IDDRI

ISSUE BRIEF

N°07/18 • JUNE 2018

Rising CO_2 emissions in 2017: What's going on in China?

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China is the world's largest CO_2 emitter. However, China's energy related CO_2 emissions have been flat or declining since 2014. This led to much optimism that China's emissions growth was finally being reversed, and that it could potentially over-achieve on its Nationally Determined Contribution (NDC). On the back of that, global emissions could potentially peak in the next few years, as required by the Paris Agreement. However, in 2017 China's CO_2 emissions began to rise again, and there are indications that this trend is continuing in 2018. What is causing this increase is therefore of paramount importance. In addition, the question of whether this rising trend can be reversed in the next few years is of crucial importance to whether a rapid global peak of emissions can be achieved.

This article has received financial support from the French government in the framework of the programme "Investissements d'avenir", managed by ANR (the French National Research Agency) under the reference ANR-10-LABX-01; it also received support from the French Biodiversity Agency

KEY MESSAGES

- The recent performance of China in terms of addressing climate change and transitioning its energy sector has been somewhat flattered by an un-reported economic slowdown in the period 2013 to 2016. Looking at the energy data for the last three years, it seems implausible that China's economy has grown as fast as reported.
- Recent stimulus has reversed this slowdown and economic recovery has driven a rapid growth in energy demand in 2017. In the future, it seems likely that economic growth rates will decline moderately year on year, on the back of declining growth rates of investment and industrial production. This should assist in keeping energy demand growth in check, although not to the extent seen in 2013 to 2016.
- If energy demand growth can be slowed in the coming years compared to the growth rate seen in 2017, it is likely that the supply growth of low-carbon energy would be sufficient to keep emissions growth in check. On balance, it appears likely that the next few years will see approximately stagnant emissions in China, with alternating years of slight growth or slight decline. A definitive peak and declining trend thereafter still appears some way off.
- China is still well on track to achieve its 2020 and 2030 climate policy commitments, in particular the target to reduce the carbon intensity of GDP by 60-65% by 2030. Indeed, it still seems likely that China would overachieve this target. It appears still likely that China would peak its CO_2 emissions before 2030.

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UNREPORTED RECESSION, UNREPORTED RECOVERY?

Previous work by IDDRI in 2016 argued that it was premature to draw the conclusion that China's emissions had permanently peaked, stating: "it is quite possible that Chinese emissions follow a peak-plateau-increase-peak trajectory" (Spencer *et al.*, 2016). This is indeed what appears to have occurred in 2017. China's emissions are driven by its economic trajectory, both in terms of its rate and structure of economic growth. In this regard, it is possible to divide China's recent economic history into three phases:

- *2010-2013*: China was very exposed to the 2009 Global Financial Crisis, given the importance of exports to its economy at that time. In response, the Chinese government unleashed a huge economic stimulus, focused on infrastructure development, in order to replace external demand from advanced economies. The economy grew at 8.38% per year in real terms, and energy intensity improved at 3.2% per year across this period.
- *2013-2016*: As the stimulus unwound, the Chinese economy wobbled. Economic growth slowed to 6.97% per year across this period. Moreover, there is significant evidence that GDP growth numbers from this year mask the extent of economic slowdown, particularly in the commodity dependent 'rust-belt' Northwest (*Financial Times*, 2018). With official GDP statistics as the denominator, energy intensity improved significantly in this period, at a rate of 5.0% per year.
- *2016-onward*: economic concerns were reflected in the bursting of a stock-market bubble in June 2015, which galvanized a policy response. Additional economic stimulus, again focused on infrastructure investment, was unleashed and came to fruition in 2016 and 2017. Official statistics state that China grew at a rate of 6.7% in 2016 and 6.58% in 2017. However, this is belied by a reversal of energy intensity trend, which improved by 5.5% in 2016 but only 2.3% in 2017. It appears more likely that previous years' energy intensity improvements reflect an inflated GDP denominator, a possibility discussed in previous IDDRI work (Spencer, et al., 2016, p. 10).[1]

1. All statistics from the preceding three bullet points from (Enerdata, 2018). 2017 numbers are estimates and likely to be revised, but the scale and direction of the trends noted in the paragraphs above are robust.

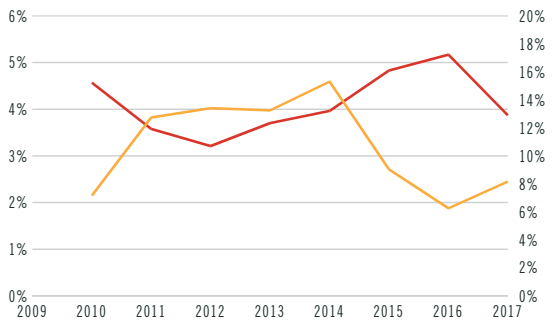
These three phases can clearly be seen in the figures below, which show three indicators related to the macroeconomy and energy sector: the producer price index (Figure 1), real growth of gross investment and energy intensity of GDP (Figure 2). We use the producer price index as it provides the clearest evidence of industrial slowdown, with overcapacity and reduced demand leading to a sustained period of declining producer prices (2012-2016), and the recovery thereof from mid-2016 onwards.

The uptick in emissions in 2017 is due to i) economic stimulus that has been unfolding since 2016; ii) a high probability that the extent of economic slowdown during the years 2013-2016 was masked by erroneous GDP numbers. In other words, the 2017 growth number of 6.58% in 2017 was closer to the actual number than the growth rates of ca. 7.0% over the previous three years. If this is the case, in the period 2013-16 energy intensity improvements were less than reported, and lower growth contributed to slowing energy demand growth.

Figure 1. Monthly producer price index, Jan 2010 to Feb 2018, % change yoy

Source: IDDRI, based on data from (CNBS, 2018)

Figure 2. Energy intensity improvement (red, left axis) and real growth in gross investment (green, right axis), % change yoy



Source: IDDRI, based on data from (Enerdata, 2018).

WHAT DOES THE FUTURE HOLD?

For China watchers, the last few years have delivered a couple of important new insights. Under President Xi, a high premium is being placed on political and hence economic stability. The promises of economic reform, including further market liberalization, reduction in the role of the state, and economic restructuring, have not been fully realized. A consolidation of State Owned Enterprises (SOEs) has occurred in key sectors, particularly commodities and heavy manufacturing, at the active behest of the government, which does not seem to show any desire to privatise the "commanding heights" of the economy. Continued support to headline growth numbers has been provided through infrastructure investment, notably by SOEs and local authorities. By raising demand for heavy industrial products, this has slowed the economic restructuring that would help to further improve Chinese energy intensity.

In the short term, now that the Chinese economy has stabilized somewhat from the slowdown of 2013-2016, the Chinese government will likely ease up on the rate of investment and economic stimulus. The rapid growth of corporate and local government debt is a serious concern. The inefficiencies and waste that come from continued high levels of relatively unproductive investment, and economic resources being consumed by unproductive "zombie" companies instead of reallocated to more productive use, are a significant drag on growth.

Recent stimulus has raised short-term growth, but with potentially negative consequences for mid-term growth due to the delay in productivity increasing reforms and the continued growth of debt in SOEs and local authorities. Economic growth rates are likely to slow down in the next few years, and cautious market reforms and macroeconomic restructuring are likely to be undertaken. These macroeconomic evolutions may cause energy intensity to improve faster than it did in 2017. This would mean a return to roughly stable emissions in the coming few years, provided solutions for low-carbon energy and energy efficiency continue to be deployed (see below).

THE CHINESE ENERGY SECTOR IN 2017

A closer look at the recent variations of some key drivers of China's final energy demand (Table 1) highlights that the stimulus-driven industrial recovery has been a significant contributor to the increase in Chinese energy demand. In addition, energy demand in the residential and services sectors continue to rise at an increasing pace. This highlights that, while China's economy cautiously restructures away from its dependence on heavy-industry and government-led investment, there is still plenty of latent demand growth in the residential and services sector. Controlling this growth in residential and services demand will be crucial to China's low-carbon pathway (Spencer *et al.*, 2016).

Table 1. Selected trends in China's final energy demand

	Absolute growth, 2016-2017 (Mtoe)	Percentage growth, 2016-2017	Annual growth, 2013-2016
All Sectors, Total Final Consumption	85.03	4.16%	1.57%
Industry	33.49	3.12%	-0.27%
Transport	12.02	4.01%	3.88%
Residential	19.29	5.84%	3.68%
Services	8.80	7.94%	5.82%
Agriculture	0.88	2.16%	1.24%

Sorce: IDDRI, based on (Enerdata, 2018). "Others" contributed 0.28 Mtoe of demand growth.

Final demand for electricity grew faster than overall final demand, at 6.6%. This highlights another important trend: as China's economy restructures to services, household consumption, and high-end manufacturing, electricity is likely to grow in importance as an energy carrier.

This increase in electricity demand was met first and foremost by coal, which grew 166.4 TWh (this was from increased production from existing plants, rather than new investment). The growth of coal-fired electricity contributed to 46% of demand growth, while low carbon sources (nuclear, hydro, wind, solar) contributed 45% (gas contributed 9%). The improvement of the carbon intensity of electricity production slowed down to 1.6% in 2017, compared to 3.6% in 2013 to 2016. The implication is that even herculean efforts on the supply-side for low-carbon energy can be insufficient if electricity demand is growing strongly. In turn, if energy supply is to be decarbonized, more must be done to control energy and electricity demand growth.

Much has been made of China's stagnant or declining coal consumption since 2013. However, it is important to note that this phenomenon is confined to the industry sector. Since 2011, China's industrial coal consumption has declined by 3% per year, while coal consumption in the power sector grew at a (modest, but still positive) rate of 0.7% per year. 2017 was the first year since 2011 that

China's industrial coal demand increased, by 0.4%. On the other hand, coal consumption in power plants grew by 4% in 2017. It is unlikely, however, that the historical peak in total coal consumption across all sectors will ever be exceeded. If China's electricity demand growth moderates after the stimulus of 2016 to 2017, the bump in coal demand in 2017 will not be repeated and renewables should be able to absorb the majority if not all electricity demand growth.

Table 2. Selected trends in China's electricity production

	2017 production (TWh)	Absolute growth, 2016-2017 (TWh)	Percentage growth, 2016-2017	Annual growth, 2013-2016
Total electricity production	6,529.05	363.75	5.90%	4.21%
Coal	4,368.24	166.36	3.96%	0.88%
Wind	305.20	63.60	26.32%	19.61%
Solar	136.46	58.65	75%	71%
Other low-carbon*	1,512.35	42.18	2.87%	10.78%
Other fossil^	206.81	32.97	18.97%	14.23%

Source: IDDRI, based on (Enerdata, 2018). *Hydro, nuclear, biomass, geothermal, tidal. ^ Natural gas and oil.

China still appears on track to meet its NDC of reducing the carbon intensity of GDP by 60-65% by 2030, and peaking emissions by the same date. 2017 was the slowest improvement in the carbon intensity of China's GDP since 2013: even projecting forward this rate of improvement would see China attaining a reduction of the carbon intensity of GDP of 67% by 2030. For emissions to peak, however, the rate of carbon intensity needs to exceed the GDP growth rate, which is likely to by greater than 5% per year to 2030. To find an addition one percentage point of carbon intensity improvement, more needs to be done to control energy demand growth and decarbonize final end-use sectors (e.g. through the electrification of transport). This still appears feasible (Spencer *et al.*, 2016).

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