (2003). *From Mao to Market: rent seeking, local protectionism, and marketization in China*: Cambridge University Press.
76. Wehrle, C. (2008). Shanghai's power and gas situation. *Shanghai Flash, 1, January*.
77. World Bank. (2006). *China: Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China*. Washington, D.C.: The World Bank.
78. World Bank. (2007, December 18). In Search of Clean Energy to Meet China's Needs*. The World Bank*. Retrieved from http://go.worldbank.org/Y2TEASWHB0
79. Wright, T. (2000). The political economy of prices in China's planned and market economies: competition and control in the coal industry. *Asian Studies Review, 24*(3), 349-376.
80. Wu, C. and Wang, H. (2007). China: seeking meaningful decentralization to achieve sustainability. In A. Breton, G. Brosio, S. Dalmazzone & G. Garrone (Eds.), *Environmental Governance and Decentralisation* (pp. 397-435). Cheltenham, UK; Northampton, MA, USA: Edward Elgar.
81. Yan, X. (2001). The impact of the regulatory framework on fixed-mobile interconnection settlements: the case of China and Hong Kong. *Telecommunications Policy*, 25(7), 515-532.
82. Zhao, X. (2006, December 27). Basic thoughts for the Eleventh Five-year Plan of the Development of the Electricity Industry (*"Shi yi wu" dianli gongye fazhan de jiben silu*). Retrieved September 3, 2008, from http://www.ndrc.gov.cn/nyjt/nyzywx/t20070126_113846.htm

Sciences Po in China - Governance and Globalization Working Papers
Series Editor: Richard Balme

1. Pr. Michel Aglietta, Université de Paris X and CEPII, *Global Imbalances and the Future Position of China in the International Monetary System.* Sciences Po in China, Governance and Globalization Working Paper Series, 1, November 2007 (English and Chinese).

2 Dr. Zaki Laidi, Centre for European Studies, Sciences Po, *Europe and World Governance: Norms over Power*. Sciences Po in China, Governance and Globalization Working Paper Series, 2, November 2007 (English and Chinese).

3 Dr. Stephanie Balme, CERI Sciences Po and Tsinghua, Law School, *Introduction to the French Judicial System: History and Contemporary Challenges.* Sciences Po in China, Governance and Globalization Working Paper Series, 3, November 2007 (Chinese).

4 Pr. Richard Balme, Sciences Po and Peking University, School of Government, *The European Union, China and Human Rights*. Sciences Po in China, Governance and Globalization Working Paper Series, 4, November 2007 (English and Chinese).

5 Dr. Jean-Louis Rocca, CERI-Sciences Po and Ateliers Doctoraux de Pekin, Tsinghua, School of Social Sciences and Humanities, *Lost in «Translation», How to use «French» Concepts in Doing Research on China: The Cases of Boudieu and Foucault.* Sciences Po in China, Governance and Globalization Working Paper Series, 5, November 2007 (Chinese).

6 Michal Meidan (Asia Centre), Philip Andrews Speed and Ma Xin (Center for Energy, Petroleum and Mineral Law and Policy), *China's Energy Policy Governance*. Sciences Po in China, Governance and Globalization Working Paper Series, 6, January 2008 (English and Chinese).

7 Dr. Gilles Duhamel and Dr. Etienne Grass, Chaire Santé, Sciences Po, *Disease Management Perspectives for Patients with Chronic Diseases in France*. Sciences Po in China, Governance and Globalization Working Paper Series, 7, January 2008 (English and Chinese).

8 Dr Claude Meyer, Sciences Po, Groupe d'Economie Mondiale (GEM), *Should China revalue its Currency? Lessons from the Japanese Experience.* Sciences Po in

China, Governance and Globalization Working Paper Series, 8，January 2008 (English and Chinese).

9 Prof. Cai Dingjian, University of Law and Political Science, Beijing, Constitutionalism Research Institute, *Current Public Participation in Decision-making in China*. Sciences Po in China, Governance and Globalization Working Paper Series, 9，March 2008 (English and Chinese).

10 Pr. Patrick Messerlin, Jinghui Wang, Sciences Po, Groupe d'Economie Mondiale (GEM), *The EU Trade Policy towards China*. Sciences Po in China, Governance and Globalization Working Paper Series, 10, February 2008 (English and Chinese).

11 Dr. BO Yan, Dr. CHEN Zhimin，Department of International Politics, Fudan University，Shanghai：*The EU and China Global Climate Change Governance.* Sciences Po in China, Governance and Globalization Working Paper Series, 11，February 2009 (English and Chinese).

12 Andrew Floyer Acland，Associate Director, Dialogue by Design Ltd, United Kingdom：*Making Public Participation Work*. Sciences Po in China, Governance and Globalization Working Paper Series, 12，February 2009 (English and Chinese).

13 Pr. Zhenmin Wang, *The Developing Rule of Law in China*. Sciences Po in China, Governance and Globalization Working Paper Series, 13，February 2009 (English).

14 Dr. Olivier Borraz，Centre de Sociologie des Organisations, Sciences-Po/CNRS, *Risk Management and the Rise of the Regulatory State – Analyzing Transformations in French Policy-making.* Sciences Po in China, Governance and Globalization Working Paper Series, 14，September 2009 (English and Chinese).

15 Pr. Jean-Paul Fitoussi, Dr. Francesco Saraceno, Observatoire Français des Conjonctures Economiques(OFCE), *The Intergenerational Content of Social Spending : Health Care and Sustainable Growth in China.* Sciences Po in China, Governance and Globalization Working Paper Series, 15，September 2009 (English and Chinese).

16 Xin Wang, Tancrède Voituriez, Institute for Sustainable Development and International Relations (IDDRI), *Can Trade Instruments significantly reduce competitiveness pressures on ETS-constrained Industries? The Case of China Export Taxes and VAT rebates and their Implications for the EU*. Sciences Po in China, Governance and Globalization Working Paper Series, 16，November 2009 (English and Chinese).

17 Dr. Frédéric Keck, Centre National de la Recherche Scientifique (CNRS), *Food Safety in France, from Mad Cow Disease to Avian Flu*. Sciences Po in China, Governance and Globalization Working Paper Series, 17, January 2010 (English and Chinese).

18 Dr. Fran çois Bafoil, Senior Research Fellow CNRS, CERI / Sciences Po, *East European Civil Societies in the 90's, A Legacy of Solidarnosc or Different Historical Paths ?* Sciences Po in China, Governance and Globalization Working Paper Series, 18, March 2010 (English and Chinese).

19 Dr. Fran çois-Mathieu Poupeau, Research Fellow CNRS, LATTS/ University of Paris East, *Central-Local Relations in French Energy Policy Making and the Environmental Shift:towards a New Pattern of Governance between State and Local Authorities?* Sciences Po in China, Governance and Globalization Working Paper Series, 19, May 2010 (English and Chinese).

20 Dr.Daphne Ngar-yin Mah, Senior Research Associate, Dr.Peter Hills, Director and Professor, the Kadoorie Institute, the University of Hong Kong, *Policy choices, central-local relations and policy learning : a case study of the pricing policies for wind energy in China(from 1994 to 2009).* Sciences Po in China, Governance and Globalization Working Paper Series, 20, May 2010 (English and Chinese).