TRENDS IN GLOBAL CO_2 EMISSIONS: 2013 Report

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Contents

Table 2.1
Growth rates in 2012 of selected energy trend indicators in China, compared to average growth rates since 2002.

Indicator	Growth rate 2011 to 2012	Average annual growth rate, 2002–2011	Standard deviation
GDP	7.8%	10.6%	1.7%
Cement	5.3%	12.2%	4.7%
Crude steel	4.7% [3.7%]	16.5%	7.5%
Electricity consumption	5.5%	12.3%	3.4%

Sources:
2002–2011: GDP (constant prices) (IMF), cement and crude steel (USGS), electricity (IEA, BP);
2012: NBS (2013); between brackets: WSA (2013).

shift from the eastern provinces to less-developed central and western regions, to improve their energy efficiency and promote low-carbon development, and this trend appears to be continuing (Fung, 2012). Moreover, the Chinese Government approved an energy consumption control target with the aim of bringing total energy consumption below 4 billion tonnes in standard coal equivalents by 2015 (Xinhua, 2013; Bloomberg, 2012).

A more detailed discussion on the uncertainty in Chinese fuel consumption data as reported by different sources is presented in Annex 1, Section A1.4. This discussion, which includes conclusions from recent literature on the accuracy of China's CO_2 emissions (Tu, 2011; Andres et al., 2012; Guan et al., 2012), yields an uncertainty for our estimates of about 5% for most industrialised countries, and in the range of 10% for China and the Russian Federation.

United States

In the United States, in 2012, CO_2 emissions decreased by 4% to 5.2 billion tonnes, following a 2% decrease in 2011. This emissions level was the lowest since 1993 and occurred while the economy was growing, whereas, since 2005, CO_2 emissions had been increasing every year, with the exception of 2010.

The large decrease in 2012 was mainly due to a decrease in the use of coal (mostly used in power generation). The large increase in shale gas production (see Section 2.5) caused natural gas prices to decline in the first half of 2012, to the lowest level in a decade, leading to a switch to gas-fired power generation and less coal-fired power generation. Compared to coal, natural gas contains roughly about half the amount of carbon (C) per unit of energy; therefore, gas-fired electricity generation produces about half as much CO_2 as that from coal. In addition, since they operate at a higher temperature, gas-fired plants can achieve up to almost 15 percentage points higher energy efficiency than coal-fired power plants. Thus, this shift from coal to less carbon-intensive natural gas resulted in a decrease in CO_2 emissions. In addition, a 2.2% decrease in transport emissions (but no change in biofuel consumption) and mild winter temperatures reducing the demand for space heating also contributed to the decrease. In the United States, the demand for air conditioning in the summer months may also significantly influence annual trends in fuel consumption, but this was not the case in 2012 (EIA, 2013a,b). Although higher natural gas prices, later in the year, reduced the gas share in power generation below the record level of April 2012, the share of coal in power generation on average remained about 10 percentage points below the annual range of 48% to 51%, prior to 2009 (EIA, 2013d). MacMillan et al. (2013) and EIA (2013b,e) provide further insight into the fuel price incentives for coal- or gas-fired power plant operators and into the reasons for the natural gas price developments in 2012 and early 2013.

CO_2 emissions from fossil-fuel combustion decreased by 13% in 2012, thus falling below 2005 levels. Houser and Mohan (2013a,b) analysed the causes of the decrease for the United States, and concluded that the shift from coal to natural gas in power generation, from 20% in 2008 to 30% in 2012, contributed greatly to this change, but the increase in the share of renewable energy in power generation, from 7.9% in 2005 to about 11% in 2012, contributed as much. Houser and Mohan conclude that the total reduction in the carbon intensity of the US energy mix from 2005 to 2012 for about 40% was due to the shift towards natural gas, for 25% due to the shift towards wind energy, for 25% due to more use of biofuels and for the remaining 10% due to solar energy, hydropower and nuclear power. These changes contributed to about half the decrease in CO_2 emissions, the other half was due to a much slower economic growth; between 2005 and 2012, GDP grew on average by 1.1%, annually, compared to 3.1% between 1990 and 2005 (IMF, 2013). However, Shellenberger et al. (2013) claim that this analysis ignored the 10% decline in the energy intensity of the economy in 2012, compared with 2005, due to more efficient gas-fired power generation than the previous coal-fired plants, increases in energy efficiency in other sectors, and economy-wide sectoral shifts.