



Peak Coal and China

Posted by [JoulesBurn](#) on July 4, 2011 - 10:56am

This is a guest post by Dr. Minqi Li. Dr. Li was a political prisoner in China from 1990 to 1992. He received a PhD in economics from University of Massachusetts Amherst in 2002, and he has been teaching economics at University of Utah since 2006. He has published many articles on peak oil, climate change, and global economic crisis in journals such as Monthly Review, Science & Society, Review, Journal of World Systems Research, Development & Change, and Journal of Contemporary Asia. His book, The Rise of China and the Demise of the Capitalist World Economy, was published by the Pluto Press and the Monthly Review Press in 2009.

This post is excerpted from a longer paper which can be read in its entirety [here](#).

World coal production is dominated by China. China's coal production is projected to peak in 2027 with a peak production level of 5.1 billion tons. World (excluding China)'s coal production is projected to peak in 2027 with a peak production level of 4.1 billion tons.

Coal is mainly used for “base load” electricity generation (to meet the part of the electricity demand that requires constant flows) and is an essential input in the iron and steel industry. In 2008, coal accounted for 22 percent of the world's energy consumption in the industrial sector (including non-energy uses) and 4 percent of the energy consumption in the residential and commercial sector. Coal accounted for 41 percent of the world's electricity generation (IEA 2010).

In 2010, world coal production was 7,273 million tons. Figure 11 shows the annual coal production of the world's largest five producers. The world coal production and consumption is dominated by China. In 2010, China accounted for 45 percent of the world coal production (by volume) and 48 percent of the world coal consumption (by energy content).

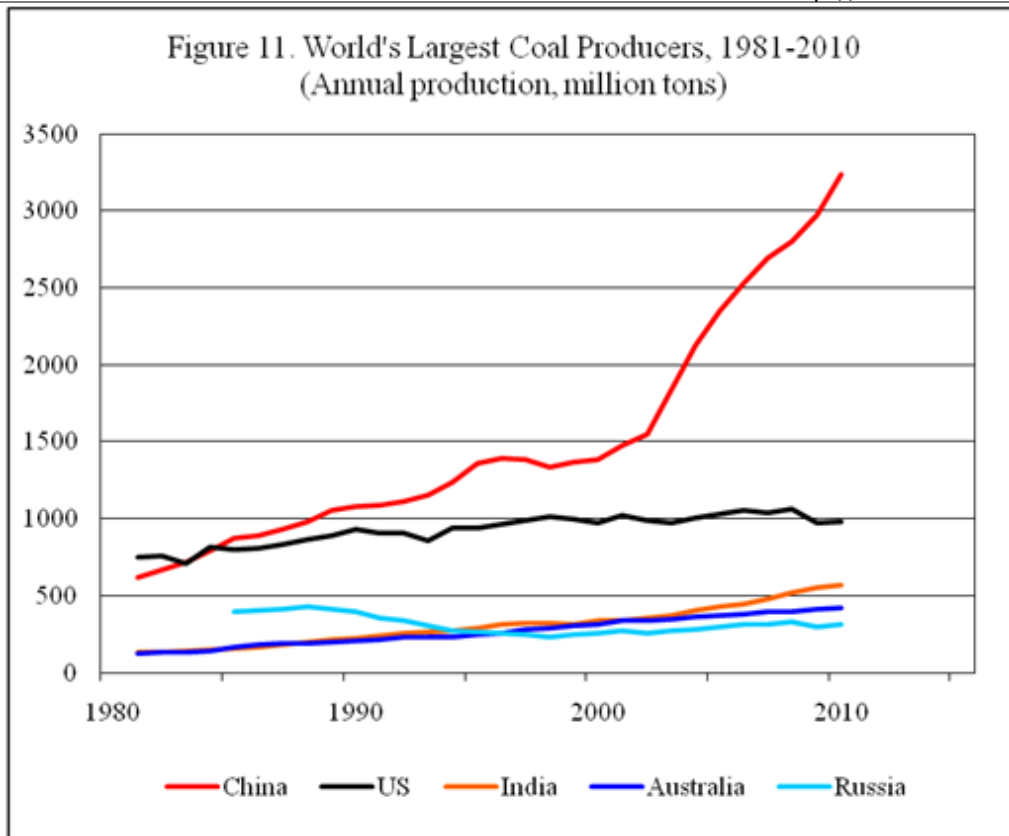


Figure 11

The BP *Statistical Review of World Energy* reports China's coal reserves to be 114.5 billion tons. This is the number that is widely cited by media and used by virtually all international energy institutions as China's "proved" coal reserves. In fact, the BP number has not been updated since 1992. Given the observed rapid growth of China's coal production, the reserves number reported by BP is likely to have substantially underestimated China's remaining recoverable coal resources. Some earlier studies that relied upon the BP number suggested that China's coal production could peak before 2020 and the peak production level would be less than 3 billion tons (see Heinberg 2009: 55-73). In fact, China produced 3.2 billion tons of coal in 2010.

Tao and Li (2007) used China's official coal reserves at the end of 2002 published by China's Ministry of Land and Natural Resources and estimated that China's coal production could peak between 2025 and 2032, and the peak production level was likely to be between 3.3 and 4.5 billion tons. However, the Chinese government does not regularly publish the official coal reserves. According to various news releases, at the end of 2001, 2002, and 2003, China's official coal reserves were 189.1, 188.6, and 189.3 billion tons respectively.

Since 2001, *The Statistical Yearbook of China* (published by China's National Bureau of Statistics) has published regularly China's coal "reserve base." While "reserves" refer to the economically recoverable coal that can be actually produced after mining losses have been subtracted, "reserve base" refers to the economically recoverable coal before the subtraction of mining losses. For 2001, 2002, and 2003, China's reserve base was reported to be 334.1, 331.8, and 334.2 billion tons respectively. A comparison of the two sets of numbers suggests that the implied recovery factor (the ratio between reserves and the reserve base) is about 57 percent.

In this study, a 60 percent recovery factor is applied to China's coal reserve base from 2001 to 2009 to derive a "standardized" estimate of China's remaining recoverable coal resources. The remaining recoverable coal resources in 2010 are assumed to be the same as in 2009 (the official

The sum of the estimated remaining recoverable coal resources and the cumulative coal production is defined as the “observed ultimately recoverable coal resources.” Figure 12 shows the historical growth rates of China’s observed ultimately recoverable coal resources.



Regression for the period 1991-2010 leads to a downward linear trend suggesting China's ultimately recoverable coal resources to be 257 billion tons. Figure 13 compares the historical evolution of the observed ultimately recoverable resources and the projected trend.

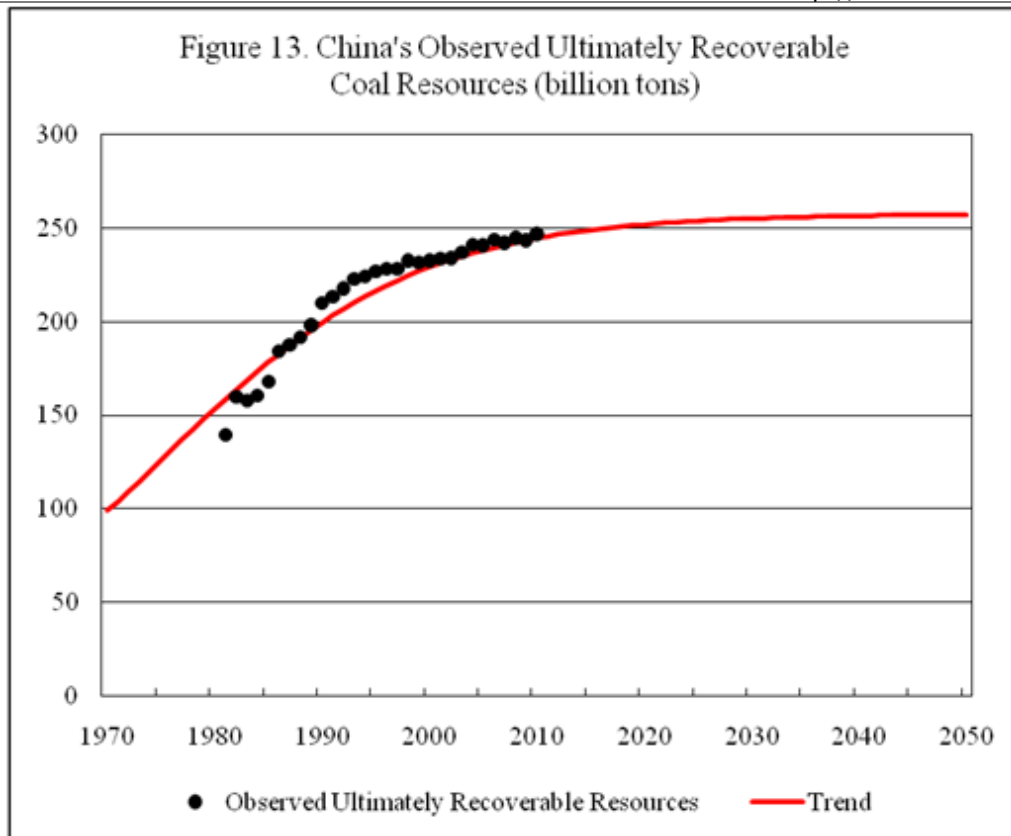


Figure 13

This report assumes that China's ultimately recoverable coal resources will be 260 billion tons. Given this assumption, China's future coal production can be projected by fitting a logistic curve to historical production levels. Figure 14 compares China's historical coal production and the projected production. China's coal production is projected to peak in 2027 with a production level of 5.1 billion tons.

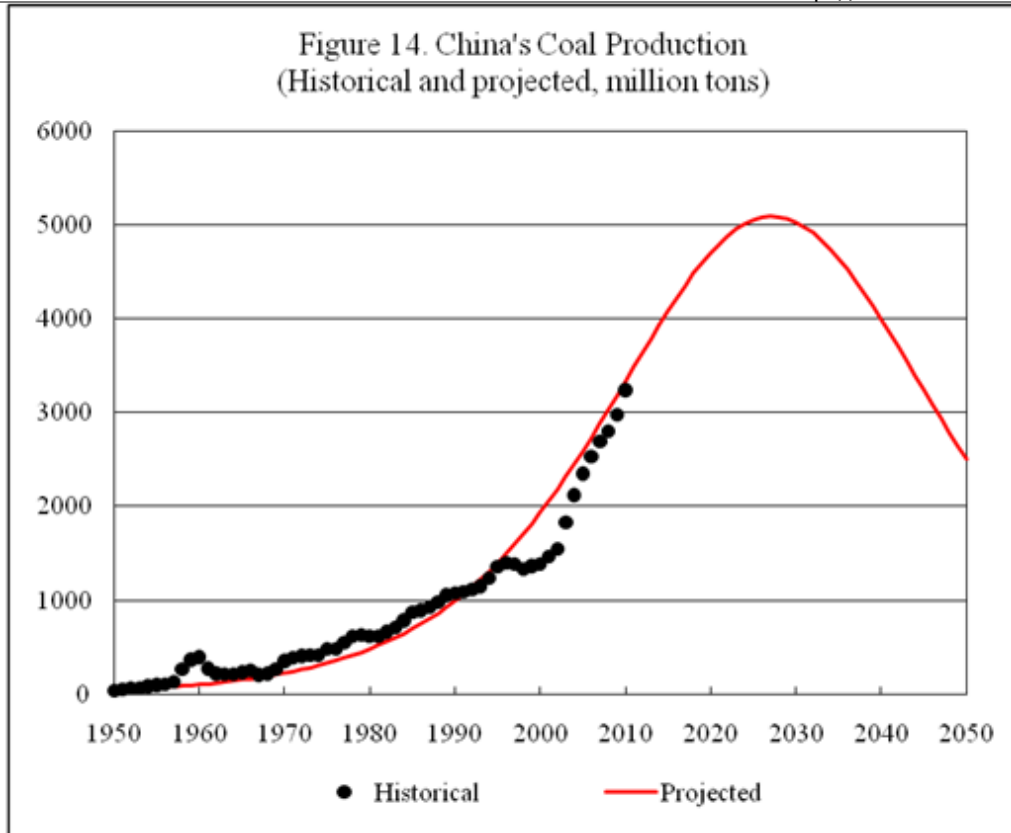


Figure 14

In 2010, China overtook the United States to become the world's largest energy consumer. China now accounts for about 20 percent of the world's energy consumption and about 25 percent of the world's total carbon dioxide emissions. China's future development will have a major impact on the global economic, social, political, and ecological trajectories in the 21st century.

China depends on coal for 70 percent of the energy supply. If China's coal production slows down dramatically and eventually declines in the coming years, China's economic growth (and by implication global economic growth) will be severely constrained.

From 2000 to 2010, the Chinese economy expanded at an average annual rate of 10.4 percent and China's coal production grew at an average annual rate of 8.9 percent. The economic growth rate was higher than the coal production growth rate only by 1.5 percentage points. However, after 2005, China's energy efficiency improved rapidly. From 2005 to 2010, the economic growth rate accelerated to 11.1 percent and the coal production growth rate slowed down to 6.6 percent. The economic growth rate was higher than the coal production growth rate by 4.5 percentage points.

Taking the experience of 2005-2010 as a guide, this report generously assumes that China's future economic growth rates will be coal production growth rates plus five percentage points. According to this report's projection, China's average annual growth rate of coal production will slow down to 3.8 percent for 2010-2020, 0.7 percent for 2020-2030, -2.3 percent for 2030-2040, and -4.6 percent for 2040-2050. Simple calculation suggests that China's average annual economic growth rate could slow down to about 9 percent for 2010-2020, 6 percent for 2020-2030, 3 percent for 2030-2040, and 0 percent for 2040-2050. In other words, the Chinese economy will decelerate sharply after China's coal production peaks and approach complete stagnation by the 2040s.

According to the BP Statistical Review of World Energy, at the end of 2010, world (excluding

China) had 746.4 billion tons of coal reserves. However, out of the total coal reserves, 403.9 billion tons were sub-bituminous and lignite coal, that is, coal with low energy content and economic value. Only 342.6 billion tons were anthracite and bituminous coal of relatively high quality.

Figure 15 shows the historical growth rates of world (excluding China)'s cumulative production of coal. A long-term downward linear trend can be established based on the growth rates from 1931 to 2010 (regression R-square = 0.724). The world (excluding China)'s ultimately recoverable coal resources will be about 660 billion tons and the remaining recoverable coal resources will be about 400 billion tons. The predicted remaining recoverable coal resources roughly correspond to the anthracite and bituminous coal reserves reported by BP.

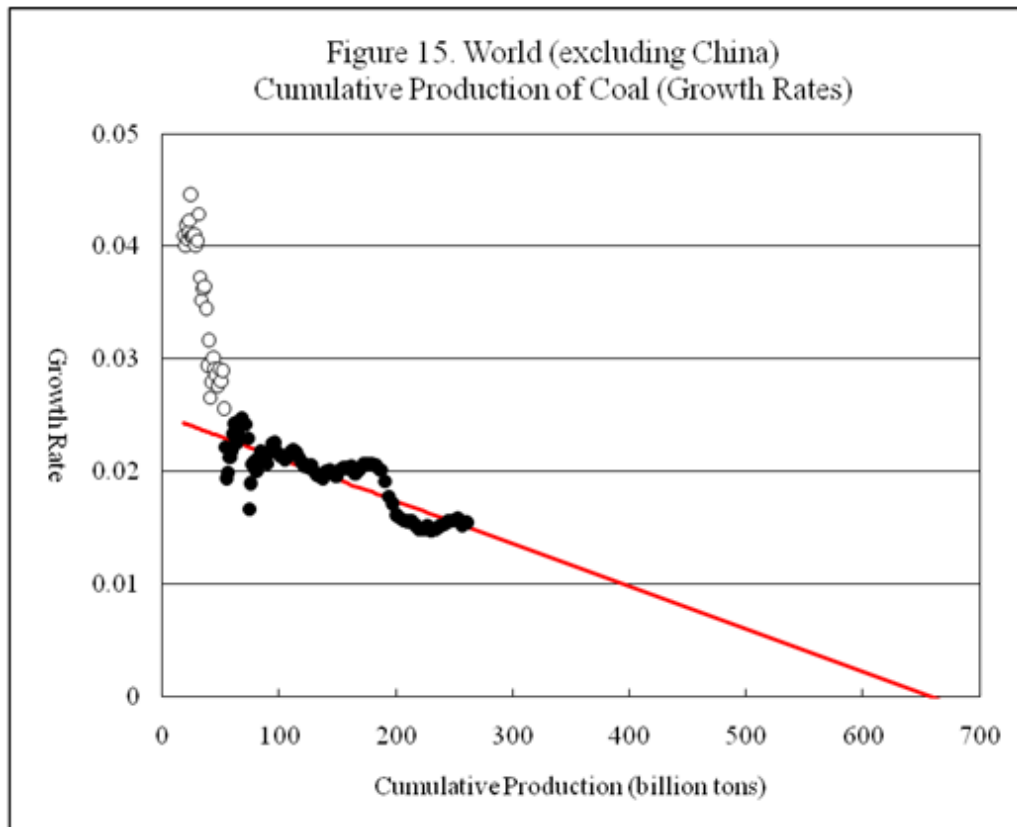
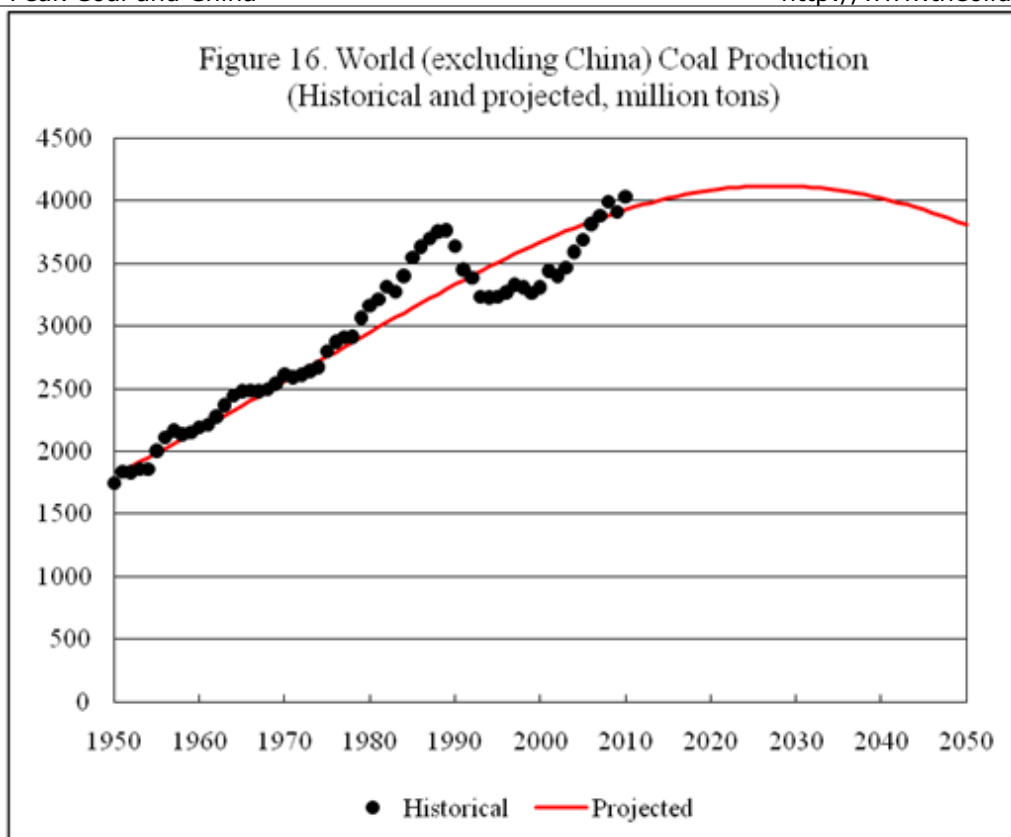


Figure 15

Figure 16 compares the world (excluding China)'s historical coal production and the projected coal production. The world (excluding China)'s coal production is projected to peak in 2027, with a production level of 4.1 billion tons.

*Figure 16***Previous TOD articles on China Coal**

[China's coal bubble...and how it will deflate U.S. efforts to develop "clean coal"](#)

[The Chinese Coal Monster](#)

[The Chinese Coal Monster - running out of puff](#)

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