



# CHINA HEADS TO LOW-CARBON FUTURE

A Briefing by  
the Energy & Climate Intelligence Unit and China Dialogue

# EXECUTIVE SUMMARY

Over the last few years, China has adopted an increasingly ambitious and committed approach to climate change and low-carbon development. It plays a positive leadership role within the United Nations climate negotiations, has become the world's biggest investor in renewable energy, and has rapidly restrained and apparently reversed its growth in coal consumption.

The drivers include concern about environmental impacts such as air pollution and climate change, and China's movement to a geopolitical role in which commitments to poorer countries and responsible global citizenship assume more central importance. More fundamentally, the costs of renewable energy have plummeted in the last few years, driven in large part by competition between Chinese manufacturers. As a result, China is poised to become the dominant supplier of products for the global low-carbon economy of the near future, with all the economic rewards that will bring.

The implications for the rest of the world, including the United Kingdom, are profound. In particular, China's embrace of a low-carbon development model creates incentives for other countries to move in a similar direction. From advanced economies such as the UK, China appears to be actively seeking expertise in many aspects of the low-carbon society, including energy saving, renewables, low-carbon urban planning and carbon trading. UK companies already export low-carbon goods and services worth more than £800 million per year, and President Xi's visit would appear to offer a golden opportunity for expansion.

This report tries to capture the dynamism and scale of China's changing energy, environment and climate change landscape, and the opportunities that presents for UK plc.

“It is imperative for us to enhance energy conservation and environmental protection. Tackling climate change is not only our binding international obligation as a major responsible country, but also the pressing need for our own development.”

*Li Keqiang, Davos 2014*

# PLANNING THE TRANSITION

China's Five-Year Plans (FYPs) are its most important policy documents, providing centralised and integrated frameworks for the country's economic development. Since 2006, climate and energy policies have been central elements of the plans. The 11th FYP (2006-2010)<sup>1</sup> first articulated a target for "a resource-conserving and environment-friendly society", while the 12th FYP (2011-2015)<sup>2</sup> listed "sustainable growth" as a national priority.

During the period of the 11th FYP, China closed down outdated and inefficient plants in power and heavy industry. Together with other measures, this reduced energy consumption per unit of GDP by almost 20% between 2005 and 2010, saving more than 1.46 billion tonnes of CO<sub>2</sub> emissions<sup>3</sup>.

The 12th FYP went beyond energy efficiency improvements to incorporating specific climate change targets into central planning. It included a further 16% reduction in energy consumption per unit of GDP and a 17% reduction in carbon emissions per unit of GDP - targets that have almost been met. It prescribed an increase in the share that clean forms of energy (non-fossil fuel sources) have in the overall mix, to 11.4% by 2015, 15% by 2020 and 20% by 2030. In 2014, non-fossil fuels made up more than 25% of the country's electricity generation<sup>4</sup>.

The 13th FYP is likely to show similar ambition and underpin a deepening energy transition.

## Transforming the energy system

The rapid growth of renewable energy in China began in 2005, with the introduction of the first Renewable Energy Law<sup>5</sup> (amended in 2009). It set out core regulations mandating grid connection, determining electricity pricing, cost allocation and preferential funding. Today, China is the world's leading market for clean energy finance, attracting US\$54.2 billion (around £35.4 billion) of investment in renewables in 2013, rising to \$89.5 billion (around £58.4 billion) in 2014. In that year, China invested nearly 73% more in renewables than the United States, the world's second largest market<sup>6</sup>.

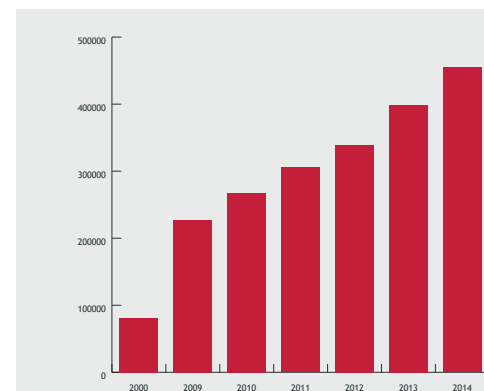
Wind and solar power in particular have seen rapid expansion, as a result of a favourable policy and

market environment. In 2005, China's wind power capacity stood at 1.26 gigawatts (GW), but reached 96GW<sup>7</sup> by the end of 2014. Growth in installed solar capacity was even more remarkable, from 0.09GW in 2010 to 28GW<sup>8</sup> at the end of 2014.

China not only has the world's largest installed capacity of wind and hydroelectric power, but also the largest installation of solar heating and biogas. In 2013, China installed more solar photovoltaic (PV) capacity than the whole of Europe; it is also the world's largest producer of wind turbines and solar panels, lowering the cost of both technologies significantly in recent years.

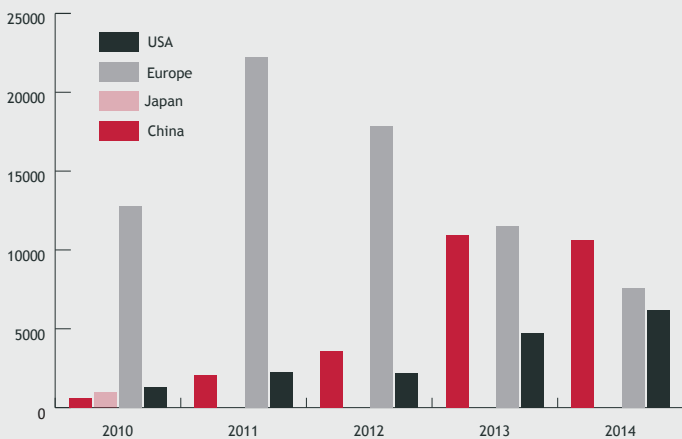
By 2020, China plans to install 200GW of wind energy capacity. It also plans 100GW of solar PV capacity by 2020 - almost as much as Japan and Germany between them expect to have installed by 2030. Recent analysis suggests this target will rise to 150GW<sup>9</sup>.

Such rapid growth comes with considerable challenges, and insufficient grid infrastructure has tended to hamper the connection of clean power sources. To meet this challenge and get renewable energy on the grid, Ultra-High-Voltage (UHV) electricity transmission is being built across China. The State Grid Corporation has already invested 500 billion yuan (almost £52 billion) to extend the UHV grid and plans to invest a further 420 billion yuan (more than £43 billion) in 2015<sup>10</sup>. By 2020, UHV and other intra-regional transmission capacity will reach 400GW, enough to connect all planned coal, hydro, nuclear and wind power to areas with high demand.



Total installed renewable energy capacity (MW)

Source: IRENA



Annual solar capacity installed (MW)

Source: IRENA

Furthermore, China's National Energy Administration has recently announced it will invest 2 trillion yuan (around £207 billion) in the power distribution network<sup>11</sup> over the period 2015 to 2020.

In the meantime, a renewable energy quota system<sup>12</sup> is being introduced in China's electricity sector as part of recent power sector reforms, under which each province will be responsible for ensuring that a certain proportion (currently set between 2 and 10%) of electricity demand will be met from wind, solar and biomass.

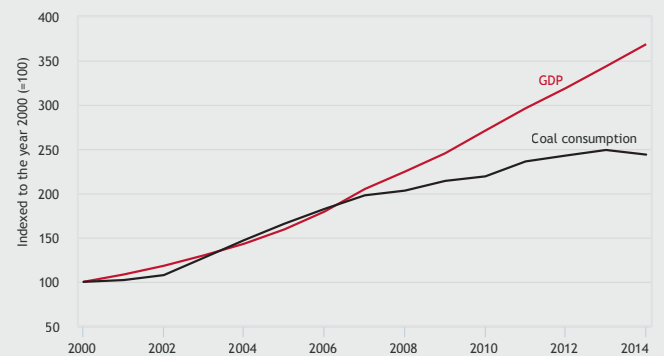
Other power sector reform plans include introducing more market-driven competition in the electricity sector and redesigning the pricing system. Analysts point to the likelihood of green electricity tariff schemes in the new pricing system.

China has also resumed its nuclear expansion after a year's pause for a safety review occasioned by the Fukushima disaster in 2011. As of June 2015, China had 27 operating nuclear power reactors (accounting for 2.4% of the total electricity production in China in 2014) with a further 24 reactors under construction. By 2020, nuclear power is due to provide 58GW of capacity, and some 150GW by 2030<sup>13</sup>.

Despite the fast growth in renewables, the main energy source in China (accounting for around 75% of electricity production) is still coal. The country is the world's largest coal producer, consumer and importer. Coal is responsible for most of China's greenhouse gas emissions, as well as severe air and water pollution.

However, even here there are signs of change. Coal is in structural decline: in 2014, demand fell for the first time in over a decade - by 2.9% compared with the previous year - even as the economy continued to grow. In the first four months of 2015, China consumed 8% less coal than in the same period last year (indicating a 5% year-on-year fall in CO2 emissions over the same period). Not only is the country importing less coal (imports were down nearly 34% in the first seven months in 2015 on the same period last year), but the government has also constrained coal production domestically (halting new mining in eastern China).

In 2013, China introduced its first initiatives to cap the use of coal, aiming to restrict its share in the national energy mix to 65% by 2017<sup>14</sup>. Based on this and other factors, including China's UN commitment to cut the carbon intensity of its economy by 60-65% by 2030 from 2005 levels (see below), analysts suggest China's greenhouse gas emissions may peak by 2025, a full five years ahead of the date it has pledged to the UN.



China: Coal vs. GDP

Source: Greenpeace

China has also introduced ambitious energy efficiency policies, such as the Top 10,000 Energy-Consuming Enterprises programme under the 12th FYP. It covers around 17,000 major firms - accounting for around two-thirds of total energy consumption - and aims to save energy equivalent to 250 million tonnes of coal over the course of the plan.

“It is both technically and economically feasible for renewable energy to satisfy over 60 percent of China’s primary energy consumption and 85 percent of electricity consumption by 2050; and under the high renewable energy penetration scenario, China will be able to peak fossil energy consumption and carbon emission by 2025”

*China 2050 High Renewable Energy Penetration Scenario and Roadmap*

At the same time, China is catching up fast in innovation, in all sectors including low-carbon energy. From 2008 to 2012 its research and development (R&D) spending doubled, with the government investing 1.98% of GDP (compared with a mere 0.6% in 1996). The average for the EU, by comparison, was 1.96%<sup>15</sup>. According to a 2014 OECD report, China will by 2019 be the world’s top R&D spender.

The New York Times observed five years ago<sup>16</sup>: “Calling renewable energy a strategic industry, China is trying hard to make sure that its companies dominate globally”; and in terms of supplying the essential infrastructure for a world decarbonising quickly, China’s companies in areas such as wind turbines and solar panels are well-placed to be mass-market providers. Already, among the world’s top 10 wind turbine manufactures, three are from China<sup>17</sup>; China is also the largest producer of solar PV modules<sup>18</sup>, accounting for more than 60% of annual production in 2012 and 2013.

### Putting a price on carbon

During his state visit to the United States in September 2015, President Xi Jinping announced that a national cap-and-trade programme for greenhouse gas emissions would be introduced in 2017. It marks the culmination of a concept first unveiled in the 12th FYP in 2010. Under the Emission Trading System (ETS), the government will

set limits for greenhouse gas emissions and allow businesses to trade permits. (A similar mechanism, the EU ETS, has been in operation in Europe since 2005).

Starting with Shenzhen in 2013, China has launched a total of seven ETS pilots in five municipalities (Beijing, Shanghai, Shenzhen, Tianjin and Chongqing) and two provinces (Hubei and Guangdong), representing a variety of economic, social and geographic contexts, and covering a total population of 199 million.

These pilot schemes cover 30% of China’s annual GDP and 20% of its carbon emissions. China therefore already houses the world’s second largest carbon market after the EU ETS, and the national scheme will be the world’s biggest when it starts in 2017. After some fluctuations, the carbon price in mid-2015 ranges from 9 yuan (around 93 pence) per tonne (in Shanghai) to 42 yuan (around £4.32) per tonne (in Beijing); an average price expectation for the national ETS in 2017 is 39 yuan (around £4.01) per tonne.

1	Trina Solar	China
2	Yingli Green Energy	China
3	Canadian Solar	Canada
4	Hanwha SolarOne	South Korea
5	Jinko Solar	China
6	JA Solar	China
7	Sharp	Japan
8	ReneSola	USA
9	First Solar	USA
10	Kyocera	Japan

World’s top 10 solar panel manufacturers

Source: IHS

According to the Washington DC-based China Environment Forum, more than 38 million tonnes of carbon dioxide had been traded in the secondary carbon markets of the seven pilot regions<sup>19</sup> by July 2015.

In addition, several cities (including Hangzhou and Qingdao) and provinces (Zhejiang, Gansu and Anhui) have begun to plan their own emissions trading systems, and pilots for low-carbon provinces and cities have been underway since 2010 in which local governments would introduce and explore multiple carbon control measures.

### China's changing position in global negotiations

At the Copenhagen climate summit in 2009, China was widely depicted as being one of the “laggards” that blocked a global treaty to control carbon emissions. Just six years on, its approach to the ongoing UN climate negotiations is very different.

At the time of Copenhagen, China, like virtually every other country, outlined its plans for controlling its own emissions. It followed the norm for developing countries of a pledge to reduce “emissions intensity” - the amount of greenhouse gas emitted per unit of GDP. Its target of a 40-45% cut by 2020 placed it among the more ambitious nations in the developing world.

Six years on, emissions intensity has been reduced by 33%<sup>20</sup>, and China is broadly on course to meet its 2020 target.

Along with the announcement for a national cap-and-trade programme, China has pledged 20 billion yuan (more than £2 billion) to support developing countries to combat climate change, via the new China South-South Climate Cooperation Fund. This is a major development, as the assumption within the UN climate convention process has been that only developed nations would put such funding forward.

The most significant recent moves have been two joint announcements from China and the United States. Not only are these nations the biggest two

greenhouse gas emitters by far, accounting for around half of the global total, but mistrust between the two was also a significant factor behind the failure in Copenhagen, with relations on climate change remaining frosty in the few years afterwards.

In the first of these bilateral announcements<sup>21</sup>, in November 2014, President Xi pledged that China would peak its carbon emissions by 2030, with efforts to peak earlier. It will also increase the share of non-fossil fuels in primary energy consumption to 20% by 2030.

In June 2015, China officially submitted this plan to the UN climate convention (UNFCCC)<sup>22</sup>, becoming the first emerging economy to unveil its Intended Nationally Determined Contribution (INDC). In doing so it clarified that this also entails an improvement of 60-65% in emissions intensity by 2030 (on a 2005 baseline).

The second bilateral announcement<sup>23</sup> took place in September 2015. The official statement from Presidents Xi and Obama noted that they share a “personal commitment to a successful climate agreement in Paris” - scene of the 2015 UNFCCC summit, at which governments are likely to conclude a new global climate change agreement. The Presidents also outlined a number of unilateral and bilateral work streams, including China's plan to ensure half of its new urban buildings are “green” by 2020 and to introduce new fuel efficiency standards for heavy goods vehicles by 2019.

Taken together, these statements and pledges indicate that relations between the world's two “emissions superpowers” have moved on hugely in the last six years. International diplomacy - in which the UK has played a leading role - has helped to advance China's stance towards international negotiations. But far more important is the growing awareness that climate impacts and air pollution pose major threats to development, and the rapidly evolving market for low-carbon goods and services. In short, China's new approach rests on the fact that its leaders see combatting climate change as being in the national interest.

“The state shall give priority to the development and utilization of renewable energy in energy development”

*Article 4, Renewable Energy Law, 2013*

## THE 13TH FIVE-YEAR PLAN (2016-2020): GOING FOR GREEN

The process of drafting of the 13th FYP started in April 2014. An initial draft is expected in October 2015; the National People's Congress is expected to endorse the final version in March 2016. The 13th FYP will be the first to start under President Xi's leadership.

Climate change is likely to be a core aspect of the plan. In 2014, Xu Lin, director of the National Development and Reform Commission (NDRC) Development Planning Department, promised that energy efficiency and environmental protection would be central to the 13th FYP. His department is China's top economic planning unit; it is responsible for drafting the 13th FYP, and introduced China's first national climate change plan in 2007. China is also expected to introduce a climate change law this year or next, and future actions on low-carbon development are also likely to include new pollution controls.

Throughout his administration, President Xi has called for “significant breakthroughs” in 10 specific areas, including what he calls “ecological civilisation”<sup>24</sup>. This phrase has been fleshed out in concrete policy initiatives aimed at changing the priorities and performance of China's local officials away from solely achieving economic growth, towards a “lifelong accountability system” that includes environmental performance in political evaluation. Premier Li Keqiang has clarified<sup>25</sup> that an important part of ecological civilisation is the development of a green, low-carbon and recycling economy.

## CHINA'S LOW-CARBON PRIORITIES AND THE 'NEW NORMAL'

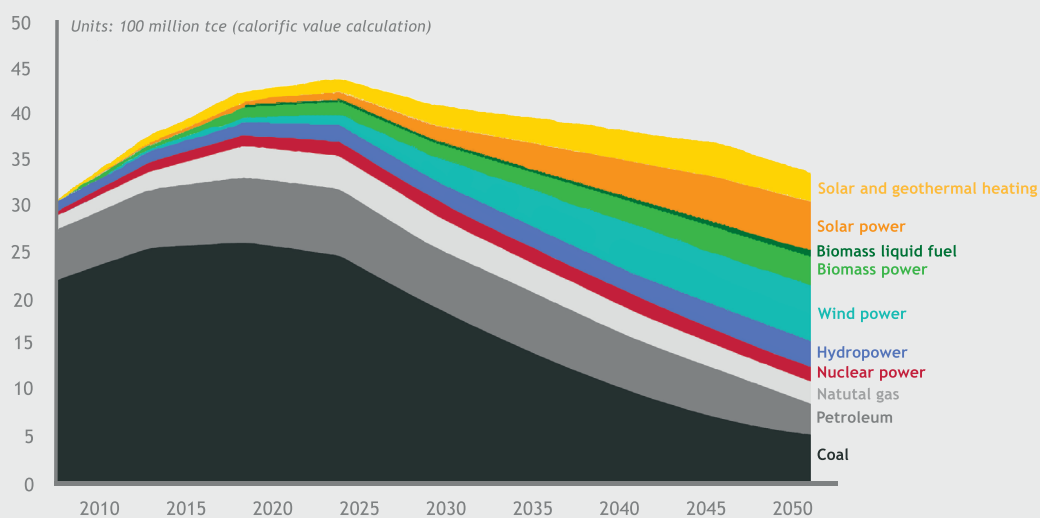
To understand China's plans to “green” its economy, it is important to identify the multiple challenges the country faces, and the priorities of its government. After three decades of wasteful and highly polluting growth, China now aims to develop a new growth model that addresses both economic and environmental pressures.

The assumption that environmental protection entails an economic sacrifice has largely been discarded in China. Rather, the government increasingly considers low-carbon sectors as the drivers of future growth. As the state-owned China Daily puts it<sup>26</sup>: “Unlike the Western countries which only began to address environmental problems after they became rich and transferred their highly polluting manufacturing to developing countries, China has to blaze a new trail in order to achieve sustainable development.”

In late 2014, President Xi first introduced the term “new normal”<sup>27</sup> to describe China's transition to slower, more sustainable and efficient economic growth that avoids the “middle-income trap”, where a country attains a certain income but will get stuck at the level. Environmental concerns are also seen as improving energy security, for example by reducing gas import bills.

In 2014, China's GDP growth was officially 7.4%, in line with the government's target of 7.5% for the year. In 2015, growth is expected to be 7.1%, and 6.9%<sup>28</sup> by 2017. This is a much slower pace than the annual average of 10% attained in the past three decades. But it is still a medium-to-high growth rate, and meeting it presents multiple challenges - for example, reconciling rapidly growing energy demand with the desire to curb imports and limit air pollution and climate change.

The leadership aims to make this growth low-carbon. China 2050 High Renewable Energy Penetration Scenario and Roadmap<sup>29</sup>, a report from the high-



Projected Chinese Primary Energy Consumption under 'High Renewables' Scenario

Source: China 2050 High Renewable Energy Penetration Scenario & Roadmap

level energy think tank the Energy Research Institute, predicts “a true revolution of energy production and consumption”; and President Xi has also called, in a major 2014 speech, for a “revolution in energy production and consumption”<sup>30</sup>. According to the Scenario and Roadmap, by 2050, renewables will account for over 60% of China’s total energy consumption and more than 85% of its total electricity consumption<sup>31</sup>. These targets are comparable with all but the most ambitious European countries. It also concluded that fossil fuel use and hence carbon emissions could peak by 2025.

The Energy Research Institute works under the National Development and Reform Commission (NDRC) and the study was jointly produced with a number of core energy research centres close to China’s top decision makers. By far the most ambitious projection of China’s renewable energy future, it is a clear sign of the potential scale of China’s green transformation.

Environmental issues are also becoming more and more visible in the public sphere, due mainly to the significant challenges posed by fossil fuel burning - notably, air pollution. Environmental protection became the most discussed topic on the internet in China in 2014, with three times more comments than the second ranking topic, anti-corruption, according to China Youth Daily’s online public-opinion monitoring centre.

In response to popular pressure to tackle China’s air pollution crisis, Premier Li Keqiang announced in March 2014 that the government had declared “war on pollution”. China’s increasingly dynamic

media increasingly make the connection between environmental issues and climate change, and public awareness of climate change is high.

February 2015 saw the release of *Under the Dome*, an online documentary detailing China’s severe air pollution. Financed and presented by Chai Jing, a prominent former state television reporter from China Central Television (CCTV), it attracted more than 200 million views within three days and generated a nationwide discussion. Though the authorities later censored it, the film earned official endorsements and made a strong link between air pollution and coal and oil consumption.

Mankind may utilize nature and even try to transform it. But we are after all a part of nature. We should care for nature and not place ourselves above it... We should respect nature, follow nature’s ways and protect nature. We should firmly pursue green, low-carbon, circular, and sustainable development.”

*Xi Jinping addressing UNGA Sept 2015*



## OPPORTUNITIES FOR UK PLC

At an unprecedented and unanticipated pace, China is emerging as the dominant player in the world's low-carbon economy. There are many potential opportunities for countries whose political and business leaders are aligned and alert.

Low-carbon development is generally technology- and capital- intensive, and China still needs foreign technology and investment. As an example, its ETS pilots have received technical assistance from several European countries, including the United Kingdom. With the national ETS now under construction, UK experience in national and European carbon trading schemes has immense value both for Chinese policymakers and the companies involved.

Other opportunities may be found in pollution prevention and control. Over the next five years, China plans to invest 1.7 trillion yuan (around £175 billion) in environmental protection, aiming to reduce air pollution by 25% by 2017<sup>32</sup>. UK expertise in "clean-tech" industries including, for example, waste management and green building techniques, could be of value in China's growing low-carbon market.

In 2011/2, the UK exported £821.8 million of low-carbon environmental goods and services (LCEGS) to China, according to research for the UK government<sup>33</sup>. (LCEGS includes a large and diverse number of specific products, including renewable energy technologies, carbon finance and waste management.) The UK was the fifth most important supplier of LCEGS to China, and the most important in Europe. It is not clear whether a similar analysis has been performed since. The following year, a report commissioned by the Foreign and Commonwealth Office<sup>34</sup>, together with UK Trade and Investment and the China-Britain Trade Council, listed five areas in which UK plc had an opportunity to increase exports: Green buildings,

"China may buy core technologies, key parts and components and energy saving and environmentally friendly equipment from developed countries..."

*Li Keqiang, OECD Summit speech 2015*

transport, clean energy, waste management, and energy & low-carbon services.

On September 21, 2015, British Chancellor of the Exchequer George Osborne and Chinese Vice-premier Ma Kai (a key figure in climate change policy) reached agreement on 53 policy elements at the seventh China-UK Economic and Financial Dialogue in Beijing. The most highlighted element of this deal in the UK has been the £2 billion guarantee to underwrite Chinese financing of the Hinkley Point C nuclear power station. However, a wide range of other low-carbon issues are also present in the document, including agreement to work together on increasing energy efficiency, developing carbon capture and storage, promoting renewable energy, and addressing climate risks and climate resilience.

Shortly before Mr Osborne's trip, the official newspaper China Daily published an article<sup>35</sup> opening with the statement that "China's move to a low carbon future will provide opportunities for companies in the United Kingdom." It noted that China's energy transformation "...will require energy efficient technology, products and solutions - and that is where the UK comes into the equation... the UK has developed a thriving "clean-tech" industry, which can help China solve its pollution problems and trigger a period of sustainable growth.

"Many industries that the Chinese government has placed a great emphasis on include renewable energy, green building techniques, manufacturing, and water and waste management. UK companies have excelled in these sectors. "

Such an article in an officially sanctioned publication is, effectively, an invitation to bid.

## CONCLUSION

China is moving towards a low-carbon future with unexpected speed and remarkable breadth of vision. Its manufacturing companies already lead the world in market volume for products such as wind turbines and solar panels. Increasingly, those products will both provide power for China itself and for the rest of the world. At the same time, it is putting tougher constraints on coal burning than any analysts deemed possible five years ago, driven by the spectre of air pollution and climate change impacts.

These national trends complement a much-changed approach to international climate change negotiations. Just a few years ago, discussions between the UK and Chinese Premiers would, if they had involved climate change at all, have been marked by the UK encouraging China to make stronger commitments on reducing emissions. It is not apparent any longer that the UK is the leader and China the laggard; a case can be made that the two countries have rapidly traded places.

It is evident that China is actively seeking to import low-carbon goods and services that it cannot yet provide for itself from more advanced economies. But companies wanting to provide those goods and services will have to surmount the hurdles that undoubtedly remain to western involvement in Chinese business. Given those hurdles, it is likely that British companies would need government assistance to take maximum advantage of the huge opportunities on offer; likely, too, that if the British government does not step up, others will.

On climate change and clean energy, the notion of China as a reluctant laggard is definitively out of date. It is rapidly turning into a climate and clean energy leader, keen to do business in the low-carbon marketplace. For those prepared to seize them, opportunities await.

“I predict China will see a genuine green tide. If you don’t move to meet that, it will swallow you up.”

*Prof. Huang Haifeng, assistant to the Dean of Peking University’s HSBC Business School*

## Notes

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