Energy Research & Social Science 4 (2014) 135–138

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Short communication

The political economy of China's energy and climate paradox

Nathaniel Green*, Matthew Kryman

Institute for Energy and the Environment, Vermont Law School, United States

ARTICLE INFO

Article history:
Received 11 September 2014
Accepted 11 September 2014
Available online 19 November 2014

Keywords:
China
Energy
Environment
Sustainability

ABSTRACT

This communication argues for the existence of a fundamental paradox related to Chinese energy and climate policy, made all the more discernible by trends in the electricity sector, urban development, and transportation. It first makes the case for the "browning" of China, identifying trends in electricity, pollution, and transportation that highlight the unsustainable nature of their present predicament. The second section, however, points to countervailing trends suggesting that China is also "greening," becoming cleaner and less carbon intensive. The article concludes by noting that Chinese governance is excessively fragmented and that environmental sustainability may be incompatible with the accepted model of economic growth.

1. Introduction

This communication argues for the existence of a fundamental paradox related to Chinese energy and climate policy, made all the more discernible by trends in the electricity sector, urban development, and transportation. It first makes the case for the "browning" of China, identifying trends in electricity, pollution, and transportation that highlight the unsustainable nature of their present predicament. The second section, however, points to countervailing trends suggesting that China is also "greening," becoming cleaner and less carbon intensive. The article concludes by noting that Chinese governance is excessively fragmented and that environmental sustainability may be incompatible with the accepted model of economic growth.

Our central argument is that these trends, however, have their own set of political economy, and as such will deeply influence the pace and trajectory of policy reforms that the country chooses, or refuses, to take. The communication thus touches on a number of key themes for the journal and the field at large, including socio-political economy [1–3], energy governance [4–8], energy transitions [9–11], and externalities [12,13].

2. Toward a brown China

The case can certainly be made that China is becoming dirtier—browner—each year. China's rapid growth is staggering. It is currently the world's most populous country, the biggest emitter of greenhouse gases (GHGs), the fourth largest producer of oil, the sixth largest producer of natural gas, and the largest miner and consumer of coal [14]. Over the past ten years, 70 million new jobs were created and, since 1984, more than 600 million Chinese citizens—nearly 10 percent of the global population—have been lifted out of poverty [15]. The country now leads the world in markets for automobiles, steel, cement, glass, housing, power plants, renewable energy, highways, rail systems, and airports [15]. Analysts expect the Chinese GDP to grow from $6 trillion in 2010 to $9 trillion by 2015 [16]. If this rapid growth continues, China will overtake the United States as the world's largest economy sometime in the 2020s [15].

Rapid economic growth has led to a corresponding increase in energy use. Between 1990 and 2008, energy use in China grew 146 percent. Yet Chinese per capita energy consumption, and greenhouse gas emissions, is far below that of consumers in the European Union and United States [17]. Due to a combination of economic inefficiency and its large population, China is nonetheless the world's largest energy consumer, with room for significant growth. The International Energy Agency projects that China will consume 70 percent more energy than the United States by 2035, and it will account for 30 percent of global growth in energy demand between 2009 and 2035.

In order to meet these increasing energy demands, the Chinese government has been building new, dirty power plants at a frantic pace. In the electricity sector more than three-quarters of all coal-fired power plants world-wide were built in China in 2010, enabling coal to contribute to about 80 percent of Chinese electricity generation. The Chinese coal sector employs 7.8 million people and

* Corresponding author. Tel.: +1 5109185394.
E-mail address: greennat@gmail.com (N. Green).

http://dx.doi.org/10.1016/j.erss.2014.09.002
2214-6296/

produces about 40 percent of the world's coal [18]. The resultant increase in greenhouse gas emissions from the coal plants added to the Chinese grid in the last five years has already offset all of the gains made by the Kyoto protocol and collective voluntary efforts around the world over the same period [19].

In the domain of cities, in 2008 only one percent of China's 560 million city dwellers breathed air considered safe by the European Union [20]. Continuing this trend, for the first half of 2013 the Chinese government reported that ambient airborne particulate concentrations in 74 of China's largest cities are three times the level considered safe under World Health Organization (WHO) guidelines [21]. The World Bank similarly estimated that the economic burden of premature mortality associated with air pollution amounted to at least $63 to $272 billion in damages or as much as 3.3 percent to 7.0 percent of national GDP [22]. Consequently, the World Health Organization estimates that 275,600 people die annually because of outdoor air pollution in China [23]. About 30 percent of river water is so polluted it is considered unfit for agricultural, industrial, and electrical purposes [24]. Two-thirds of China's 660 largest cities suffer from water shortages with 110 facing "severe" shortages, and water pollution throughout the country sickens at least 190 million people and causes 60,000 premature deaths every year [25].

In the transport sector, China is the leading country for the production and sales of gasoline-powered automobiles in the world, encouraged by government subsidies and support to the industry to create jobs. However, fewer than 5 percent of the Chinese actually own an automobile, meaning hundreds of millions of potential customers exist. Due to the sheer number of households lacking a private vehicle, almost 400 million motorized vehicles could be on Chinese roads by 2035 [26], an amount greater than the number of cars in the United States in 2012.

3. Toward a green China

Perhaps oddly, however, there is also considerable evidence that China is becoming "greener." China began to address climate change at a policy level beginning in 1988, when the central government first gave the National Development and Reform Commission (NDRC) responsibility for coordinating official positions in then-upcoming international climate talks [27]. More recently, the Chinese government has begun to look specifically to renewable energy sources as a means of mitigating pollution and greenhouse gas emissions. The Twelfth Five Year Plan (FYP), adopted by the Chinese government in March 2011, has brought environmental and climate-oriented concerns to the forefront of national policy. Its targets include:

- Decreasing energy intensity (energy consumed per unit GDP) by 16% by 2015.
- Decreasing carbon intensity (carbon emissions per unit GDP) by 17% by 2015.
- Increasing share of non-fossil energy in total energy mix from current 8.3% to 11.4% by 2015.
- Increasing R&D expenditures on cleaner forms of energy supply from 1.8% GDP to 2.2% GDP.
- Reducing nitrogen oxide and ammonia nitrogen pollution, linked to industrial heavy metal pollution, by 10% by 2015 [28,29].

The requirements listed above are binding targets, and therefore provincial and local officials, and the heads of state-owned enterprises, at least in principle will be evaluated, and penalized or promoted, in part based on whether or not they meet said targets, though enforcement in the past has been sporadic [29].

Such targets do seem to be catalyzing the growth and acceptance of low-carbon technologies. In 2012, China led the world in the largest amount of renewable energy capacity installed that year, and it ranked first in six different categories of renewable energy. It was home to approximately one-fifth of the world's renewable power capacity, with an estimated 229,000 MW of hydropower capacity in addition to about 90,000 MW of other renewables (mostly wind) [30]. Renewables, including hydro, met 27.5 percent of the country's electricity supply, a share almost twice that of the United States. In China, for the first time ever, wind power generation increased more than generation from coal and surpassed and exceeded the output of nuclear power plants [30]. Behind the U.S. and Brazil, China is also currently the third largest producer of biofuels in the world [30].

New renewable energy production has been driven by several major developments in China's legal and policy apparatus. As of 2010, roughly half of the Certified Emissions Reductions (CERs) in circulation were produced by projects in China, with roughly one third of China's CERs being produced by wind projects [31]. As the future of CDM-derived funding in China has become uncertain, state planners have begun to look to other options for stimulating the growth of renewable energy. In particular, on February 27, 2012, China's NDRC announced a plan to develop a national quota regime intended to encourage renewable energy development [32]. This system will define a required mix of renewable and conventional electricity sources to be applied on a region-by-region basis [33].

More recently, the central government has established ambitious goals for the development of distributed solar PV generation. In early 2014, established a new policy for adding 14 GW of new solar capacity over the course of the year. Of this new capacity, some 60 percent is to come from distributed generation rather than from utility-scale projects [34]. Incentives for the development of distributed generation rely primarily on feed-in tariffs, similar to previous models developed for utility—scale solar and wind power. So far, the policy faces difficulties in implementation due to low-set feed-in tariffs and uncertain grid interconnection. Still, the central government's continued commitment to distributed solar should mean that we can expect continued, if sometimes shaky, growth in this sector.

Taken collectively, these policies could meaningfully alter the trajectory of China's energy sector. Bloomberg New Energy Finance predicted in 2013 that China will add an additional 1583 Gigawatts (GW) of new electricity capacity to its grid by 2030, and that renewable power will represent more than half of these new additions, meaning that renewable energy reaches "the same capacity level" as coal in 2030 [35]. That report forecast that "coal-fired power generation will decrease from 67 percent in 2012 to 44 percent in 2030, or 25 GW annually, while renewable generation will increase from 27 percent in 2012 to 44 percent in 2030, at 47 GW per year."

In addition, some cities have introduced experimental carbon trade programs. Opened in June 2013, the Shenzhen Carbon Exchange will cover 635 industrial and construction companies, and may add transport firms and other major consumers of electricity and fossil fuel in the future [36]. Six other regions will host corresponding pilot schemes, with a goal of full implementation by 2015. This new scheme accompanies a specific goal: a 40–45% reduction in carbon emissions from 2005 levels by 2020.

In terms of cities, the State Council openly advocated the "energetic establishment" of "eco-provinces" and "eco-cities" in 2000 and legislated the Cleaner Production Promotion Law and the Environmental Impact Assessment Law in 2002 to make existing cities safer and cleaner [37]. The State Council also enacted the Energy Conservation Law in 2008 to hold officials accountable for implementing environmental standards [38]. As a result, a slew of