Growing China's renewables sector: a developmental state approach

Geoffrey C. Chen (University of Duisburg-Essen) and Charles Lees (University of Bath)

Abstract

Over the last decade China expanded its renewable energy sector with unprecedented speed. This success story presents a challenge to Western modes of environmental governance, where stakeholder participation is often deemed a necessary pre-condition for effective policy outcomes. Drawing on new research including previously unpublished interview data, the article first discusses established modes of environmental governance before examining the growth of China's renewables sector through the theoretical lens of the 'developmental state'. The article then analyses renewable energy policy design and implementation in China, illustrating how top-down command and control strategies have successfully diffused renewable energy technology from a standing start. We argue that (1) China's distinct approach to the sector differs from Western modes of environmental governance and (2) this has revealed a new path towards renewable energy diffusion that authoritarian states in particular might regard as an attractive alternative to participatory models.

Keywords: China, Environment, Developmental State, Governance.

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Introduction

Mitigating climate change entails reshaping the energy sector, accelerating technological innovation, and raising public awareness. The task also requires substantial political capital to implement long-term mitigation strategies. In many Western democracies, political support is built on a decision-making process in which widening public participation is assumed to be desirable or even non-negotiable (O'Riordan and Jäger 1996; OECD 2002; Van Tatenhove and Leroy 2003; Few *et al.* 2007; Baker 2013; Devine-Wright 2014). Western modes of environmental governance are by no means identical but generally entail a degree of recognition that central government should cede power to sub-national tiers of government and work in partnership with non-governmental actors (WECD 1987; Mol 1996; Seyfang and Haxeltine 2012; Bäckstrand and Kylsäter 2014). Taken in the round they constitute an orthodox dominant policy template adopted by many states (Hajer 2010; Wanner 2015).

As the Figure below indicates, China's renewable energy industry grew at unprecedented speed and surpassed previously leading countries (Bradsher 2010; REN21 2015: 20). The approach China settled upon after some trial and error, however, is driven by top-down command and control measures (Schreurs 2011). This makes China an important outlier and potential alternative pole of influence in the context of global environmental politics.

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This article explores how China developed its relatively unorthodox model for swiftly diffusing non-hydro renewable energy. Next we posit our definitions and conceptualisation, including a brief description of the sustainable development ideal type, the national modes of governance that it informs, as well as the broad principles of the developmental state model. Following that we examine the application of the developmental state model in China[i]. Finally we discuss how the Chinese model provides an attractive alternative for authoritarian states.

Definitions and Conceptualisation

Our analysis recognises that the modes of governance that emerged in the Chinese renewables sector were contingent on context and circumstance. The Europeanisation literature demonstrates that institutional consolidation and change is non-linear (Radaelli 2005) and marked by a 'complex causality' (Saurugger 2006). From a different theoretical tradition but also focusing on European governance, Jessop's 'strategic-relational' approach stresses the dynamic and mutually constitutive relationship between 'modes' and 'objects' of governance (Jessop 2005). As we shall see, in developing its renewables sector Chinese policy makers rejected established Western modes of environmental governance – although specific practices were

adapted where necessary. But neither did China revert to its default pattern of decentralised governance but rather we see the emergence of a ‘definite mode’ of governance (Jessop 1997) appropriate to the specificities of renewables sector in China and the political-economic role it plays.

China’s adoption of a developmental state strategy was no foregone conclusion. Yeh and Lewis (2004) argue that China originally pursued a more market-oriented path but modified it because of internal and external pressures. For instance, whilst it soon became clear that power supplies could not keep up with the pace of industrial development, concerns for energy security meant the Chinese government remained ‘cautious about allowing foreign companies to gain control of electricity production’ (Yeh and Lewis 2004: 448). China felt the need to partially acquiesce to World Bank pressure to privatise the sector in order to attract capital investment but remained wary of the dangers of market failure. In particular, the California electricity crisis of 2000 and 2001 convinced China's leaders that ‘the only way to maintain system reliability is to maintain government control’ (Yeh and Lewis 2004: 450). And of course the Chinese Communist Party had observed the Perestroika reforms and the Soviet Union’s subsequent collapse and had drawn the appropriate conclusions. Under the principle of ‘grasping the large and releasing the small’ in order to maintain overall political-economic control, Chinese policy makers settled on the retention of so-called ‘Pillar Industries’ whilst gradually liberalising relatively small and medium-sized state owned enterprises (Pearson 2015).

Sustainable development and multi-level governance as the Western orthodoxy

There is no single 'Western' mode of environmental governance but there are commonalities across Western jurisdictions that are not seen in the Chinese context. Many of these are grounded in the assumptions that underpin the notion of sustainable development, which has become a significant normative and technical guide for environmental governance. The discourse of sustainable development was deployed in the 1980 World Conservation Strategy (IUCN; UNEP; WWF) but is most commonly associated with the 'Brundtland Report' (WCED 1987). These principles informed the Rio Earth Summit (UNCED 1992 Agenda 21) and in subsequent documents from international organisations such as the World Bank's Global Environmental Facility and the World Business Council for Sustainable Development.

The pragmatic, reformist, and anthropocentric principles of sustainable development work with the grain of orthodox political economy, particularly since the neo-liberal turn, and have gained much traction. The core elements are: (1) development, with a focus on meeting basic human needs and achieving more equitable living standards; (2) sustainability, with an emphasis on greater inter-generational justice; (3) equity, encouraging sustainable and socially responsible patterns of consumption; and (4) integration, planning, and democratic participation. Three additional features underpin these four elements. First, the precautionary principle, which has generated robust risk

management practices and, embedded in the environmental *Aquis*, is now a statutory requirement for EU member states and candidate states. Second, a distinct set of institutional forms and practices, particularly in member states, including integrated Ministries of the Environment, autonomous stand-alone Environment Agencies, inter-sectoral and intra-sectoral/horizontal and vertical policy integration, and policy instruments. Third, through Agenda 21, a commitment to broadening and deepening networks to encompass activists and policy entrepreneurs in a web of multi-level governance and resource dependence.

The EU is an active proponent of this approach, working through multiple institutional actors including the Commission (DG ENV, the Industry and Agriculture DGs and, in the case of accession states, DG Enlargement), the European Parliament, and to a lesser extent the Council of Ministers, European Council, and European Court of Justice. Environmental action plans develop distinctive policy instruments including a Community Action Program promoting NGOs in the environmental field, voluntary agreements such as the Eco-label scheme, and the cultivation of formal and informal expert networks reaching across and beyond the EU (Taylor *et al.* 2012).

Within this overall framework, variance remains across individual states and across sectors. Sectoral variance is well documented (Cowell *et al.* 2015), recognising that institutions of governance should as far as possible reflect the scale of the problems associated with each sector (Bulkeley, Watson,

and Hudson 2007; Watson *et al.* 2008; Moss and Newig 2010). Studies of national variance are less common and research into energy transitions tend to favour single states (Nadai 2007; Wolfe 2008; Klagge and Brocke 2012) or focussed comparisons between states (Toke and Lauber 2007; Lehtonen and Nye 2009). More comparative research is needed, particularly into how the complex task of aligning regulatory, market, and social interventions is achieved across different settings. But the limited comparative research indicates that we should not be surprised by the persistence of variance at the national level, despite pressures from the European level (Taylor *et al.* 2012).

Nevertheless European states face common problems in the promotion and governance of renewable energy, particularly the need to foster innovation, cement public acceptance and political support, and secure economic resources (Elliott 2011; Jänicke 2012a, 2012b; Warren *et al.* 2012). Because publics often associate renewable energy with noise pollution, economic damage, and some deterioration of the landscape, renewable energy projects in the West are regularly opposed by local residents (Rule 2014), which further sharpens the focus on the need to secure stakeholder engagement (Devine-Wright 2014)[ii]. As we shall see, these concerns are less evident in China.

The developmental state

Environmental scholars have begun to question whether decentralisation is conducive to achieving step changes of policy and governance (Bardhan and Mookherjee 2007) and doubts have emerged about the quality of evidence demonstrating that participatory governance works as a universal template (Midlarsky 1998; Blühdorn 2013). The progress made by China in the renewables sector over a very short period of time has amplified these concerns.

Our reading of the existing literature (Amsden 2004; Wade 2004; Cumings 2005; Breslin 2012; Johnson 2012; Gore 2014) and our own research leads us to argue that China's approach to governance of the renewables sector conforms to the developmental state model. The developmental state literature draws upon historical examples from Europe, such as 16th century England or 19th century Germany, as well as the experiences of the post-war East Asian economies such as Japan, South Korea, and Taiwan.

Evidence from East Asia in particular demonstrates how political elites went above and beyond the simple exploitation of short-term comparative advantage in order to transcend their branch economy status within the global economic system (Öniş 1991: 110; Evans 2014). The primary objective was modernisation and the market made subservient to the need to 'catch up' with the developed economies. The developmental state literature explicitly links state intervention and rapid economic development (Woo-Cumings 1999: 2; Kjær 2004: 133).

The literature, however, goes beyond a simple focus on state intervention. Weiss identifies three dimensions along which we can map the developmental state. These are, first, their strategic priorities, second, their organisational arrangements, and, third, the extent of institutionalised links between the state and organised economic actors (Weiss 2000: 23). In terms of the first dimension, East Asian states were not interested in exploiting a stable but subaltern position within the global economic system but rather were determined to catch up. Second, in terms of organisational arrangements, market activity is guided by a lead industrial planning agency. This institution attracts the best managerial talent, who are delegated and supported by political elites within a hierarchical political system. Third, the paradigmatic developmental state intervenes through leveraging tight government-corporate networks, which are the conduit for information flows. These three dimensions explain why policy makers overseeing economic development enjoy a degree of operational autonomy not seen elsewhere (Doner, Ritchie, and Slater 2005). Buttressed by political elites but also endowed with a high degree of popular legitimacy, technocrats within the developmental state avoid the experiences of their contemporaries in weaker states, where private and/or short-term interests often subvert the modernisation process (Öniş 1991: 114; Evans 2014). In developmental states there is a high level of consensus over national development goals and support for the economic bureaucracy to take effective policy measures to

achieve the catch-up that is at the core of developmental state strategy (Weiss 2003: 247).

Thus the developmental state is reflexive. Elites are aware of their relative backwardness and governments deploy techno-managerial policy networks to overcome this. These arrangements are fundamentally different from many of the newly industrialised states in Latin America, where the economic bureaucracy exercises limited competence (Weiss 2004: 49–54). In developmental states, pilot agencies regularly announce development plans with particular targets set. Governments also establish a range of positive and negative incentives to shape behaviour in selected sectors to achieve catch-up (Johnson 1987: 142; Wade 2004). Private sector actors then adjust their expectations and subsequent operations based on these incentives. One of the key incentives deployed are subsidies based on performance. Technocrats give or sustain support for particular enterprises and sanction underperforming businesses (Amsden 2004). In the developmental state, 'intervention was more performance-oriented and targeted than in Western countries' (Kjær 2004: 135). When permitted, European states might allocate 'bailout' funds to support precarious industrial sectors (Weiss and Hobson 2007: 151; Yeung 2014). In developmental states, by contrast, the government picks winners: strategically sponsoring sectors, cultivating competitiveness and leadership in domestic or international markets, research, and exports, but also protecting local businesses (Wong 2004: 350; Breslin 2012).

The developmental state drives economic policy forward through a range of financial interventions. State-owned banks monitor capital flows and policy makers develop regulations for limiting such flows and as well as controlling prices (Wade 2004; Johnson 2012). Science and technology policy is central to the modernisation process and technology transfer is pursued through licensing from abroad (Amsden 2004; Evans 2014). Governments also invest in training technology professionals and developing human capital. Crucially, however, the developmental state sees no matching obligation to its citizens' wider welfare needs (Öniş 1991: 113; Johnson 2012).

It is easy to see why developmental states tend to emerge within authoritarian regimes. Such regimes allow coordination to take place and, in turn, the successful modernisation of the economy maintains political stability and boosts system legitimacy. Chalmers Johnson (1987) describes how political systems often differ across developmental states but, when encountering endogenous and exogenous challenges, all of these countries have kept citizen participation in check.

Compared with liberal democratic states, the acid test of the developmental state is the reification of economic development as a system output. Built upon resource scarcity, industrial programs in developmental states are both economically nationalist and oriented towards the global economy. Thus, on the one hand, developmental states limit the influence of foreign capital in

order to protect emerging industries and, on the other, they develop a range of institutional configurations aimed at nurturing future competitiveness in international markets and building national champions (Yeung 2014). The high levels of legitimacy enjoyed by East Asian states as a result has to some extent allowed them to avoid the crises seen in newly industrialised countries in Latin America, including Argentina and Brazil, when enacting supply-side measures and seeking the cooperation of organised business groups (Öniş 1991: 118).

The Developmental State in the Chinese context: a Chinese alternative?

The logic of the developmental state is apparent in the Chinese strategy of catch up within the renewables sector, with concerted attempts to transfer and adapt the best available foreign technology, whilst actively protecting China's domestic industry (Pearson 2005). Governance of the sector remains firmly in the hands of the state, with the majority of energy producers and grid networks dominated by state-owned enterprises (Andrews-Speed 2012; Pearson 2015), albeit with an increasing number of local private sector actors involved in wind turbine and photovoltaic technologies.

The domestic sector was incentivised by localised protection measures. Before 2009, for instance, all tenders for wind power construction projects had to meet a localisation rate (the percentage of equipment produced

domestically) of 70 per cent (Lewis 2013: 82). Such measures encouraged domestic manufacturers to close the technology gap with market leaders rather than rely on labour-intensive comparative advantage. Technology transfer took place through licencing purchases or by acquiring intellectual property rights (Lewis 2011, 2013). For example, Goldwind, a state-owned enterprise now ranked in the world's top five wind power equipment manufacturers, purchased technology licences from German manufacturers Jacobs, RE Powers, and Vensys. Similarly, Ming Yang, China's largest private-sector wind power equipment manufacturers, obtained technology licences from another German company, the turbine manufacturer Aerodyn[iii] In this fashion domestic enterprises moved quickly up the technological ladder, won local market share and, as the sector matured, strengthened global competitiveness.

In addition – and again consistent with developmental state paradigm - China tasked a lead agency, the National Development and Reform Commission (NDRC) to develop the sector[iv]. The NDRC strictly controlled the price of electricity generated from renewable sources[v], an approach fundamentally contrary to the neo-liberal doctrine that, in order to stimulate the sector, the appropriate course of action is to progressively lift restrictions and embed comparative advantage (Kuzemko 2013). Through the NDRC, which enjoyed far great steering power than a European-style environment ministry or environmental protection agency, China was able to actively intervene in the market by re-allocating resources and controlling energy prices.

These measures were not old-school Maoism, however (García 2011). The role of the state transformed from that of an administrative executive to that of an entrepreneurial agency by, first, incentivising companies to align themselves with the wider industrial plan and, second, allocating resources within the power generation sector and coordinating the activities of public- and private-sector manufacturers. The intention was to discipline these firms to provide the backbone of the Pillar Industry and drive economic development.

Following the introduction of the Renewable Energy Law in 2006, the State Council published a number of related policy documents, including Trial Measures for Pricing and Cost Sharing Management for Renewable Energy Power (2006), the Opinions of the State Council of Invigorating Equipment Manufacturing (2006), the Middle- and Long-Term Programme of Renewable Energy Development (2007), the "Eleventh Five-Year" Guidelines for Renewable Energy Development (2008), the Notice on Policy to Improve Grid-Connected Power Pricing for Wind Power (2009), and the Decision on Accelerating the Fostering and Development of Strategic Emerging Industries (2010). All of these documents confirm the role of the NDRC as the focal point for guiding and incentivising the sector. As Andy Zhong, the marketing director of the China Sunergy Co. Ltd., a Chinese enterprise listed on the New York Stock Exchange, indicated: 'learning has been important for us, and the policy documents provided by the government have become the most important sources!'[vi]

The Chinese state deploys negative incentives as well and large state-owned enterprises in particular are tasked with acquiring mandatory market share with potential sanctions for failure. The NDRC's 2007 Middle- and Long-Term Program of Renewable Energy Development document stated: 'electricity producers with more than 5 million kW of their total installed capacity should produce 3 per cent and 8 per cent of electricity generated from non-hydro renewable sources, respectively' (NDRC 2007: 30). As Hongfei Huang, manager of offshore wind power development for state-owned enterprise Zhejiang Energy Corporation, observed, this compelled state-owned enterprises to participate in the rush to wind power.[vii] Similarly, Yangang Jia, the vice president of China Electric Equipment Group (GEEG) and the president of Solar Energy Research Institute, said wryly,

> This is what we called 'listen to the Party, lean on a moneybags, find the right path' (*Tingdangdehua, bangdakuan, zouzhenglu*, 听党的口，傍大款，走正路). There is no other way, as the NDRC is where industry policies are issued….. So we have no choice but to build a smooth relationship with central government' (Jia 2013)[viii].

Building an internationally competitive renewables sector from the top down

The early stages of China's development policy were built on carbon energy, and in particular its enormous coal reserves, with huge negative environmental impacts (Liu and Diamond 2005; Shapiro 2012). By the late

1990s, the environmental damage inflicted was hard to ignore. Over the following decade the pollution problem became increasingly intractable, in that the downside risk of slowing economic growth was potentially as damaging as maintaining the existing carbon-intensive modernisation path. Squaring this circle was key to why the shape of China's renewable energy policy was fundamentally different from those of the European environmental leaders.

The biggest difference is in the nature of business ownership in China. As we have discussed, China focused on deploying state-owned enterprises as the gatekeepers of energy security. In particular, two state corporations, the China Southern Power Grid Company Limited and the State Grid Corporation of China, dominated the power transmission, transformation and distribution markets. Unlike in Western economies where the renewables orthodoxy emerged, China's energy market was tightly controlled and the Communist Party, through its formal bureaucracy and its penetration of institutions and civil society, actively shaped business investment decisions (Tunsjø 2013). One interviewee remarked: 'China's renewable energy development seems to be dominated by large companies, most of which have official colours'[ix].

The second feature in which China differed from most Western countries is that state-owned enterprises also dominated the scaling up of the power generation sector[x] and private power companies only accounted for a limited market share (Xu 2010; Wang *et al.* 2012). As gate keepers within the sector,

large state-owned enterprises securitised the energy resources involved – an outcome considered as much a priority as creating a profitable sector. Again this contrasts to the broadly market-oriented thinking of energy governance in the West, in which market efficiency is often the desired outcome.

So the Chinese energy market is dominated by the state. But as has always been the case in a country as vast and diverse as China, central government delegates functional responsibility to the provinces, mandating them to introduce the appropriate policies for local conditions, subject to central guidance (*Yindi zhiyi*, 因地制宜). This means that local governments enjoy some discretion in adapting central government's mandate to local conditions. For example, when adapting central government's unified tariff policy, Jiangsu Province, in which a number of successful equipment manufacturers were located, added additional subsidies to facilitate the development of local energy suppliers. By contrast, Zhejiang Province - another province with a reputation for cultivating entrepreneurship – chose to implement central government policy without any additional augmentation[xi]. In general, however, the consensus remains amongst provincial policy makers that the provinces should restrict themselves to an 'assistant's role'[xii] and work with the grain of central government policy. As an anonymous senior official at the Provincial Development and Reform Commission commented: 'central government is the most important actor, whose mandates are to be obeyed in every way, and the province's responsibility is to add some other features and facilitate the implementation of the policy'[xiii].

There are two reasons why the Chinese central state remains capable of such control. First, as one of our interviewees pointed out, 'central government has official capacity and is capable of taking funds from the provinces and then redistributing them to lower levels of governments to fulfil tasks allocated by the centre. In addition to centrally distributed funds, local governments can also facilitate additional development funding to assist in the implementation of policy'[xiv]. Article 3 of the 2006 version of the Interim Measures for the Special Fund Management for the Development of Renewable Energy specifies that these development funds should be used primarily for research and development, standardisation, application programmes, system construction, resource exploration and – crucial to China's developmental state approach - to promote local equipment production[xv]. In the solar sector, the most critical policy measures introduced by central government were the Solar Photovoltaic Building Demonstration Scheme (*Taiyangneng guangdian jianzhu yingyong shifan xiangmu*, 太阳能光□建筑□用示范□目) and the Golden Sun Demonstration Scheme (*Jintaiyang shifan goncheng xiangmu*, 金太阳示范工程□目). These two schemes were intended to more efficiently allocate funds to support the rapid expansion of solar power installation. Wind power, on the other hand, was expanded through large-scale auctioning mechanisms. Power suppliers and equipment manufacturers collaborated in bidding processes and state-owned power transmission and distribution companies were required to sign agreements with them to carry out construction[xvi].

The second reason, as indicated by one of our interviewees, is that central government, through the NDRC, still enjoys more leverage over the relevant policy instruments than local government. In China a mechanism called 'hook responsibility' (*Guagou zeren*, 挂□□任) delegates responsibility and liability downwards from central to provincial to municipal governments and then, eventually, to township governments. As an interviewee noted: 'if a problem occurs after policy implementation, the centre will blame the subordinate in charge'[xvii]. Hook responsibility helps central government limit *ex post* opportunism and ensure that the provinces effectively implement mandated policies. As another interviewee told us: 'only central government is entitled to introduce key measures regarding tariff and tax policies, and only the central government has the final say on these issues.'[xviii]

We can see how hook responsibility operates in the area of solar energy, where in 2010 the Ministry of Finance issued the Notice of the Organisation of Solar Photovoltaic Building Demonstration Project, under which solar photovoltaic building integration projects received unified support through two sets of price subsidies[xix] (Wang *et al.* 2012: 80). In the same year, central government also introduced the so-called Golden Sun Scheme, with the aim of scaling up a photovoltaic industry that was henceforth to be regarded as one of China's 'strategic emerging industries' (*Zhanlue xinxing chanye*, □略新□□□). The policy regulated equipment for the tender, subsidy standards, supervision, and management of energy projects. 50 per cent of price subsidies were provided through a unified bidding process for demonstration

projects using crystalline silicon photovoltaic modules, grid-connected inverters, and lead-acid batteries (Wang *et al.* 2012: 81). As discussed earlier, this 'unified' pricing policy left little local discretion within the top-down chain of command between central government, the provinces, and local government.

China's development state approach is not just limited to top-down command and control measures. For instance, the early development of the photovoltaic equipment manufacturing industry took place in a relatively decentralised fashion where, as Gallager points out (2014: 222–4) local manufacturing was boosted by individual technical and academic experts, especially those returned from overseas with knowledge of modern climate technology. A number of private, local solar and wind power equipment manufacturers rapidly emerged with government support[xx], such as the Chinese Electric Equipment Group for solar energy and Ming Yang for wind power sector – although state-owned enterprises such as Goldwind continued to dominate market share (Lewis 2013: 161 – 2). Development of the sector was boosted by cultivated interaction between state, academia and industry in the kind of corporatist networks we associate with the developmental state paradigm. One of our interviewees indicated that, as the lead agency for the sector, the NDRC closely cooperated with the China Association for Science and Technology. Moreover, in Jiangsu Province the provincial Energy Research Society took responsibility for the development and execution of technology projects and also drafted the Eleventh and Twelve Five-Year strategies for energy conservation for the Jiangsu Provincial government. As our

interviewee observed: 'in the last fifteen years, under Premier Li's encouragement, civil society has taken on more and more of the duties assigned by the government'[xxi]. The harnessing of all levels of government and civil society was also advocated in the 2006 Opinions of the State Council for Invigorating Equipment Manufacturing, to mobilise educational institutions to build human capital and also to facilitate catch-up in key technologies and equipment (Article 3.4–3.9). Again this is consistent with the developmental state's emphasises on the significance of human capital for modernisation.

It is clear that, after a period of trial and error, the Chinese communist party now considers the developmental state paradigm the appropriate model, given the trade-off between the need to cultivate quasi-market dynamics whilst retaining central steering capacity. This pattern is somewhat at odds with the energy sector as a whole, in which a more decentralised model is the norm (Andrews-Speed 2012) and might reflect the relative failure of some aspects of China's modernisation process where central control has been less apparent[xxii]. This supports Jessop's notion of the constitutive and evolving relationship between 'modes' and 'objects' of governance (Jessop 2005). The defining feature of China's renewables governance is the degree to which the main parameters, including how tariffs are set, the degree to which local government can adapt central government policy, etc., are determined by the NDRC. Consistent with the developmental paradigm, the NDRC has considerable operational autonomy, framing the renewables sector as a 'strategic' modern Pillar Industry, levering corporate networks, and rapidly growing China's installed capacity of renewable energy, as well as overseeing

the expansion of the global market share in equipment manufacturing. The sector has been guided by a centralised, and professionalised leadership with the goal of upgrading the sector in order to catch up with and eventually overtake advanced Western states. Such a strategy was ultimately driven by the imperative of state building rather than environmental protection. But in doing so it has nevertheless overseen the expansion of the Chinese renewables industry from a standing start to world-class status.

Conclusions

This article shows how the rapid expansion of the renewables sector in China and the associated scaling-up process have not followed the sustainable development paradigm that we see in different forms in the West, characterised by varying degrees of participatory governance, decentralisation, and the inclusion of societal actors.

On the contrary, this study demonstrates that the expansion of renewable energy in China was characterised by the enhancement of central steering capacity, consistent with the developmental state paradigm. In the Chinese model, neither market efficiency nor increasing societal participation was a priority for restructuring the energy market. Instead, central government securitised the sector through re-centralisation and *re-intervention*, giving priority to political stability through its lead agency, the NDRC.

This article demonstrates that the emerging model of renewable energy governance in China re-emphasises what many environmental governance theorists have regarded as a thing of the past: top-down command and control policy instruments levered by a strong state. China will not give up its bureaucratic system-monitoring mechanisms and remains actively involved in the developmental process. It has created a 'definite mode' of governance (Jessop 1997) that is appropriate to the sector in China and the role it plays in political-economic terms as a Pillar Industry. The apparent success of this strategy poses a challenge to Western modes of governance as it provides an attractive alternative for authoritarian states elsewhere in the world that may wish to address their environmental problems but do not wish to cede political or economic control in order to do so.

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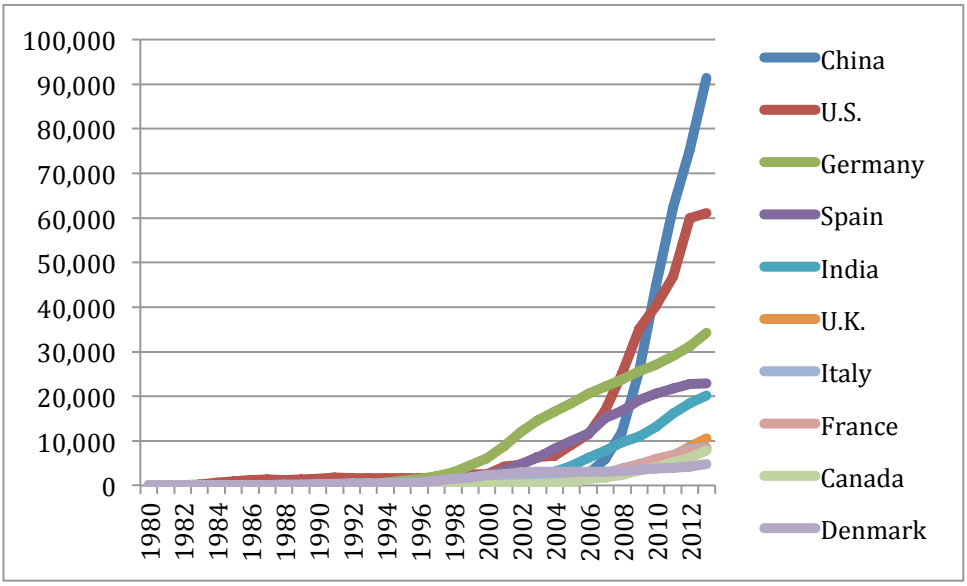
Figure: Cumulative installed wind power capacity in the top ten countries, 1980-2013 (Megawatts)



Source: http://www.earth-policy.org/? /data_center/C23/, accessed 4 May 2014. Adapted by authors.

End-notes

[i] Our analysis is based on data from semi-structured interviews with 32 renewable energy-related policymakers, think tanks, academic researchers, business practitioners, and nongovernmental organisations conducted during the field trip from 9 February to 25 August 2013. The majority of the interviewees are leaders or senior executives in professional associations, research societies, academic institutions, corporations, government apparatus, and non-profit organisations. Apart from interview data, our analysis is based on collected written materials, including policy and legislature documents, statistical data, newspaper articles, and limited availability of internal documents.

[ii] Evidence drawn from Germany and Denmark's experience seems to show that the sharing of decentralised ownership rights reduces local objections to the deployment of renewable energy (Jacobsson and Lauber 2006; Mitchell *et al.* 2006; Szarka and Blühdorn 2006; Elliott 2011: 219–48) and outcomes tend to be better if residents have an economic interest in local projects (Mabee *et al.* 2012). Moreover, ceteris paribus large-scale developments seem to be less acceptable to public opinion than a proliferation of small, privately administered projects (Devine-Wright 2014).

[iii] Other examples are Sinovel and Dongfang. These two domestic companies remain in the top three. They acquire technology licences from Fuhrländer and RE Power, both of which are German turbine companies (Lewis 2011: 294).

[iv] As a successor to the State Planning Commission that maintained control of the country's planned economy, NDRC is a restructured governmental organisation under the State Council, which maintains obligation to formulate macroeconomic policies and social development. With respect to energy governance, one of the agency's functions is to determine the general framework of the country's energy policies and to permit major development projects. Even more so, NDRC is also responsible for the planning and drafting of climate policies; its subsidiary apparatus, the Department of Climate Change, is responsible for 'front end' climate actions such as carbon emissions trading, controlling the greenhouse gases emitted by the heavy industry and project approval. Its power seems stronger than the newly emerging Ministry of Environment, which was only nominally upgraded in 2008. Most of the work involves the end-of-pipe solution such as environmental policy monitoring, inspection, supervision and verification.

[v] Anonymous interview at the Energy Bureau, Jiangsu Provincial Development and Reform Commission (JS/09/2013) and interview with Jingcheng Jin, Director of Power and New Energy Department, Zhejiang Provincial Development and Reform Commission (ZJ/02/2013)

[vi] Interview with Andy Chong (JS/11/2013).

[vii] Interview with Hongfei Huang (ZJ/12/2013).

[viii] Interview with Yangang Jia (JS/10/2013).

[ix] Anonymous interview in Jiangsu (JS/05/2103).

[x] Interview with Jinwei Zhu (JS/04/2013)

[xi] Interview with Jingcheng Jin (ZJ/02/2013).

[xii] Interview with Professor Pei-hong Wang, board member of China Energy Research Society (JS/02/2013).

[xiii] Anonymous interview (JS/15/2013)

[xiv] Anonymous interview (JS/15/2013).

[xv] This policy document has revised and re-introduced in 2015, and certain purposes for the development fund have been removed, such as encouraging the research and 'local content' equipment production.

[xvi] China's wind resources are mainly concentrated in the Northern regions and coastal areas; these areas accounted for 77 per cent of the above-mentioned land-based wind energy resources (Liu 2013). As Lewis (2011) observes, we have seldom seen wind resources on such a scale developed elsewhere in the world.

[xvii] Anonymous interview (JS/15/2013).

[xviii] Interview with Ruilin Xu (JS/03/2013).

[xix]According to the policy, the subsidy is a standard tariff on 17 Yuan/W for the building project. For the combined-mounted photovoltaic building-integration projects on the roof and walls, the subsidy standard tariff is 13 Yuan/W. Regarding PV tariffs, an anonymous policy maker at Jiangsu Energy Bureau indicated, 'Now at Jiangsu Province, the price of 1 kilowatt of electricity is

1 Yuan. The cost is actually 4.355 Yuan, and the rest is supported by the state's subsidies. State funds supports enterprises, this is why our renewable electricity price is lower than the prices in European countries.'(Anonymous 09/JS/2013).

[xx] Interview with Yangang Jia (JS/10/2013).

[xxi] Interview with Pei-hong Wang (JS/02/2013).

[xxii] For example, the development of nuclear power in China began early in the 1950s, and the industry was dominated by three state-owned enterprises: China Guangdong Nuclear Power Group Co., Ltd., China National Nuclear Corporation and China Power Investment Corporation. As with the renewables sector, the state was reluctant to open up the sector to foreign actors, and the principle of endogenous technology development was stressed as well as the attempt to facilitate technology transfer from American and French producers (OECD 2012: 116). However, unlike the renewables sector, there was no centralised government apparatus developing coherent policies for the sector (Xu 2010: 68) and no set of unified standards for nuclear safety and industrial technology and the local industry still remains relatively backward (Liu 2013: 106). In addition, within the field of climate technology, there is a recognition that the process of catch-up is facing difficulties. As the Ministry of Technology's Twelve Five Year Special Guidelines of Electric Vehicle Technology Development, published in 2012, put it:

> At present, China's electric vehicle development has entered a critical period. We are facing major development opportunities, and we are also facing serious challenges. There are still many problems to be solved in the development of electric vehicles; for example, our core technology is not competitive, corporation is reluctant to invest, and the potential of government coordinative and planning capacity has not been fully released (Ministry of Technology 2012).