Journal of Cleaner Production 145 (2017) 199–208

Contents lists available at ScienceDirect

Journal of Cleaner Production

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

Policy and regulatory responses to coalmine closure and coal resources consolidation for sustainability in Shanxi, China

Xia Cao

Faculty of Law, Shanxi University of Finance and Economics, 696 Wucheng Road, Taiyuan, 030006, Shanxi, PR China

ARTICLE INFO

Article history:
Received 5 August 2015
Received in revised form
7 January 2017
Accepted 9 January 2017
Available online 11 January 2017

Keywords:
Sustainable development
Coalmine closure
Resources consolidation
Policies and regulations
Shanxi
China

ABSTRACT

The late 1990s and early 2010s witnessed China's efforts to reform its coal industry towards sustainability. A series of rigorous initiatives were launched to consolidate its coal resources and upgrade its mining sector. The "mine closure and production reduction campaign" (MCPRC) and "coal resources consolidation campaign" (CRCC) were among the notable. This paper conducts a general review of the policies and regulations relating to these initiatives with Shanxi, one of the key coal-producing provinces and one of the pilot areas for reform, as a case study. The paper argues that the "one-size-fits-all" approach may have brought short-lived political and economic benefits. However, in the long run, a rationally-designed, stable, socio-economically and environmentally co-ordinated regulatory framework for both large and small coal mines is needed for the sustainable development of China's coal sector. This finding would be helpful for the potential similar reform initiatives for the coal sector and for the wider energy sector across the country.

1. Introduction

The concept of sustainable development depicts for human beings a growth pattern integrating economic activity with environmental integrity and social concerns. In mining, this concept contemplates a more holistic approach that contains a symbiotic relationship between mining, community and the natural environment in the planning, operation and closure of a mine (Williams, 2005). To achieve sustainability, the global coal industry has almost entirely undergone a shift from predatory and excessive development with a poor record on safety and resource efficiency toward a moderately sustainable mode with safer, more environmental-friendly and more efficient requirements.

The last decade or so has seen China making continuous efforts to strengthen the environmental and social sustainability of its coal industry. A cornerstone of the central government's sustainability strategy relates to reorganizing the mining industry into large and economically-efficient enterprises (Creedy et al., 2006; World Bank, 2008). Two most influential initiatives are "mine closure and production reduction campaign" (MCPRC) between 1998 and 2002, and the "coal resources consolidation campaign" (CRCC) between 2006 and 2010. Both initiatives involved the wide-spread and vigorous closure of small-scale coal mines (SCMs), mostly township and village coal mines (TVCMs), which boomed after the launch of China's open-door policy starting in the early 1980s. Large numbers of TVCMs were controlled by local governments at township and village level and a very small proportion, usually smaller mines, were privately owned. As China usually measures the size of a mine by tonnage or volume of ores or minerals extracted by the mine, a coal mine producing less than 300,000 t/y is generally considered as an SCM. These TVCMs long suffered from similar problems as conventional SCMs around the world: namely, illegal operations, irrational locations, low recovery rates, poor safety records and serious environmental damage (ILO, 1999, Hilson, 2002; Gunson and Yue, 2002; Andrews-Speed et al., 2003, 2005; Shen and Gunson, 2006; Shen et al., 2009; Shi, 2009, 2013).

To obviate the poor records of SCMs, TVCMs in particular, a spate of policies and regulations were articulated to facilitate the reorganization of China's coal sector. Shanxi Province, one of China's key coal producers with the overwhelming majority of TVCMs across the country, was chosen to take center stage in the implementation of the MCPRC and CRCC initiatives. These campaigns to reform the coal sector came to an end by the middle of 2011. However, a new round of reform, known as the "Energy Revolution", was launched in June 2014. This targeted the energy sector as a whole, covering consumption, supply, technology and institutional arrangements with the aim of reducing total coal

E-mail address: caoxia_502@163.com.

http://dx.doi.org/10.1016/j.jclepro.2017.01.050
0959-6526/

consumption and promoting the cleaner use of coal in response to the global drive to combat climate change and the domestic, highly-touted ambition of constructing an ecological civilization and a green economy. The purpose of this paper is to draw some experience and lessons from the reform precedents in the coal sector through reviewing the MCPRC and CRCC initiatives targeted at China's coal sector between the late 1990s and the early 2010s. This analysis will help to improve the effectiveness of similar future initiatives in China in the coal sector and across the whole energy sector.

The paper first presents the coal reserves at national level and in Shanxi Province as well as challenges facing sustainability of the coal sector (Section 2). Then the paper reviews policies and regulations put in place to address these challenges (Section 3). Finally, the paper discusses selected issues that arose during the implementation of the both initiatives (Section 4), with conclusions and implications for policy and regulatory improvements (Section 5). The analysis of this paper is mainly based on the policies and regulations implemented nationally and locally between 1996 and 2010, in addition to the official literature, academic papers on the subject and information gathered from field investigations.

2. Abundant in coal reserves but with poor records of sustainability

2.1. Review of coal reserves in China and Shanxi Province

China has the world's third largest coal reserves after the US and Russia, and is the biggest coal producer and consumer in the world. According to the BP Statistical Review of World Energy, the consumption of coal declined marginally in both 2014 and 2015, but coal still remains the dominant fuel, accounting for 66% of China's energy consumption (BP Statistical Review of World Energy, 2016). Given the huge size of population and continuing economic growth, China's coal demand could rise to over 4.0 bt by 2020 (World Bank, 2008: 5). This will continue to pose increasing challenges to achieve sustainable mining, particularly in the context of global efforts to cope with climate change and China's pursuit for its ecological civilization construction and a green economy. This scenario is vividly depicted as a "quadruple-mixed" difficult period in the newly issued China Energy Development Report 2016 –with gradually slowing demand for coal, an urgent need to curb overproduction, intensified requirements for environmental protection, and the continuing need for structural adjustment of the coal sector (China Energy Research Society, 2016).

Shanxi Province is a good case in such a dilemma. It is located in North China and is very well-known as being the "home of coal".

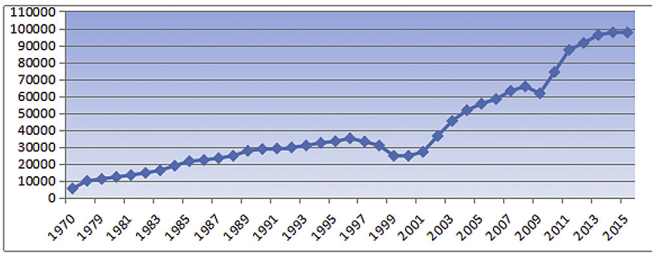

Fig. 1. Coal output in Shanxi Province between 1970 and 2015 (10^4 t). The Figure indicates coal output in Shanxi between 1970 and 2015. Generally the curve shows a steady rising trend except two downturn turning points: one between 1999 and 2001, the other between 2009 and 2011. The 1st turning point is partly attributed to MCPRC, and the 2nd turning point is partly attributed to CRCC.
Source: Created by the author using parts of data from: Sun and Zhang (1992: 1) and Lu (2010: 21–22).

Out of 160,000 km^2 of the total territory of Shanxi, 62,000 km^2 possesses coal reserves, making up 40.4% of the total area. Among all 119 counties (including towns and districts), 94 counties abound in coal resources. According to the latest national survey, in 2013 Shanxi possessed 266.4 bt of proven, remaining coal reserves, ranking now the 2nd place after Inner Mongolia, accounting for 22.6% of the national total (China Statistical Yearbook, 2014). The coal sector is a mainstay industry across the Province and has long played a pivotal role in both national and local economic development. Its annual production has generally grown steadily (Fig. 1) (Sun and Zhang, 1992; Lu, 2010), but with two downward trends, between 1999 and 2001, and between 2009 and 2011. These periods of output decline were related to a combination of national policy campaigns to close mines and temporary reductions in global coal demand. In 2009, the coal production in Shanxi fell behind that of Inner Mongolia for the first time in history, but this was just temporary.[1] Its status as China's leading coal-producing region is likely to remain for some time given its abundant coal reserves and its long-standing contribution of around 25% of the national total coal production and over 70% of the national exported coal to other parts of the country (Wang, 2010: 1). Within Shanxi, the coal industry provides more than 45% of the provincial tax revenue, over 85% of the total aggregate industrial output value (together with the coke, metallurgy and power sectors), and employment for over 1.04 million local people (Wang et al., 2008: 35). In these ways it makes a substantial contribution to the local economy.

2.2. Poor records of sustainability

Its heavy reliance upon coal has resulted in China having a poor record on sustainability. Taking Shanxi for example, coal is generally viewed as much a boon as a bane, for the Province's coal-driven economy has long developed at the cost of wasted mineral resources, environmental damage, human lives and a lack of capacity for sustainable development. There are four major issues in this respect.

2.2.1. Irrational development layout and low industrial concentration level

The early 1980s saw the unusual growth of TVCMs fueled by the Government's radical mining policy, popularly depicted as "Where there is water, let the water flow." This overtly encouraged all sizes of mines to provide much-needed energy for the country (Gunson and Yue, 2002; Andrews-Speed et al., 2003, 2005; Shen and Gunson, 2006; Shen et al., 2009; Shi, 2009, 2013). As a result, the total number of coal mines in Shanxi reached 10,971 by 1997, of which TVCMs accounted for more than 60% and these mines contributed some 70% of the output (Wang et al., 2008: 23). Although over 7000 TVCMs had been closed during the MCPRC period (1998–2002), Shanxi still had 2820 coal mines at the end of 2007. Of these, 1926 mines were SCMs with a production capacity below 300,000 t/y, accounting for 68% of the total number of coal mines across the Province. At that time, large coal companies or groups were producing a mere 51.3% of the provincial total output. By comparison, in the 1990s four large coal companies supplied 70% of the American national total output, and a single big company in Germany produced 0.2 bt/y (Wang et al., 2008: 38).

[1] Both Shanxi and Inner Mongolia are among the biggest coal-producing regions in the country with the former having been the No. 1 producer before 2009. But a turning point appeared in 2015 when Shanxi produced 975 mt of coal, regaining its No. One placement after 5 years' following Inner Mongolia that produced 910 mt of coal during the same year (China Statistical Yearbook, 2010–2014).