Lo, A.L. (2014). China's Carbon Markets: Prospects and institutional barriers. In: Opportunities for the Critical Decade: Enhancing well-being within Planetary Boundaries. Presented at the Australia New Zealand Society for Ecological Economics 2013 Conference, The University of Canberra and Australia New Zealand Society for Ecological Economics, Canberra, Australia.

China's Carbon Markets: Prospects and institutional barriers

Alex Y. Lo[1*]

[1]Griffith School of Environment, Griffith University, Gold Coast campus, Queensland 4222, Australia

*Email: alex.lo@griffith.edu.au; Ph: +61+(07)+ 5552-7419

Abstract

The potential scale of China's emission trading schemes has raised prospects for a regional carbon trading network. However, the Chinese carbon markets rest upon a unique political-economic context and institutional environment that are likely to limit their development and viability. This article offers an overview of such structural economic and political constraints, and discusses the main challenges to the development of carbon markets in China. It is based on an extensive review of official policy documents, published research papers, and relevant news reports. The article is divided into two main sections. The first one elaborates on the national policy context in which China's carbon market and pilot ETSs are situated. The second explains the structural hurdles to the development of domestic carbon markets. Implications are discussed in the conclusions.

Keywords

carbon markets; emission trading; climate governance; political economy; developing country; China

Introduction

In the past decade carbon emission markets have ascended to the dominant form of institutions for climate change mitigation (Ellerman, Convery, & Perthuis, 2010; Grubb, 2012; Lo & Spash, 2012; Mol, 2012; Spash & Lo, 2012). Global carbon trades recorded an increasing market value of US$176 billion in 2011 (Kossoy & Guigon, 2012, p. 10). About US$23 billion originated from the trading of secondary carbon offsets under the Kyoto Protocol's market mechanisms, notably the Clean Development Mechanism (CDM). The entire CDM program is expected to reduce 2.2 billion tonnes of CO_2 from 2004, when the first CDM project was registered, to the end of the first Kyoto commitment period in 2012[1]. China hosts most of the

[1] 7,400 projects are registered under CDM, as of 14 December 2013. Source: UNFCCC CDM Official Website (http://cdm.unfccc.int/Statistics/Public/CDMinsights/index.html)

registered CDM projects and supplies most of CDM carbon credits. During 2005 and 2010, however, the country's annual CO_2 emissions rose from 5.4 billion tonnes to 8.0 billion tonnes (International Energy Agency, 2013: 52), more than offsetting the lifetime capacity of the CDM in emissions reduction. The CDM alone is clearly not sufficient.

Global carbon finance needs to be scaled up by an order of magnitude in the second commitment period. Some commentators see potential from outside the project-based CDM. Allowance-based market mechanisms may be able to engage emerging economies in ways similar to what is operating in Europe, i.e. the European Union's (EU) emission trading scheme (ETS) (Grubb, 2012; Perdan & Azapagic, 2011). The EU ETS is the world's largest carbon market, which is worth US$148 billion and has entered Phase III (2013-2020) of its implementation. Outside Europe, progress has also been made in the Anglo-American world, with ETSs emerging in New Zealand, Australia, California and ten northeastern states of the U.S., British Columbia and Quebec (Canada). Major Asian economies are taking up this trend, including Tokyo (Japan), South Korea, China, Kazakhstan, and India. Some commentators pin their hopes for large-scale emissions reductions on China, the world's largest emerging market (Fankhauser, 2011; Guan & Hubacek, 2010; Lo, 2010, 2013; Wang, 2013).

There are growing prospects for a regional carbon trading network as a way to further engage other major Asian economies since China declared a plan to introduce ETSs in the late 2011. Seven pilot ETSs have come to operation in the country since 2013 (Han, Olsson, Hallding, & Lunsford, 2012; Lo, 2012). The short-term goal is to establish trans-provincial and trans-regional ETSs in transition to a national ETS by 2015/16. The prospective national scheme may eventually become the world's second-largest after the EU ETS and mark a major step forward in creating a global carbon market at a potentially higher value than the oil market. This has brought some hope to advocates of a common carbon price across the globe.

However, China's carbon pricing policies are developed upon a different political-economic context. The majority of the existing mandatory ETSs operate in mature market economies safeguarded by a liberal democratic regime. In contrast, China is a developing market economy with socialist political legacies (Lo, 2008a, 2008b, 2010; Tsang & Kolk, 2010). Also it currently does not assume any binding commitment to absolute emissions reduction. These political realities have created considerable institutional barriers to the development of domestic carbon markets in China.

This article offers an overview of such structural economic and political constraints, and discusses the main challenges to the development of carbon markets in China. It is based on an extensive review of official policy documents, published research papers, and relevant news reports. The article is divided into two main sections. The first one elaborates on the national policy context in which China's carbon market and pilot ETSs are situated. The second explains the structural hurdles to the development of domestic carbon markets. Implications are discussed in the conclusions.

China's climate policy and recent development

Towards a market-based approach

China has risen to the world's second largest economy and the largest national source of greenhouse gases (GHGs), producing 25.4 per cent of the world's total CO_2 emissions, or 5.9 tonnes CO2 per capita in 2011 (International Energy Agency, 2013: 52 and 103). In the 2009 United Nations Summit on Climate Change, the then Chinese President Hu Jintao indicated that China will not accept mandatory national targets for emission reduction until major developed countries take the lead. Later in the Copenhagen conference, the Chinese delegate reportedly attempted to block the development of the Copenhagen Accord (Christoff, 2010). China was blamed for failing to assume tougher emission reduction targets and work with the international community in meaningful ways.

Nonetheless, China has made some progress back home (Jiang, Zhuang, Miao, & He, 2013; Zhang, 2007, 2011). China is the world's leader in renewable energy production (Schroeder, 2009), and carbon intensity declined over the last two decades. Prior to the Copenhagen negotiations, the country substantially scaled up its unilateral commitment: carbon intensity down by 40-45 per cent below 2005 levels by 2020. Official climate change policy programmes have been put in place since the second half of 2000s. In 2007, China launched the National Climate Change Program (National Development and Reform Commission, 2007). In 2008, the White Paper on China's Policies and Actions for Addressing Climate Change was released (State Council, 2008).

China's climate policy regime indicates two key features influencing the development of domestic carbon markets. Firstly, economic interests are deeply embedded into the climate policy framework – more so than in major developed countries. The 2007 and 2008 policy documents are essentially an energy blueprint and none of them makes reference to the Ministry of Environmental Protection (MEP), the national environmental agency, or its predecessor (Lo, 2010). Climate change policies are formulated and implemented by the National Development and Reform Commission

(NDRC), which is a macroeconomic planning and management agency under the State Council (commonly known as the 'central government'). The NDRC is a more powerful administrative body, with its own energy and environmental departments, than the MEP. It is worthwhile to note the NDRC is a co-chair of the National CDM Board of China, whereas the MEP is only a Board member. The dominant role of the NDRC indicates the strategic position of climate policy as being situated in the context of energy security and conservation (Lo, 2010; Tsang and Kolk, 2010). Climate change impacts are understood primarily in macro-economic terms (Sautter, 2009).

Second, China remains a planned economy in some aspects, despite the tendency of decentralisation in environmental policy-making (Mol, 2009). Climate change is treated by political elites and state administrators as a technical issue, for which technical fixes are concentrated on energy saving measures and introduced in a top-down fashion (Lo, 2010; Tsang and Kolk, 2010). Centrally planned policy guidelines are published in a periodic legislative document known as the 'Five-Year Plan for National Economic and Social Development' (FYP). FYPs prescribe national economic and social directions and coordinate policy priorities. FYPs are the most prominent strategic blueprint for the country. Climate change was not written into any FYP until the 11th FYP which covered the period of 2006-2010. Specifying mandatory targets is a key feature of FYPs and the 11th FYP addressed climate change by declaring commitment to an energy intensity target, i.e. 20 per cent reduction during by 2010. Throughout this period, GHG control in China was achieved largely through direct regulation. A range of administrative and political measures were deployed, including government-funded incentives to support installation of energy saving equipment, top-down imposition of energy saving targets on energy-intensive industries, and forced closure of inefficient power plants and factories. Market-based instruments played only a limited role.

Although China's institutional innovations have produced positive environmental outcomes, they have not contributed to absolute reductions in emissions and energy use (Mol, 2009). Success has been achieved only in relative terms. During 2000 and 2011, China's carbon intensity (CO_2 emissions per unit GDP) dropped by 19 per cent, but the level of CO_2 emissions more than doubled (140 per cent) (International Energy Agency, 2013: 97 and 52, respectively). The 11th FYP received a marginal success against the emission reduction target. China managed to lower energy intensity by 19.06 per cent by the end of 2010. This result, however, involved an extended use of the 'visible hand', i.e. political intervention, such as electricity rationing (Wu, 2011), and formal, coercive requirements on energy consumption (Gilley, 2012). As part of the last-ditch efforts to meet the target, a number of provinces were forced to shut down large swathes of industrial capacity, resulting in

the “black-outs” of some industries and certain cities towards the end of 2010 (Gilley, 2012; Han *et al*., 2012). The marginal success came with high costs.

This experience prompted the central government to seek a different strategy. Market-based policy instruments immediately received attention from senior government officials. Carbon taxes and cap-and-trade mechanisms are prime examples of these instruments being put under serious consideration by the central government.

Tax, or trading, or both?

Carbon trading entered an uncertain period in 2009, when the world economy stumbled and the Copenhagen conference failed to produce substantive agreements on post-2012 commitments (Perdan and Azapagic, 2011). When the world economy began to recover from the financial turmoil, China cast a vote of confidence for the carbon market, ahead of the neoliberal U.S. Towards the end of 2010, senior Chinese officials declared their ambition to establish a national ETS to curtail its growing GHG output. In October 2011, the National Development and Reform Commission (NDRC), China’s top economic planning agency, granted official approval to seven carbon trading pilot projects.

However, carbon taxes were actually the first candidate pulled out from the policy toolbox (Wu, 2011; Han *et al*., 2012; Yu and Elsworth, 2012). Carbon taxation was listed by the Ministry of Finance (MOF) as a promising carbon pricing approach as early as 2007, and several peak government agencies and research institutions were brought together to undertake preliminary research into its feasibility. It has been supported by a group of prominent government and academic economists as a practical option for China in the early stages of its transition to a low-carbon economy in advance of a national ETS (Fan *et al*., 2011: 40). A new proposal for a Chinese carbon tax was submitted to the MOF for official consideration in the early 2012, with a hope to roll out in the second half of the 12th FYP period covering the period of 2011-2015 (Lin & Yang, 2012). Note that the carbon tax project is principally coordinated by the MEP, the MOF and other finance agencies, whose influences in the country’s climate policy regime are modest.

Carbon taxes are a fiscal measure that harnesses market forces for controlling carbon pollution in ways opposite to carbon trading. Carbon taxes involve setting a fixed price of carbon emissions and allowing the quantity of emissions to fluctuate, whereas carbon trading involves fixing quantity of emissions and allowing the price of carbon emissions to fluctuate. Cap-and-trade mechanisms produce efficient outcomes by allowing the market to determine the right price. Therefore they are, in theory, incompatible with carbon taxes which preclude carbon prices from changing.

Fan *et al* (2011) and Lin and Yang (2012) believe that the two policy instruments can co-exist in a given period of time. While it is possible in theory for carbon taxes and carbon trading to co-exist in a policy mix (Sorrell & Sijm, 2003), their potential conflicts should not be under-estimated. Technical feasibility aside, carbon trading has proven to be a preferred option being given higher *political* priority than the idea of carbon tax, which has merely received scholarly appreciation and ministerial consideration.

The political preference for ETS is evident in the 12th FYP. Although the government promises an annual GDP growth of 7 per cent under the 12th FYP period, it assumes ever greater environmental commitments than under any previous FYP. Prominent targets include an energy intensity reduction of 16 per cent and carbon intensity reduction of 17 per cent by 2015 – the first time when a CO_2 emission control target is written into a FYP. Carbon trading has also found its way in the official agenda. Confirmation comes from a brief statement in the 12th FYP that the country will embark on the building of domestic carbon markets (State Council, 2011a: Chapter 21). This commitment is official and granted at the highest level. More details were provided later in the thematic FYP on GHG control released by the State Council (2011c) reiterating the commitment to domestic carbon trading. The political endorsement articulated in these FYPs is authoritative, giving impetus to a top-down approach by which the market construction project proceeds.

A formal notice of implementation outlining the Chinese ETS program was released in October 2011 by the NDRC (2011) . The brief document states that, adherent to the master plan of the Community Party and the State Council (i.e. the 12th FYPs), the NDRC will gradually create a domestic carbon trading market (National Development and Reform Commission, 2011). The announcements by the State Council and its economic arm NDRC have not only confirmed the political priority of establishing a compliance carbon market, but also painted a clearer picture by appointing seven pilot sites across the country, including two provinces (Guangdong and Hubei) and five cities (Beijing, Tianjin, Shanghai, Chongqing, and Shenzhen). The short-term goal is to establish trans-provincial and trans-regional ETS in transition to a national scheme by 2015/16. Individual pilot schemes have come to operation since 2013.

China's climate change policies are formulated within the scope of continuing economic development. Although considerable political efforts are being organised to put a price on carbon, the overriding desire for economic growth and the interventionist planning tradition have created practical obstacles to China's success on the carbon trading front. These challenges are explained in the next section.

Structural constraints on the development of domestic carbon market

'Cap and trade' mechanisms are driven by formal regulations and/or voluntary business commitments. In addition, they require a robust regulatory and legal framework and a liberal market economy to produce efficient outcomes. The Chinese carbon market falls short of the basic requirements and fails to play a functional role. The Chinese experience is characterised by incomplete regulatory infrastructure and excessive government intervention.

Incomplete regulatory infrastructure

Compliance carbon markets are regulation-driven. Under an ETS, firms are required to surrender emission permits for a given amount of emissions produced. Legislation is imperative to establishing the legal status of emission permits or allowances. Enforcement and punishment are required in the event of non-compliance or misconduct, where permits are not surrendered as stipulated, prescribed trading rules are violated, or data reporting is found to be misleading. Moreover, the number of permits a firm has to hold is assessed against available emissions data. An accurate and consistent system for measurement, monitoring, reporting and verification is essential to effective regulation of firms covered by an ETS.

China's regulatory infrastructure for carbon trading is far from complete. There are considerable challenges in setting up robust monitoring, reporting and verification mechanisms, which remain current in Europe and more so in China, where legal enforcement is constantly a problem confronting all levels of the society. Currently, there are no national regulations specifically for emission trading, and the on-going ETS programme proceeds as an administrative operation. While any assessment of regulatory performance in advance of the implementation of the pilot schemes is inevitably inconclusive, it is useful to review other relevant regulatory experiences as a reference point, such as the SO_2 ETS.

The notion of SO_2 emission trading has come to China since the 1990s. Although local governments had set up regulations for the SO_2 ETSs, the lack of transparency in actual regulatory practice remains a concern. Emission trading rules are not clearly articulated, and enterprises have little assurance that the trading arrangements could protect their rights because 'under-the-table' negotiations and corruptions dominate (Tao & Mah, 2009). Market transparency is also limited due to the absence of an effective information management and disclosure system (Tao and Mah, 2009). Furthermore, the punitive mechanisms are poorly constructed. Fines are too low to discourage non-compliance (Chang & Wang, 2010; Mol, 2009). Violation for the second time is tolerated: a firm would not be fined twice for the same polluting activity in the event of non-compliance, consequently creating little

motivation for buying or selling emission permits (Chang and Wang 2010). Locally there is strong political resistance to the enforcement of environmental laws, including those relating to emission caps that are thought to be detrimental to the economy (Liu & Xu, 2012; Zhang, 2007). Bureaucrats generally have low motivation to consistently enforce legal provisions.

Allocation of emission permits would be a source of faults if monitoring, reporting and verification mechanisms lack accuracy and consistency. This is the current situation in China, where official emissions data lack reliability (Zhang, 2011) and the current systems are predominantly based on self-reporting (Tao and Mah, 2009; Chang and Wang, 2010). Regulated firms prepare emissions reports by themselves subject to occasional inspections by environmental agencies. They are only required to report fuel inputs and emissions are not monitored on a regular basis, if ever. Manipulation of emission data is not uncommon under some allocation methods (Tao and Mah, 2009). Permit allocation remains arbitrary in the absence of reliable information on which it is based. China is not known for effective legal enforcement or disclosure of sensitive environmental information (Mol, He, & Zhang, 2011).

Excessive state intervention

The promise of economic efficiency relies upon the existence of a perfectly functioning market. A necessary condition for an ETS to work is that prices are allowed to fluctuate towards market equilibrium. The idealized setting is a free market economy in which prices are determined by market dynamic and not being controlled by a single party. This economic assumption has lost validity in actual market settings. The European experience suggests that market power does exist and the power industry, often dominated by a handful of large corporations, has the ability to engage in activities such as mark-up pricing, price discrimination and manipulation.

The current situation of the power market in China has violated that assumption in a different dimension. Key economic policies are formulated by central authorities and state intervention continues to affect every aspect of economic life. In this country power prices are actively regulated by a central authority. Despite recent electricity market reforms, electricity prices remain under the central government's control. The Department of Price, a subsidiary of the NDRC, is responsible for moderating the prices of key commodities, including electricity. Through its administrative arm the central government sets a specific price for almost every newly built generation plant since 1985 (Du, Mao, & Shi, 2009). There are large variations in the regulated prices between or even within plants. The regulation of wholesale electricity price proves to be ineffective (Du *et al*., 2009). Criteria for price control have been arbitrary.

Price control means that the carbon price under the ETS would reflect political judgement, rather than marginal cost of production. Regulated electricity companies would be prevented from passing the full cost to electricity users who are expected to adjust their power consumption in response to price signals, as the central government is highly concerned about the impacts of volatile prices on the economy, particularly the possibility of inflation under the carbon price (Wu, 2011). A World Bank report predicts that under a Chinese ETS which covers the power industry, the Department of Price would play a central role in managing the cost of carbon and its fluctuation (Kossoy and Guigon, 2012). The managed carbon price would effectively become a kind of carbon tax in co-existence with a cap-and-trade mechanism, in which both prices and emissions quantity are subject to some form of state control. Prospects for economic efficiency are, however, uncertain (Sorrell and Sijm, 2003).

The regulatory experience with the Chinese SO_2 ETS has demonstrated the limited scope for the market to operate free from arbitrary political manipulation. The SO_2 emission trade prices are largely modulated or instructed by the state depending on the discretion of individual government officials (Tao and Mah, 2009). Emission trading transactions have been subject to administrative intervention. In some cases the government dominates the entire transaction process, including negotiation on trading price, trading volume and terms of permit ownership (Tao and Mah, 2009). Market competition has only recently come to existence in China's regulated power sector in which political bargaining is prevalent. The legacy of planned economy has created distortions to the ETS.

Given the tremendous economic implications of GHG control, the central and local governments are tempted to execute the 'visible hand' by modulating prices as they do regularly to manage the economy. It is then uncertain as to how the power sector can be brought into the prospective ETS. Gilley (2012) has noted that a key element of China's climate policy discourse is the extensive use of authoritative power. This governance tradition comes into conflict with the theoretical requirements for an emission trading regime to operate efficiently.

Conclusions

China has made efforts on emission reduction in the context of continuing economic development. The conditional commitment is evidenced by the declared preference for intensity targets and compatible market-based mechanisms recently adopted. Carbon taxes could fit the domestic context, whereas domestic carbon trading in early stages lacked coordination and merely served to reap short-term benefits and improve public image without demonstrated environmental achievements. However, carbon trading has proved to be politically more attractive. High-level coordination is

underway and centrally approved ETSs are up and running. Political resistance has softened; local emissions caps are being introduced and national caps are imaginable in medium term. The real challenges are, however, how the regulation-driven carbon market system works effectively with the state machinery which is not primarily designed to support such system.

This article has identified two main challenges to the development of carbon markets in China, namely, incomplete regulatory infrastructure and excessive government intervention. These challenges tend to be institutional and arise from the unique political system of China, which operates as a 'social market economy'. The lack of a robust regulatory and legal framework and the excess of government intervention are more intractable governance issues. Modest changes in governing practice have occurred along the tendency for decentralization of environmental policy-making. However, some of the institutional barriers are rooted in the ways in which the larger system operates and maintains its legitimacy. For example, improving the regulatory and legal framework for GHG emission reporting will enhance transparency, but may open up some sensitive energy security issues that the ruling regime has traditionally been very cautious about (official data on provincial and municipal GHG emissions are currently not open to public). Also, the ability to exercise direct government intervention to the macro-economy (e.g. moderating utility prices) proves to be important for the non-elected, ruling regime to maintain economic and social stability in this country. Political efforts are required to address these deeply entrenched institutional barriers and re-define the role of the state. Although the ongoing ETS programme will introduce new institutional practices at various scales, the success of China's carbon market reform crucially depends on the ability of these new institutions to transform the distorted state-market relation.

Biography

Alex Lo is a faculty member of the Griffith School of Environment of Griffith University. He specializes in the study of political economy and ecological economics. His research focuses on climate change policy and politics, public perception of climate change, and public engagement in climate change mitigation and adaptation.

References

Chang, Y.-C., & Wang, N. (2010). Environmental regulations and emissions trading in China. *Energy Policy, 38*, 3356-3364.

Christoff, P. (2010). Cold climate in Copenhagen: China and the United States at COP15. *Environmental Politics, 19*(4), 637-656.

Du, L., Mao, J., & Shi, J. (2009). Assessing the impact of regulatory reforms on China's electricity generation industry. *Energy Policy, 37*(2), 712-720. doi: 10.1016/j.enpol.2008.09.083

Ellerman, A. D., Convery, F. J., & Perthuis, C. D. (2010). *Pricing carbon : the European Union Emissions Trading Scheme* Cambridge, UK: Cambridge University Press.

Fankhauser, S. (2011). Carbon Trading: A good idea is going through a bad patch. *The European Financial Review, April*, 32-35.

Grubb, M. (2012). Cap and trade finds new energy. *Nature, 491*(29 November), 666-667.

Guan, D., & Hubacek, K. (2010). China can offer domestic emission cap-and-trade in post 2012. *Environmental Science & Technology, 44*(14), 5327-5327. doi: 10.1021/es101116k

Han, G., Olsson, M., Hallding, K., & Lunsford, D. (2012). China's Carbon Emission Trading: An Overview of Current Development. Stockholm: FORSE and Stockholm Environment Institute.

International Energy Agency. (2013). CO2 Emissions from Fuel Combustion - 2013 Highlights. Paris: International Energy Agency.

Jiang, K., Zhuang, X., Miao, R., & He, C. (2013). China's role in attaining the global 2°C target. *Climate Policy, 13*(sup01), 55-69. doi: 10.1080/14693062.2012.746070

Kossoy, A., & Guigon, P. (2012). *State and Trends of the Carbon Market 2012*. Washington, DC. p. 94-100: The World Bank.

Lin, A., & Yang, F. (2012). China's carbon tax is very real. Retrieved from http://www.chinadialogue.net/article/show/single/en/4742-China-s-carbon-tax-is-very-real

Liu, S., & Xu, N. (2012). Data gaps hobble carbon trading.

Lo, A. Y. (2008a). Achieving environmental goals in a competitive electricity market? Post-colonial Hong Kong, public choice and the role of government. *Energy and Environment, 19*(7), 958-978.

Lo, A. Y. (2008b). Merging electricity and environment politics of Hong Kong: identifying the barriers from the ways that sustainability is defined. *Energy Policy, 36*(4), 1521-1537.

Lo, A. Y. (2010). Active conflict or passive coherence: The political economy of climate change in China. *Environmental Politics, 19*(6), 1012-1017.

Lo, A. Y. (2012). Carbon Emission Trading in China. *Nature Climate Change, 2*(11), 765-766.

Lo, A. Y. (2013). Carbon trading in a socialist market economy: Can China make a difference? *Ecological Economics, 87*(0), 72-74. doi: http://dx.doi.org/10.1016/j.ecolecon.2012.12.023

Lo, A. Y., & Spash, C. L. (2012). How Green is your scheme? Greenhouse gas control the Australian way. *Energy Policy 50*, 150-153.

Mol, A. P. J. (2009). Urban environmental governance innovations in China. *Current Opinion in Environmental Sustainability, 1*(1), 96-100. doi: 10.1016/j.cosust.2009.07.002

Mol, A. P. J. (2012). Carbon flows, financial markets and climate change mitigation. *Environmental Development, 1*(1), 10-24.

Mol, A. P. J., He, G., & Zhang, L. (2011). Information disclosure in environmental risk management: Developments in China. *Journal of Current Chinese Affairs, 40*(3), 163-192.

National Development and Reform Commission. (2007). China's National Climate Change Programme. Beijing: National Development and Reform Commission, the People's Republic of China.

National Development and Reform Commission. (2011). Notice on the commencement of carbon trading pilot projects. Beijing. Available at http://www.ndrc.gov.cn/zcfb/zcfbtz/2011tz/t20120113_456506.htm (in Chinese) Accessed 27 August 2013: National Development and Reform Commission, the People's Republic of China.

Perdan, S., & Azapagic, A. (2011). Carbon trading: Current schemes and future developments. *Energy Policy, 39*(10), 6040-6054. doi: 10.1016/j.enpol.2011.07.003

Sautter, J. A. (2009). Clean Development Mechanism in China: Assessing the Tension between Development and Curbing Anthropogenic Climate Change. *Virginia Environmental Law Journal, 27*(1), 91-118.

Schroeder, M. (2009). Utilizing the clean development mechanism for the deployment of renewable energies in China. *Applied Energy, 86*(2), 237-242.

Sorrell, S., & Sijm, J. (2003). Carbon Trading in the Policy Mix. *Oxford Review of Economic Policy, 19*(3), 420-437. doi: 10.1093/oxrep/19.3.420

Spash, C. L., & Lo, A. Y. (2012). Australia' s Carbon Tax: A Sheep in Wolf's Clothing? *The Economic and Labour Relations Review, 23*(1), 67-86.

State Council. (2008). China's Policies and Actions for Addressing Climate Change. Beijing: State Council, People's Republic of China.

State Council. (2011a). The Twelfth Five-Year Plan for National Economic and Social Development (in Chinese). Beijing: State Council, People's Republic of China.

State Council. (2011c). Working Plan for Greenhouse Gas Control under the 12th Five-Year Plan (No. 41) (in Chinese). Beijing: State Council, People's Republic of China.

Tao, J., & Mah, D. N.-y. (2009). Between market and state: Dilemmas of environmental governance in China's sulphur dioxide emission trading system. *Environment and Planning C: Government and Policy 27*(1), 175-188.

Tsang, S., & Kolk, A. (2010). The evolution of Chinese policies and governance structures on environment, energy and climate. *Environmental Policy and Governance, 20*(3), 180-196. doi: 10.1002/eet.540

Wang, Q. (2013). China has the capacity to lead in carbon trading. *Nature, 493 (17 January 2013)*, 273.

Zhang, Z. (2007). Why has China not embraced a global cap-and-trade regime? *Climate Policy, 7*, 166-170.

Zhang, Z. (2011). Assessing China’s carbon intensity pledge for 2020: stringency and credibility issues and their implications. *Environmental Economics and Policy Studies, 13*(3), 219-235.