

China's environmental policy: an introduction

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ABSTRACT. This special issue covers several important aspects of China's environmental policy, ranging from evaluation of government programs (biogas and the Sloping Land Conversion Program) that aim directly to enhance the rural environment, to the reform of natural resource sectors (collective and state forest reforms) that set foundations for the sustainable use of natural resources, and to the impacts of urban environmental policies (including urban transportation management and industrial pollution control policy). We provide an overview of the topic and a brief introduction to each of the contributed papers.

Economic reform and the ensuing growth over the past three and a half decades have raised China from a typical poor developing country to the world's second largest economy. While the income gain has been substantial, the environmental cost is astonishing. The fact that China is already the world's largest CO₂ emitter highlights the significance of environmental problems in China.

Significant efforts to curb environmental deterioration started in the 1990s. Since the early 1990s, China's forest policy has shifted focus from boosting timber supply to ecological protection. Two national-level ecological restoration programs, the Sloping Land Conversion Program (SLCP) which involved the conversion of 10,000 ha of steep cropland into forests, and the Natural Forest Protection Program (NFPP), which stopped or reduced the logging of natural forests that are also under the management of state enterprises and in the upper reaches of major rivers, were implemented in the late 1990s. At almost the same time, an environmental campaign to reduce industrial pollution began. In 1996 a central policy of closing small-sized mills in 15 polluting industries was introduced. In 2000 the policy of forceful closure of all mills that failed to meet emission standards was announced. In 2006, in view of unsuccessful environmental protection, the central government issued measurable goals for energy

saving and emission reduction. In 2007 compensation for farmers who participated in the SLCP was extended, to ensure the success of the program. In 2011 the NFPP was extended to a second phase with a doubled budget. In 2009 China made a concrete commitment at the COP 16 in Copenhagen on CO₂ emission control, and announced the plan to implement this commitment in the 'twelfth five year plan period (2011–2015)', regardless of the outcomes of COP negotiation. Government expenditure on environmental protection increased significantly, up from 1 per cent of annual GDP in 1999 to 1.4 per cent in 2011. A total budget of RMB 3.4 trillion has been allocated to environmental investment for the 12th five-year-plan period.

The outcomes of these efforts have been mixed. China is among the very few countries in the developing world to achieve a reversal of deforestation trends. Forest area and volume in rural areas, where collectively owned forests are dominant, have been expanding, largely due to continuing government investment (such as SLCP and other government-funded afforestation efforts) and institutional reform (such as forest tenure reform). In the state forest areas, NFPP ended severe deforestation. However, performance in pollution control is very intriguing. Statistics show that industrial pollution, both air and water, has decoupled from GDP growth. The recent pollution source census, however, revealed that non-point source pollution has been growing and has surpassed industrial (also point source) pollution. China's riversheds remain terribly polluted. A recent *New York Times* article (Wong, 2013) stated that, in 2010, 1.2 million premature deaths in China were caused by outdoor air pollution. Given the experience in 2013, it is expected that the damage could be several times higher. There is no doubt that China is still on a path which is not sustainable. A dramatic change in the growth pattern is needed, based on a report jointly completed by the World Bank and China State Council's Development Research Center (WB & DRC, 2013).

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Greening China's rural energy: new insights on the potential of small-holder biogas, by Luc Christiaensen and Rasmus Heltberg

Traditionally, Chinese farmers relied on agricultural residues and firewood for cooking and heating. As income grows, this energy structure is changing and commercial energy use has increased. On the production side, the rural economic structure has also undergone changes. Livestock production increased, as did contamination of soil and water from animal wastes.

The increasing use of fertilizers and pesticides contributed to improving crop productivity, but also to increased environmental stress in rural areas. Household health damage due to the burning of traditional fuels and raising of livestock became major concerns.

Recently the government launched a biogas program throughout rural China. The adoption of biogas equipment increased due to the subsidies. Expected results of the biogas program include: (1) improved management of manure in rural settings, so that contamination of the rural environment will be reduced; (2) replacement of traditional fuels, so that health effects of burning are reduced; and (3) substitution of commercial energy, such as electricity and coal, to reduce farmer's costs and potentially reduce CO₂ emissions.

[Christiaensen and Heltberg \(2014\)](#), based on data collected from 2,700 households in five provinces, assessed a new generation of smallholder biogas. Tangible environmental and economic benefits were found, including switching away from fuelwood and crop residues, less time spent on fuelwood collection and cooking, which benefits women, and saving on fertilizer expenses by using biogas residues. Overall, these initial findings are grounds for optimism about the potential for scaled-up smallholder biogas to deliver safe and clean rural energy in China and beyond, provided critical conditions are met.

Program sustainability and the determinants of farmers' self-predicted post-program land use decisions: evidence from the Sloping Land Conversion Program (SLCP) in China', by Xiaojun Yang and Jintao Xu

This paper evaluates the long-run sustainability of China's Sloping Land Conversion Program (SLCP) by investigating the determinants of farmers' self-predicted post-program land use decisions. Using data from a household survey conducted in 2005, [Yang and Xu \(2014\)](#) examined farmers' ordinal responses to a question about their probability of converting the enrolled lands back to cultivation after the program ends. First, the paper finds that targeting the program on steeper sloped and lower quality plots can significantly decrease the probability of reconversion. Second, there is a significant and robust household income structure effect on the reconversion probability. Third, participating households with the right to decide what to plant on enrolled land have a higher probability of maintaining the reforested land after the program ends. Finally, subsidy shortfall has a positive influence on the probability of reconversion.

These findings are consistent with a recent survey by the State Forestry Administration on actual reconversion of SLCP land.

Property rights, tenure security and forest investment incentives: evidence from China's Collective Forest Tenure Reform', by Yuanyuan Yi, Gunnar Köhlin and Jintao Xu

The second round of collective forest tenure in the last 10 years has stirred excitement and concerns. The concerns mainly evolve around potential

deforestation, land capture and associated social instability issues. Establishing a household-based forest management system, together with improved farmer land rights protection and longer contracts, are expected to provide incentives for farmers and the private sector to invest in forest growth and protection. Distrust in farmers' willingness and ability in these areas remains strong. Using data collected from more than 3,000 households across eight provinces, *Yi et al. (2014)* examined the impacts of the reform on forest management. Here forest management efforts are represented by the level of productive inputs farmers put on their forestland.

This paper includes a two-step analysis. The first step involves an assessment of how tenure reform in China's collective forest sector affects farmer households' perception of tenure security. Applying the first step estimates in the second step, the authors examine determinants of forest-related investment. The study adds to the limited research testing whether there is endogenous causality between investment and tenure security in forestland, and finds that investment was not undertaken to enhance tenure security. In addition, the data allow for differentiation between perceived tenure security and contracted use and transferability rights. Overall, stronger contracted rights were found to affect investment. China's forest tenure reform – where individual households can manage forestland, empowered by legal certification and stronger contract rights – has thus enhanced tenure security and encouraged forest investment.

Impacts of policy measures on the development of state-owned forests in northeast China: theoretical results and empirical evidence', by Xuemei Jiang, Peichen Gong, Göran Bostedt and Jintao Xu

Key state forest areas in Northeast China are the last remaining territories in China without formal systematic reform. Currently, state-owned forest enterprises (SOFEs) which manage state-owned forests in the region have been under both resource and socioeconomic stresses, but also under the aegis of the National Forest Protection Program which is aimed at alleviating pressure on forest resource harvests and reducing economic hardship in the forest communities. A rich set of locally initiated reform measures has been observed in the past two decades. *Jiang et al. (2014)* examined the effects of a number of policy measures on the behavioral choices of the SOFES, as well as impacts of local innovations. The results show that the extent to which SOFES supervising authorities emphasized the improvement of forest resources in their annual evaluation of the SOFES has had significant impacts on the harvest and investment decisions. The promotion of uses of non-timber resources, as well as reforms aiming to increase the efficiency of forest protection and management, reduced timber harvests and increased investment, which in turn led to improvements of forest resources. In contrast, innovations aimed at timber harvest and afforestation activities actually contributed to increasing timber harvest, with a negative effect on forest resources.

Travel mode choice and impact of fuel tax in Beijing', by Ping Qin, Xinye Zheng and Lanlan Wang

China's rapid urbanization has been accompanied by an exponential growth of vehicle fleet in cities, and ensuing externalities associated with unprecedented traffic jams and air pollution. This is evident in the recent ranking of Beijing as the most congested as well as the most polluted city in the world by the Millennium Cities Database. Similar pollution and congestion are spreading rapidly across all the major cities in China. Beijing's municipal government has adopted a battery of policies to reduce these problems, with very limited success. Greater utilization of economic instruments instead of administrative measures, which are still dominant in city transportation management, could potentially improve efficiency and effectiveness in the battle against increasing traffic jams and air pollution and CO₂ emissions. [Qin *et al.* \(2014\)](#) investigated the impact of increasing the fuel tax on travel mode choice based on a large sample of travel survey data. The estimation shows that, if the price of gasoline increased to a moderate level, 11.53 RMB/liter, the total car volume on the road would be reduced by 7 per cent, which corresponds to a reduction in CO₂ emissions of 786,002.4 tons, or about 8 per cent of vehicular emissions from private cars and company-owned cars in Beijing. The study demonstrates that economic policies will be useful tools if the goals of traffic and air pollution controls become more and more stringent, and all the major administrative measures are exhausted and fail.

China's provincial industrial pollution: the role of technical efficiency, pollution levy, and pollution quantity control', by Yanhong Jin and Liguo Lin

Industrial pollution control has been a key area of national environmental policy and, because of that, since the late 1990s industrial emissions have not grown as fast as GDP. Moderate decoupling of GDP growth and industrial emissions has been achieved. Nevertheless, it has been found that the social cost of a further reduction of emissions has become increasingly high. Recurring extreme pollution events remind people that environmental challenges are still large and daunting. It is time to investigate more effective policies so that further improvement can be made in the industrial sector. Therefore, getting a good sense of the relationship between economic growth and pollution control remains a very important topic for policy makers and the general public.

Using a panel of provincial economic and pollution data from 1992 to 2008, data envelopment analysis and econometric analyses, [Jin and Lin \(2014\)](#) estimated technical efficiency and examined the role of technical efficiency, pollution control instruments (pollution levy and pollution quantity control) and prices of production inputs on pollution intensity. They find that an increase in the wage and/or a decrease in capital cost are associated with an improvement in technical efficiency. The levy rates for air pollution improve technical efficiency but pollution quantity control targets have no statistically significant effect on technical efficiency. On the other

hand, technical efficiency, the effective levy rates, pollution quantity control targets and capital costs have a negative effect, but wage has a positive effect, on pollution intensity. The importance of production input prices in pollution intensity and technical efficiency suggests alternative channels for industrial pollution control as well as cautions for the unintended consequences on the environment if any policy changes are made relating to labor and capital costs.

In view of the daunting tasks of reducing water and air pollution, and raising the productivity of the rural green sector, the six papers published in this special issue are by no means comprehensive, nor do they provide a clear road map toward a green economy which the Chinese society has fully embraced. They do serve as a foundation for further exploration. What we can be sure of is that these papers point to similar directions. By evaluating government-funded green projects, it seems that voluntarism is the key for project success. Voluntarism is associated with using a market-based approach for project take-up. In the future, to enhance program performance, bidding as an implementation scheme should be formally introduced. Forest tenure reform has created incentives for farmers to invest in forest management. Hopefully this successful rural reform sets the foundation for the more difficult state forest reform. Urban governments all over China are faced with growing traffic jams and the related air pollution; finding suitable economic instruments to control vehicle fleet is urgent, as indicated by [Qin *et al.* \(2014\)](#). Industrial pollution control, after two decades of trials, has finally reached the point where a formal environmental tax has been introduced. Its effectiveness is indicated by the analyses of the pollution levy. A formal pollution tax (as well as carbon tax) will provide the local economy with a double dividend, so that local governments have incentives to strengthen monitoring and implementation.

Adoption of economic policy tools is key in order for China to transform its economy from high-carbon, high-pollution emissions and low productivity toward a growth path which is greener and more sustainable.

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