

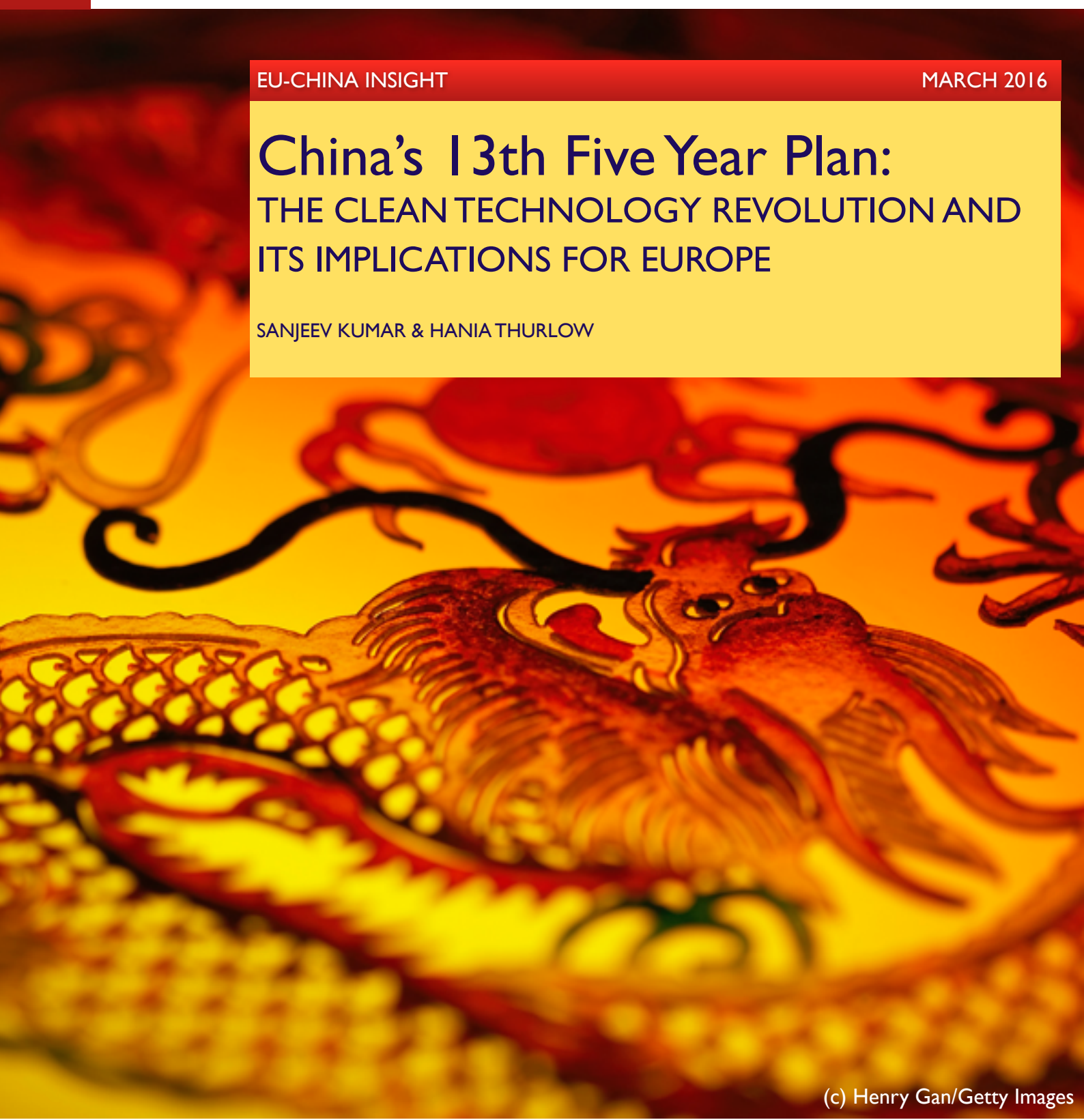


EU-CHINA INSIGHT

MARCH 2016

# China's 13th Five Year Plan: THE CLEAN TECHNOLOGY REVOLUTION AND ITS IMPLICATIONS FOR EUROPE

SANJEEV KUMAR & HANIA THURLOW



Change Partnership is a thinking and organising non-profit organisation focused on solving the politics of climate change.

Change Partnership  
26 Rue d'edimbourg,  
1050 Brussels,  
Belgium

(c) Change Partnership 2016

This work is licensed under the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License.



You are free to:

- Copy, distribute, display, and perform the work.
- Make derivative works under the following conditions:
  - You must attribute the work in the manner specified by the author or licensor.
  - You may not use this work for commercial purposes.
  - If you alter, transform, or build upon this work, you may distribute the resulting work only under a license identical to this one.
  - For any reuse or distribution, you must make clear to others the license terms of this work.
  - Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.




# Introduction

Much has been made of the shale gas revolution in the US. China, on the other hand, has embarked on a clean technology revolution that will go a long way to truly solving climate change as well as ensuring genuine sustainable development. The 13th Five Year Plan (FYP) heralds the beginning of a new phase of intensive transition from a heavily polluted low-end manufacturing towards a lucrative, high-tech, modern country powered by clean energy, with cleaner air, a greater role for markets in allocating scarce resources and driven by low-to-zero emission vehicles.

Responding to climate change is at the heart of the country's immediate future though this is more for national security concerns. Environment-related protest is a major threat to the stability of the state. Behind environmental catastrophes such as the Tianjin chemical plant explosion in August 2015 rests the spectre of local government rule-bending which ignores health, safety and environmental concerns. The game-changing Environmental Protection Law, which was passed through a bitter three-year parliamentary process, is one of the key means of ensuring that China delivers the goals set out in the 13 FYP and helps to quell unrest over dangerous air quality levels and energy-import dependence, coupled with the need to maintain economic prosperity and social stability.

China's development has centred on a *regulate to innovate* and *invest to grow* approach. Within the space of a couple of decades both approaches have harvested many tangible benefits such as technological excellence in e-buses, e-scooters, railways and renewable energy technologies. The iconic prizes of electric cars, smarter grids and cleaner industrial manufacturing are central to the 13 FYP's focus on innovation and market excellence. Both will bring down further China's power and transport greenhouse gas emissions, which are good for the country and the global commons. Good quality, mass produced and affordable clean technology will make solving climate change easier and cheaper for every other country too. How it implements a just and fair transition for regions and workers locked into high-carbon sectors will be a blueprint for the rest of the world.

Europe faces the same challenges but has much more at stake. It has a window, set by its clean technology competitors—the 13 FYP, US, South Korea, Japan and recently India—of less than five years to reposition its economy towards deep decarbonisation and recapture technological excellence. The 2030 climate, energy and transport legislative programme is now of paramount importance. It must deliver a timely and robust carbon price investment signal, streamline the rapid uptake of energy saving, renewable energies as well as the electrification of surface transport. Central to this is a responsive governance system that sets adequate targets and facilitates implementation. The kind of things China is planning to do in its 13 FYP and beyond. Above all, it must resist the temptation to seek trade barriers to protect industry and instead embrace this revolution through the creation of a clean technology trade agreement which will be the benefit for Europeans, Chinese and everyone else.

Premier Li Keqiang is shown from the chest up, wearing a dark suit, white shirt, and blue tie. He is speaking into several microphones at a dark wooden podium. The background is a large, red Chinese national emblem with five golden stars and a golden wreath.

“We will resolutely declare war on pollution as we declared war against poverty.”

Premier Li Keqiang.  
March, 2014.





# The 13th Five Year Plan

The 13th FYP (2016-2020) continues the trend, started in 1996, towards better environmental protection but now intensifies focus on the environment, climate change, clean technology development and deployment, organised in five themes—innovation, coordination, green development, openness and inclusive growth.

China's core goals, as outlined in the 13 FYP, are to build a “moderately well-off society”, whilst ensuring that the economic structure is optimised, the environment is improved and the quality of development is increased.<sup>1</sup> China wants to make the shift from investment-driven to consumption-led growth, which means finding new drivers of economic growth through innovation.

## Innovation

Chinese Premier Li Keqiang has stressed the role of innovation in 13th Five-Year Plan, to encourage new growth sources.<sup>2</sup> It is clear that the government sees innovation as vital to China's economic transformation, with the Plan calling for research and development spending to make up 2.5% of the GDP by 2020, up from 2.1% in 2013.<sup>3</sup> The EU's target for R&D spending is 3% of GDP over the same period. Currently this stands at 2.01%.<sup>4</sup>

The 13th FYP will encourage innovation and enhancing of the quality of economic development through advancing mass entrepreneurship, encouraging technological innovation and promoting the development of new industries. It will focus on the development of high technology and value added industries, whilst strengthening supporting infrastructure, financial systems and business environments to encourage this growth and rejuvenate the economy. This will include:

1. **Developing emerging industries** including industries such as energy saving and environmental protection, new energy, smart manufacturing and information technology and will be prioritised in the new FYP.
2. **Strengthening infrastructure construction and encouraging innovation** which emphasises information technology development.
3. **Encouraging corporate innovation** through further research, strengthening technology integration capabilities and importing technology from abroad, particularly to encourage replacing equipment and apply new technologies.
4. **“Made in China 2025”** - will focus on moving onto “created in China” in which raising the level of product technology, technical equipment, energy efficiency and environmental protection will be promoted to move China “from big to strong”.
5. **Developing new systems** to simplify industry and commerce system which should help accelerate financial reform, improve sectoral efficiency and reduce costs.

## Green Development

Sustainability is the main development strategy, focusing on teaming economic development with green development. Action will be taken to build a resource efficient, eco-friendly society and strengthen environmental protection to ensure sustainable social and economic development. A key focus is on reversing the environmental and social problems that arose from China's past extensive growth model of development. The 13th FYP includes:

1. **Strengthening environmental measures** through actions taken to implement the green city development plan, strengthen clean production, develop green finance to help enterprises strengthen environmental management and encourage society to pursue green consumption.
2. **Tightening pollution control** by encouraging industrial provinces to move towards high-end production and low pollution. Overall greater measures will be made to contain air, water and ground pollution. Regulatory requirements for industrial pollution to meet emission standards will be fully strengthened, as will the enforcement of any other related laws.
3. **Developing environmental protection and related industries** through accelerating energy technology innovation, encouraging the development of the new energy industry, strengthening of smart grids and promoting the development of the new energy car industry.



Solar panel factory of the Eoply New Energy Technology Co., Ltd. in Nantong City, east China's Jiangsu Province.  
(c) Xinhua News Agency.

## Coordination

The FYP will try to strengthen the development of various regions, particularly between the well-developed coastal regions in the east compared to the central and western regions, in order to tackle the issues of geographical disparities such as subpar transport facilities, accelerated urban migration which place considerable stress on urban development, inefficient logistics systems in need of updating and increasingly serious environmental pollution. This will be tackled through:

1. **Advancing coordinated regional development** by optimising urban development planning, encouraging transport integration among the different regions and improving environmental planning.
2. **Advancing new urbanisation construction** based on a people-centered new urbanisation plan; deepening household registration reform and helping rural citizens capable of working in urban areas to obtain residency.

## Openness

Liberalising measures to encourage overseas investment, establish foreign market sales networks as well as bringing in the advantages to foreign partners, all in a bid to enhance China's competitiveness globally and upgrade the economy.

1. **Strengthening two-way opening up** through construction of ports, transport corridors and economic cooperation zones. Policy wise the focus will be on the optimisation of foreign trade will be encouraged, as will positive import policies and opening up the market to the rest of the world.
2. **New opening up measures** by encouraging enterprises to promote their equipment, technology and services internationally so that China can better integrate into the global economy.
3. **Advancing the Belt and Road initiative** through improving bilateral and multilateral cooperation mechanisms and encouraging corporate investment along the route as outlined in Figure 3.

Figure 3: China's Belt and Road Initiative<sup>5</sup>



## Shared development

Efforts will be made to strengthen social services to help China become a “moderately well off society”. This includes:

1. **Promoting balanced population growth** through fully implementing the two-child policy to counteract issues of an ageing population.
2. **Reforming the social security system** with health care, pension and insurance reforms.
3. **Tightening food safety** through a highly efficient food safety management system.<sup>6</sup>



**Figure 4: Summary five key themes of the I3 FYP<sup>Z</sup>**

Key themes	Description	Focus areas				
		Increasing competition	Improving quality of life	Reducing pollution	Encouraging clean tech	Sustainable growth
Innovation	Drive economic development and shift the economy to higher quality growth.	✓	✓	✓	✓	✓
Coordination	Ensure balanced development across rural and urban areas and across different industries.	✓	✓	✓		✓
Green development	Protect the environment and pursue environmentally friendly economic growth.		✓	✓	✓	✓
Openness	Utilisation of both domestic and global markets	✓	✓		✓	
Inclusive growth	Share prosperity across the whole population and counter the effects of income inequality, ageing population and environmental degradation.		✓	✓		✓



## China's motivation

### The curse of fossil fuels

China is the largest global coal consumer. Alongside a comprehensive and networked infrastructure, coal was one of the foundations for the country's rapid economic rise. Coal is also the major source of air pollution affecting domestic stability whilst its climate change impacts are of global concern. However, over the recent months, China has taken considerable action to reduce this appetite through a process of economic restructuring and increased investment in renewable energy.

This has already prompted Fatih Birol, CEO of the International Energy Agency (IEA), to conclude that global peak coal is likely to have occurred in 2013 due to China's economic reorientation. The IEA now expects coal consumption to be 10% lower in 2020 than its original estimation.<sup>8</sup> This is considerable given that between 2002-2012, China's coal consumption increased 10.4% annually to make it the largest coal consumer in 2012.<sup>9</sup>

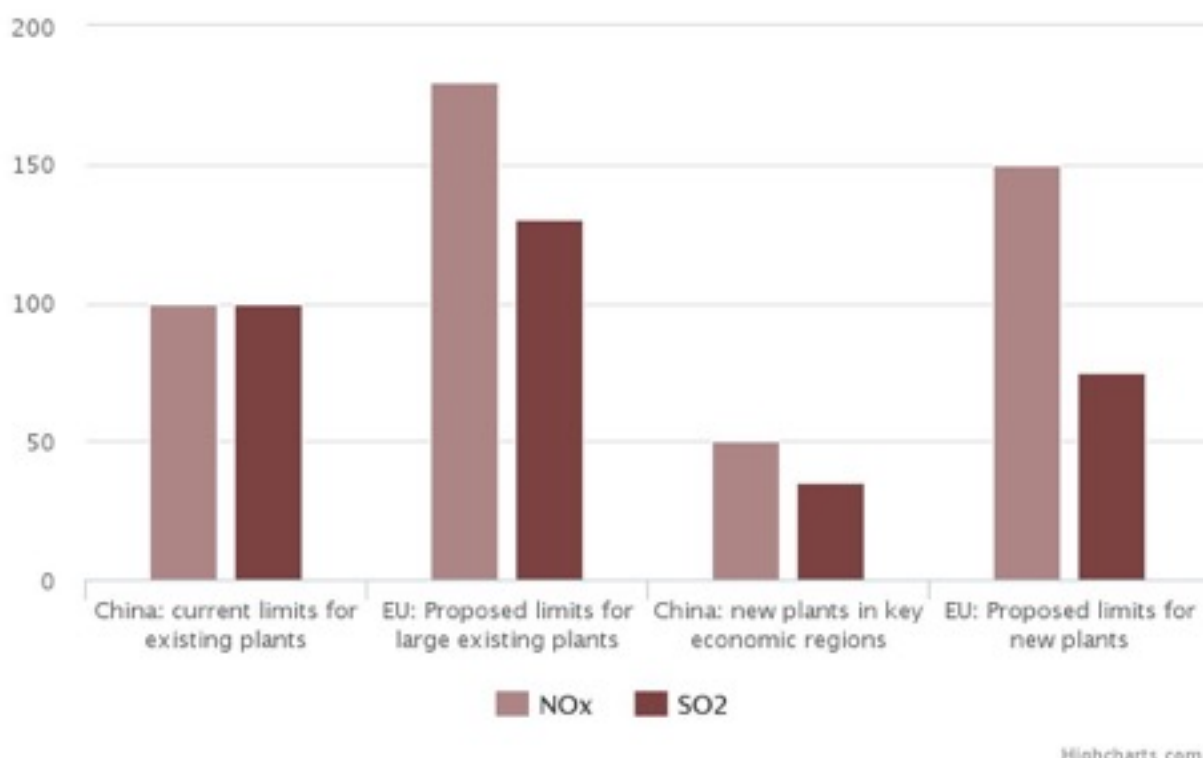
In January 2016, China announced that it will impose a three-year moratorium on new coal mining capacity. Furthermore, it announced 1,000 million tonnes of coal mining capacity will be cut during the 13 FYP. 500 million tonnes of this will be closed dependent on age and efficiency, whilst the remaining 500 million tonnes will be closed through consolidation of mining companies.<sup>10</sup> A consortium of Chinese and international experts have already started to plan for a deeper phase out from coal called the "The China Peak Coal Project". This collaboration between academia, government think tanks, research institutes and industrial associations called for a national coal cap in the 13 FYP as a means to deliver 1,140,000,000 new jobs.<sup>11</sup> Irrespective of whether a coal cap is adopted, the need to invest in alternative non-fossil fuel employment will be a paramount importance for national and regional policy makers as they grapple with the decline of coal and other associated industries such as steel. The urgency of this was highlighted on 12 March, 2016 when thousands of coal workers rioted near the Siberian border.

The government will establish a RMB 100bn (\$15.4bn) **Industrial Restructuring Fund** to aid a just transition for coal and steel workers. Local governments and the polluting companies will have to contribute to these costs.<sup>12</sup>

Europe's most far reaching mark on the world is its ability to set tough regulatory standards and processes which define global product markets. However, even in this area Europe's grip is fading away. Greenpeace's 2015 report '*Smoke and mirrors: How Europe's polluters became their own regulators*' highlights the progress China has made in cleaning up its fuel efficiency for large combustion plant. The EU's '*Best available technique*' Reference document (BREF standards), allow

European plants to emit significantly more harmful nitrogen oxide and sulphur dioxide emissions into the atmosphere than current Chinese plant as highlighted in Figure 1.<sup>13</sup>

Figure 1: China-EU pollution limits from coal-fired generation capacity



The IEA predicts China to be the largest oil consuming country by 2030.<sup>14</sup> Owen Daniels, from the Middle East Peace and Security Initiative of the Atlantic Council's Brent Scowcroft Center on International Security and Chris Brown from the Atlantic Council's Global Energy Center conclude that dependence on Middle Eastern oil is the '*Achilles heel*' of China's future economic prosperity.<sup>15</sup> It's 10.97 million barrels of oil consumption per day in 2015 was a 7.9% increase from the year before.<sup>16</sup> Already, 60% of China's oil consumption is met through imports.<sup>17</sup> This puts considerable strains on China's foreign policy and pushes it into the sphere of volatile Middle Eastern politics. This dependence could increase unless it is able to curb demand through successful implementation of the policies outlined in the 13 FYP.

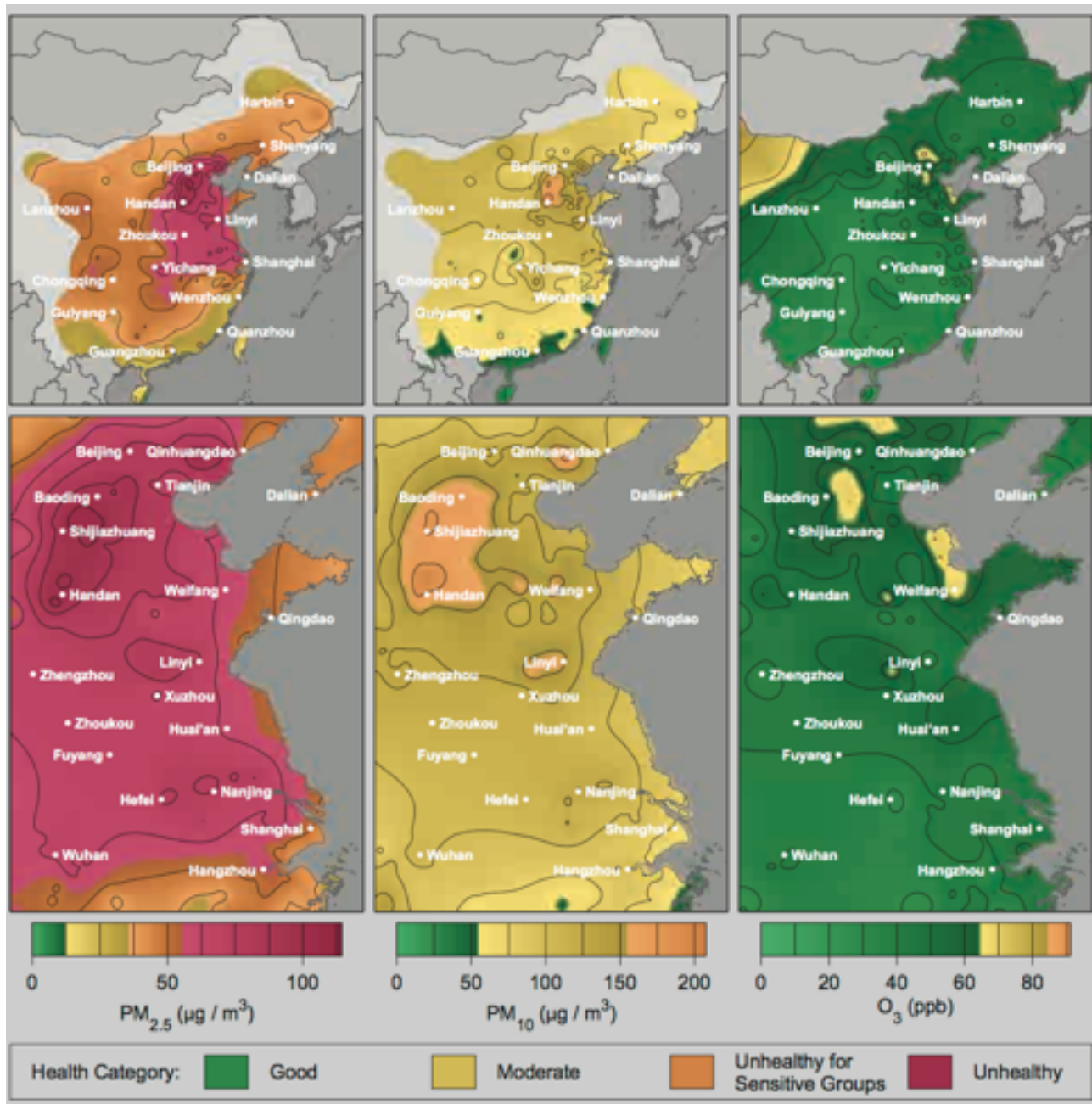
### Environment related civil unrest

Environmental pollution reduces China's GDP from between 3-10%.<sup>18</sup> The Asian Development Bank concludes that climate change impacts cost China 517.08 billion RMB (€71.5 billion). Of the 120 hectares of agricultural land, 39.17 hectares are susceptible to crop failure induced by climate related events such as severe floods, droughts, floods, subsistence and landslides. At least 154 million (11.4%) of the 1.35 billion population resides in low-elevation coastal zones most at risk

from sea-level rise.<sup>19</sup>

Analysis from the University of Berkeley indicates that the seriousness of air pollution impacts on the wealthiest and most populous parts of the country. Figure 2 indicates that Particulate Matter 2.5 and 10, the most serious for respiratory and general human health levels, are close to, or already at, dangerous levels.

Figure 2: Average air pollution maps<sup>20</sup>



The cost of this is staggering. About 1.2 million premature deaths per annum are attributed to environmental pollution.<sup>21</sup> As far back as the 2005 the Ministry for Public Security ranked pollution among the top five threats to China's peace and stability. In response to this, Premier Li Keqiang declared "We will resolutely declare war on pollution as we declared war against poverty" in March 2014.<sup>22</sup>



## The Environmental Protection Law<sup>23</sup>

The government passed a significant strengthening of its Environmental Protection Law (EPL) in 2014. The EPL indicates the serious commitment to governance and accountability.

This was the first major revision of the EPL since 1989. The ambitious first draft from the Ministry of Environmental Protection (MEP) was rejected by the National People's Congress (NPC) Standing Committee, the key legislative body in the country. The desire to weaken environmental protection met with an institutional backlash.

The influential National Resources Development Committee (NDRC) took it over and issued a much weaker redraft in 2012. This spurred the MEP to take the unlikely course of publicly issuing 34 issues countering this redraft whilst emphasising the need for stronger environmental accountability. This catalysed public dissent and led to another round of intense debate. A third draft was issued by the Law Committee of the NPC which further roused intense debate from those concerned about the environment. In April 2014 an unprecedented 4th extraordinary review was called at which point the legislation was agreed. It came into effect on 1 January, 2015. Although compromise has undermined some of its strength, it still remains an important and powerful tool in holding to account officials and companies.

The main elements of the EPL are:

- **Transparency** - companies and local government authorities are required publish information about environmental impacts, quality, incidents, licensing and penalties;
- **Increased liability for polluters** - polluters will be subject to fines that can accumulate on a daily basis. These will be made public.
- **Increased liability for government officials** - local government departments and officials will have their performance evaluations taken into account of pollution and incidents. These can be made public.
- **Whistleblower protection** - Any citizen, legal person or other organization will have the right to report (i) environmental pollution or ecological damage caused by any institution or individual; and (ii) failure of any environmental regulatory body to perform its legal duties, and such report must keep the relevant information on the informant confidential
- **Access to law courts** - 'Social public interest organisations' (civil society) can file environmental pollution claims to the People's Court for environmental pollution and ecological damage.

This is the most effective means ensuring compliance, driving change and address citizen angst against local abuse of environment laws.



# Climate policy and decarbonisation

## China's INDC

China's INDC is based on its now outdated target of peaking emissions by 2030. By 2030, China wants to reduce carbon intensity by 60-65% below 2005 levels, which according to the World Resources Institute (WRI), builds on China's existing goal to reduce intensity by 40-45% by 2020 and is consistent with scenarios demonstrating CO<sub>2</sub> emissions peaking by 2030.<sup>24</sup> Jennifer Morgan, Global Climate Director of the WRI concluded that China's INDC “demonstrates its intent to decarbonise its economy. The country's commitment was made possible by its ambitious clean energy policies and investments enacted over the past decade. China has been rapidly expanding its wind and solar power and continues to be the global leader in renewable energy investment”.<sup>25</sup>

The WRI found China's forest carbon goal to be particularly vigorous—increasing carbon stocks by 4.5 billion cubic metres which would result in an increase of forest cover of 50–100 million hectares, “or about two to four times the size of the United Kingdom”.<sup>26</sup> This amount of forest cover would create a carbon sink of around 1 gigatonne, which the WRI estimates as being the equivalent of taking 770 million cars off the roads.

## Implementation

China's INDC gives a lot of focus to how its goals will be achieved through policies and measures. Including:

- Scaling up emissions trading policies and accounting systems.
- Control coal and increase wind and solar capacity.
- Control emissions from key sectors such as steel and promote the development of less emission-intensive sectors.
- Address emissions from buildings and transport.
- Address non-CO<sub>2</sub> gases such as HFCs from industry and methane and nitrous oxide from agriculture.
- Strengthen overall resilience with focus on water resources, urban planning, public health, and disaster reduction and management.<sup>27</sup>

China's firm commitment to address climate change is strongly motivated by national interests to address air pollution, limit climate impacts and expand renewable energy work force. Official emission data, rereleased on 19 January, 2016 indicated coal use had declined by 4–5% over 2015, prompting Tim Buckley from the Institute Energy Economics and Financial Analysis (IEEFA) to state,

“The implications of these changes are huge. China’s total emissions are on track to peak potentially a decade earlier than their official target of no later than 2030.”<sup>28</sup>

## Emissions trading

President Xi Jinping announced the establishment of a national emissions trading system by 2017 during his state visit to the US in September 2015. China is responsible for about 30% of global greenhouse gas emissions. A cap on these emissions will go a long way to solving the global problem.

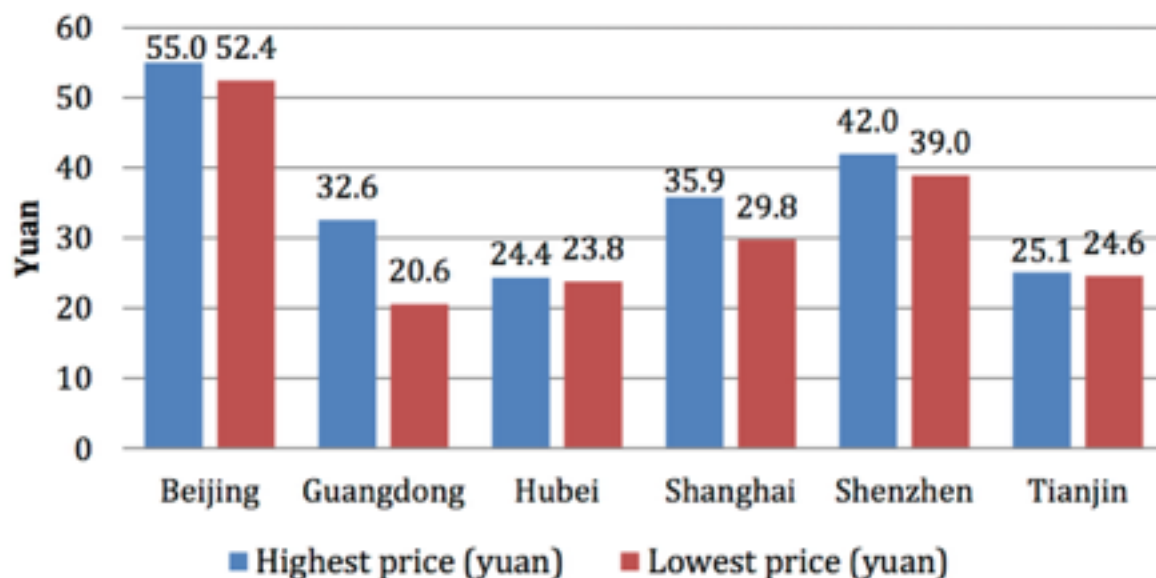
Since 2013, seven pilots have been in operation testing out different modes of design features to ascertain the core elements for the national system. Jiang Zhaoli, Deputy Director of the climate change department at the NDRC, confirmed that the national system it would incorporate 6 sectors<sup>29</sup> - power, iron and steel, chemicals, cement, paper and nonferrous metals sector - and 15 sub-sectors. The intention is to include all regions from the start to ensure that there are no free-riders and inbuilt special privileges locking in distortions into the wider scheme. Central to the success of the Chinese carbon market is its ability to install a uniform approach to monitoring, reporting and verification and good quality emission data.<sup>30</sup>

Due to regulated electricity prices, power companies are unable to pass on costs to household consumers. Plans are afoot for electricity market reform where electricity prices are set more by market conditions than regulation although it is unlikely these will be in place before the national ETS scheme starts in 2017. Therefore, the bulk of these costs will be passed on to manufacturing industry.

The following observations were made from the pilots:

- i) carbon prices reached were broadly similar or slightly higher than the €5 average reached by the EU ETS over its ten year history, as Figure 5 highlights;
- ii) regulators recognised the need to intervene in the market to reduce surpluses. For example, the Shenzhen pilot announced that it would cancel 3 million surplus ETS allowances at the end of the trading period to avoid depressed prices.<sup>31</sup> EU regulators have failed to cancel its surplus, which the Commission estimates to be over 2 billion by the end of 2020, once over its first decade which has rendered it completely ineffective.
- iii) emission data is key. To install confidence in the market, a uniform approach to collating and presenting data will be key to the schemes overall success.
- iv) enforcement and compliance was overcome through over generous free allocation. Only the national system will have the power for enforcement. With this will come with the opportunity for higher rates of auctioning.

Figure 5: Pilot ETS carbon prices in January, 2015<sup>32</sup>



There are three critical features of China's carbon market and approach to mitigation policy:

i) the Chinese system is based on companies reporting and being liable for their emissions. Because almost all of the leaders of these companies will be seeking to maintain or further their political career within China, the government has a stranglehold on compliance. Coupled with the ability for civil society to pursue pollution and environmental damage through law courts, there is no escape from emission reduction activity.

ii) the manufacturing industry (steel, cement, refineries, etc) will face an equal if not greater burden on mitigation efforts unlike the EU experience where industry is heavily subsidised to maintain and increase pollution. Research from CE Delft and Carbon Market Watch found that EU manufacturing installations in just 19 of the 28 Member States made windfall profits of €24 billion from 2008-2012.<sup>33</sup> A further €160 billion will be available for free distribution over the period 2021-2030.<sup>34</sup> In China, these sectors are expected to be at the forefront of the country's emission reductions through a combination of the carbon market and wider economic restructuring. Already, energy intensive industry in China pays a surcharge on its electricity consumption which is used to subsidise energy bills for domestic households.<sup>35</sup> Meanwhile, German households subsidise German industries to near total exemption from renewable energy costs and charges even though the subsequent lower wholesale price has given German industry a considerable competitive advantage over other producers.<sup>36</sup>

iii) as highlighted with the proposal for an Industrial Restructuring Fund to support a just transition for coal and steel workers, polluting companies will also be responsible for jointly managing and financing this transition as well as making emission reductions.



## Industrial restructuring: Why steel is so important to for peak coal

Steel restructuring is a vital means of aiding peak coal in China. Steel produced through a blast furnaces using coking coal are a major source of greenhouse gas emissions. China consumed 327 million tonnes of coking coal in 2006 of which 323 million tonnes were produced in China according to the World Coal Association.<sup>37</sup> As the sector consolidates and perhaps shifts towards electric arch furnaces, the ability of the country to peak and decline coal emissions will increase dramatically.

China's steel sector is the biggest in the world, but it has been producing excess capacity for years, with a surplus estimated at around 300 million tonnes which has been felt even more in the past 2 years due to a slowing economy decreasing steel demand.<sup>38</sup> How Beijing manages the restructuring of the steel sector will be a key test of its ability to move towards a more consumer based economy, a core aim of the 13th Five year plan. The Steel Industry Adjustment Policy, introduced in 2015, has the goal of creating a greater role for the market to allocate resources, reduce excess capacity and address high-cost barriers to plant closure. The global consultancy EY estimate that China would need to close down 112.5 million tonnes of capacity per year to 2020 to remove its surplus.<sup>39</sup>

China's State Council, led by Li Keqiang, announced the plan to cut steel production capacity by 100-150 million tonnes leading to a loss of up to 500,000 jobs.<sup>40</sup> To deal with the inevitable job losses, an Industrial Restructuring Fund was introduced on 1st January 2016, pooling finances from factories across China based on their power consumption. The government will allocate a further 100 billion RMB (€13.86 billion) to the Fund which will mainly focus on the steel and coal sectors to relocate the workers who have lost their jobs over the next 2 years.<sup>41</sup> The Chinese brokerage Shenwan Hongyuan Securities estimated that the fund could amount to 46.8 billion RMB (€6.47 billion).<sup>42</sup>

Alongside the steel worker redundancies, a further 1.3 million workers in the coal sector are expected to lose their jobs. Yin Weimin, minister for human resources and social security, said, "This involves the resettlement of a total of 1.8 million workers. This task will be very difficult, but we are still very confident."<sup>43</sup> In total, 15% of the total workforce will be laid off in a triple bid to reduce industrial overcapacity, improve air quality and mitigate international political tensions. The Chinese government are particularly prioritising keeping low unemployment rates and monitoring the potential for social unrest.

## Renewable energy

Europe had strong renewable energy policies with binding targets to 2020. However, the lack of effective transposition in key Member States coupled with considerable investment uncertainty post 2020, have dried up investment. Meanwhile, China continues its aggressive investment drive in clean energy. In 2015, it spent \$111 billion (€99.8 billion) on clean energy infrastructure, a 17% increase from the year before and easily more than the EU and US combined.<sup>44</sup>



The Dabancheng wind farm in China's Xinjiang province.  
(c) Bob Sacha/Corbis

The International Renewable Energy Agency (IRENA) announced that China was the global leader in renewable energy in 2014. That year, China has installed more new renewable energy capacity than all of Europe and the rest of the Asia Pacific region. The main drivers behind the increase being the cost-competitiveness of renewable energy technologies and other benefits such as improved energy security and decreased air pollution.

China already has the world's largest installed capacity of wind and hydroelectric power and in 2013, it installed more solar photovoltaic (PV) capacity than the whole of Europe.<sup>45</sup> China installed a further 15 GW of solar PV capacity in 2015, bringing the grand total up to 43 GW of solar PV, surpassing Germany's 40 GW and taking the title of the world's largest installed solar PV capacity.<sup>46</sup> The development has been pushed by the ambitious 13 FYP to to install 150 GW by 2020, as well as a new feed-in tariff programme. China has long since been the world's largest manufacturer of solar panels and was a key player in creating the historically low prices for solar panels, meaning that China is able to buy a lot of its domestically produced panels to push the country into dominance in the global solar economy.<sup>47</sup>

Records were also broken in terms of Chinese wind energy installations, which rose to record highs in 2015. 30.5 GW of new capacity was installed over the year, exceeding most analysts forecasts by 20-30% according to Tim Buckley from IEEFA, who stated, "[T]his gives yet more confirmation that the global electricity markets are transforming so much faster than anyone anticipated."<sup>48</sup> The total installed wind capacity across China reached 145 GW at the end of 2015,

which almost doubled the 75 GW installed by the US and tripled the amount in Germany, in third place internationally in terms of wind power capacity.<sup>49</sup>

According to IRENA, the shift to renewable energy is also bringing significant economic returns to China, it has become a major exporter of the technology for renewable energy—accounting for two thirds of international solar PV module production. The sector also employed 2.6 million people in 2013, with the potential for much greater growth. A joint brief by IRENA and China Water Risk has found huge potential in China for further developments in water based renewable energy and improving plant cooling technologies, which could reduce emissions intensity by up to 37% by 2030.

IRENA's director-general, Adnan Z Amin said, “the global issues of water, energy and climate are completely interconnected. The only effective, immediately available solution to meet the rising demand for energy while limiting environmental impacts is to scale up renewable energy. China has recognised this and must continue its leadership in the global energy transition”.<sup>50</sup> Maria van der Hoeven, head of the International Energy Agency, emphasised that China should be given more credit for its investment into clean electricity, “They are now the largest wind power market in the world. They have increased their power generation from renewables from really nothing 10 years ago—now it's 25%. These are very important signals that China is moving into the right direction”. China's spending on clean power has benefitted the rest of the world by creating a mass market that has reduced the costs of solar panels by 70% in 2015.<sup>51</sup>

## Grids

China has become the world's largest market for power transmission and distribution, and is set to be a major consumer of smart grid technology in response to China's increasing commitment to green development. Smart grid technologies are relevant to China's development in order to integrate the renewable energy with the electricity grid. The development of this technology is significant, as without smart grids, a great deal of wind and solar energy has to be ‘curtailed’ and wasted because it was not being absorbed by the electricity grid. Official data found that more than 15% of energy generated by wind power in the first half of 2015 suffered from curtailment, despite installing more wind farms than any other country in the world.<sup>52</sup>

China is in a position in which the “development of this enormous market could shape the future of the smart grid globally”<sup>53</sup> according to a report by McKinsey, which would accomplish two simultaneous goals—increasing environmental protection and driving economic development. China's unique structural context of having the potential to drive down costs due to the great scale of the market, with the consequences described by McKinsey as “the net effect of this ultra-competitive equipment sector is that China has ready access to cost-competitive equipment, and its utilities will be able to build out their infrastructure faster than anywhere else”.<sup>54</sup> This, teamed with China's ability to standardise and replicate across the whole nation quickly, smart grid investment acting as a tool for local governments to restructure their economies and due to the



centralisation of political leadership meaning that policy can be easily expedited and coordinated, has put China in a dominant position in the smart grid global market.

China's government has picked up on the need to solve this issue and has created policy to target the necessary grid development. China's National Energy Administration (NEA) released a new nine-point work plan in February, with the main focus on improving the flexibility of the electricity grid and encouraging new uses of renewable energy to prevent curtailment. China is also urging its top wind and solar power provinces to prioritise the transmission of renewable energy sources in



Bullet train attendants receive trainings in China's Shenyang  
(c) People's Daily

order to get more clean sourced power into the grid. The top economic planner, Xu Shaoshi, is encouraging the high renewable energy producing provinces of Gansu and Inner Mongolia in north-western China to launch pilot projects to help tackle the problem, which includes increasing the consumption of renewable energy locally, attracting more energy-intensive industries from the east to help absorb the supply of renewable energy better locally, as well as exploring the use of the use of wind-generated electricity to provide building heating to offset coal use.<sup>55</sup>

The NDRC stated: "We welcome local renewable energy generators to participate in and scale up direct power trading, providing alternative sources of power for electricity and heating, cutting prices for industrial users, and increasing power use and consumption as close as possible to the source of production," and emphasised an existing policy that renewable energy producers would



benefit from priority access to the grid. In addition, the NDRC has made at least 2 trillion RMB (€276 billion)<sup>56</sup> available to improve power grid infrastructure in the 2015–2020 period, in a bid to reduce coal consumption. “The rural grid modification and upgrade project will solicit private investor participation under the commercial mechanism,” said Premier Li Keqiang in a statement issued from the State Council in February.<sup>57</sup>

## Exporting trains

Innovation is one of China’s key priorities in order to transform the economy to a more consumer-driven model of economic growth. In 2003, when China embarked down the road of building a high-speed rail network it had no competence in the field. Building its ambitious domestic network gave it an opportunity to rapidly climb up the learning curve to the point that it is one of the leading rail exporters today. By the end of 2014 China had built a high-speed rail network of over 16,000 km, which is greater than any other country in the world and even larger than the entire high-speed railway network of the European Union. China’s leaders have been promoting the high speed railways overseas, emphasising their safety, reliability and economic competitiveness which has resulted in contracts in Serbia, Hungary and Macedonia as well as interest from the United Kingdom.<sup>58</sup> Analysts at McKinsey believe that China already holds 40% of the high-speed train market, but with the trains a focus of the 13 FYP this is likely to further increase.<sup>59</sup>

China’s two largest train makers merged at the end of 2015 in a bid to become even more competitive internationally, stating “we already have the proper conditions and due advantages to promote our high-speed railway technology and products in the international market”.<sup>60</sup> According to Wang Mengshu, a tunnel and railway expert at the Chinese Academy of Engineering, “China has rich expertise and experience in designing, building and operating a high-speed rail network, so the nation should be an ideal option for any foreign countries that want to build their own high-speed rail lines”.<sup>61</sup>

## E-mobility

China is pursuing excellence in all forms of electric transport. To get to today, it relied on a model of *regulating to innovate* which led it to major success in areas such as e-scooters, e-buses and increasingly the lucrative battery development sphere. Its dominance in e-scooters highlights the power of FYP regulation and planning to deliver success.

In the 1990s, regulation prohibiting petrol powered motorbikes and the exemption for electric-scooters, which were classified as non-motor vehicles, spurred this world leading market. By the 9th FYP (1996-2000), they were identified as one of 10 key scientific development priorities. Today, about 200 million e-scooters weave in and out of Chinese roads without the need for subsidy.<sup>62</sup> Should e-buses and e-cars emulate this pathway, China will go a long way to eradicating its dependence on oil and help revolutionise global transport.



Taxi Bleu and BYD launch outside Autoworld, Brussels

Already Chinese electric cars are outpacing European ventures. The Belgian taxi company Taxi Bleu placed a tender for 50 EVs in 2014 and ended up purchasing 34 of BYD's e6 model because it had a range of 300 kilometers per charge, almost double that of Renault Nissan's Zoe.<sup>63</sup> BYD is also leading deployment of e-buses across the EU.

The Volkswagen scandal, in which the German carmaker was unmasked by regulators in 2015 for deploying cheat devices to avoid US air quality standards, has already pushed Beijing to abandon Europe's clean air regulations in place of the much tougher Californian standards. The Beijing VI standard, which is currently being approved, will require all cars to have high-efficiency diesel particulate filters (DPFs) which would bring their exhaust filters below the Euro VI standard currently being rolled out across the EU.<sup>64</sup> Implementation of the FYP is likely to support the Californian flexible mechanism approach that rewards electric vehicle/zero emission producers, according to Dr Xiaoyuan Wu, Associate Professor Center for Automotive Industry (CAI) School of Automotive Studies, Tongji University.<sup>65</sup> The dual approach of regulating emissions as well as rapid intensifying rapid deployment of EVs is more comprehensive than the EU approach which just focuses on the former.

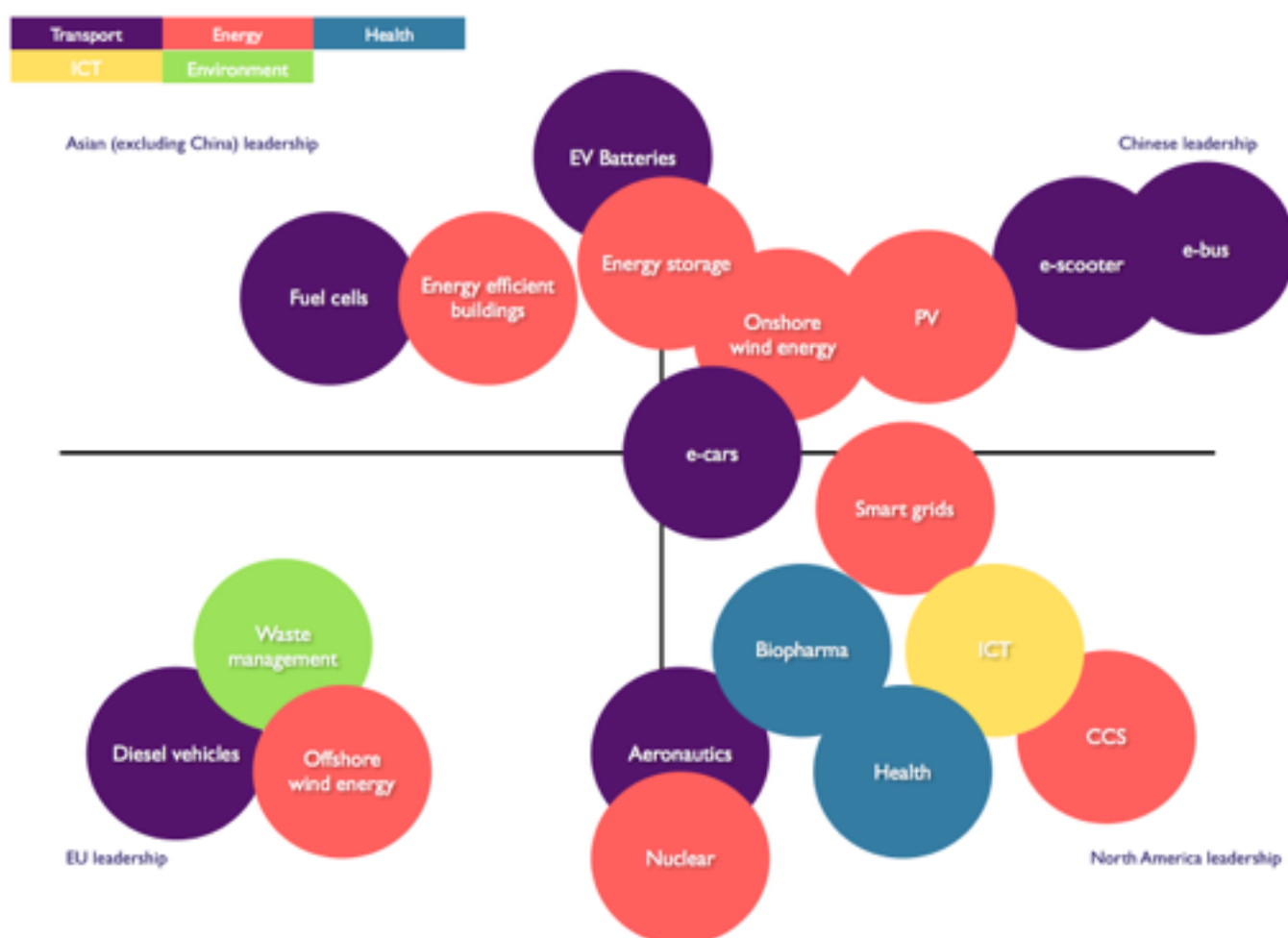
In terms of battery manufacturers, the top ten are dominated by Asian brands. The Chinese manufacturer BYD is the third largest global supplier though this position does not take into account its batteries for electric vehicles or storage solutions. The only European brand to enter the top 10 is the SB LiMotive a joint venture between the German company Bosch and the South Korean company Samsung.<sup>66</sup>

## Implications for Europe

Europe's inability to work with China on setting out a framework for cooperation on clean technology has caused considerable unrest, such as the solar tariff fiasco in 2015, and is a missed opportunity. European and Chinese consumers should not be denied the opportunity to purchase clean technology at affordable prices. To this end, closure economic integration and access to markets should be a key avenue for ensuring mutual benefits from China's clean technology revolution.

Figure 6, based on research by the European Commission and Change Partnership, indicates that the EU is already losing considerable ground in research and deployment in many of the lucrative clean technology spheres.

Figure 6: Clean technology research and deployment matrix



Source: European Commission<sup>67</sup> and Change Partnership

To address this, we propose a five point plan of constructive bilateral engagement to unlock greater mitigation effort whilst supporting clean jobs, growth and investment.

### The new bilateral China-EU arrangement

- i) The EU should establish a clean technology, *investment heavy 2030 legislative framework* based on a robust carbon price signal and strong architectures to support deep investment in energy savings, renewables and the electrification of surface transport. Furthermore, the EU must not go down the route of renegeing or watering down its existing mitigation commitment. The EU would send the wrong signals if it meets its commitment through accounting fudges such as the inclusion of land use, land change and forestry (LULUCF) credits into its target. Should China, the US and India also pursue this, all hope of meeting the Paris Agreement's target of keeping global temperatures "well below 2 degrees and pursue efforts to 1.5 degrees" would be obliterated.
- ii) A *clean technology trade agreement* should be reached enabling the freer flow of clean energy, transport and industrial products and services. Special rules, similar to the European Free Trade Agreement (EFTA) should be made to facilitate clean technology flows and access to both markets. Whilst stringent health, safety and environmental standards should be upheld, additional red tape should be removed to create the largest market in the world. European standardisation facilities should be established in China to allow their domestic manufacturing to meet EU market requirements. Similarly, greater efforts should be made to encourage Chinese companies to manufacture clean technologies within the EU to further cement trade cooperation.
- iii) A *joint technology cooperation platform* should be established to bring together closer cooperation within companies, universities and technology labs to further joint research, piloting and commercial scale demonstration.
- iv) With respect to *coal and industrial restructuring* a bilateral fund, similar to China's Industrial Restructuring Fund, should be established to support the regeneration of communities and workers.
- v) A timetable for *linking both carbon markets* should be established. As this will cover the bulk of global manufacturing industry, neither ETS can justify allocation of free pollution right to their industry. However, non-EU and Chinese producers should be required to purchase ETS allowances from the respective market they are supplying. This will create the global level playing field which blocks adequate policy responses in the EU whilst supporting clean jobs, growth and investment in China and the EU.





## Notes

- <sup>1</sup> HKTDC Research, “China’s 13th Five-Year Plan: Likely aims and implication,” 4 December, 2015.
- <sup>2</sup> China.org.cn, “Li stresses innovation in 13th Five-Year Plan,” 9 December, 2015.
- <sup>3</sup> Financial Post, “How to read between the lines of China’s latest Five-Year Plan,” 7 March, 2016.
- <sup>4</sup> Europa Statistics, “Gross domestic expenditure on R&D 2003-2013 (% of GDP) graph,” 1 July 2015.
- <sup>5</sup> HKTDC Research, “China’s 13th Five-Year Plan: Likely aims and implication,” 4 December, 2015.
- <sup>6</sup> HKTDC Research, “China’s 13th Five-Year Plan: Likely aims and implication,” 4 December, 2015.
- <sup>7</sup> APCO, “The 13th Five-Year Plan: Xi Jinping reiterates his vision for China,” 2015.
- <sup>8</sup> Carbon Brief, “IEA: China might have passed ‘peak coal’ in 2013,” 18 December, 2015.
- <sup>9</sup> Vox Energy and Environment, “The real war on coal is happening in China right now,” 6 March, 2016.
- <sup>10</sup> Energy Desk Greenpeace, “China’s coal mine moratorium is more ambitious than anyone expected,” 12 February, 2016.
- <sup>11</sup> See <http://www.nrdc.cn/coalcap/> and press release <http://www.nrdc.org/media/2015/150326.asp>
- <sup>12</sup> Financial Times, “China coal protests highlight overcapacity tensions,” 13 March, 2016.
- <sup>13</sup> Energydesk Greenpeace, “BREF: European air standards worse than China’s,” 5 March, 2015.
- <sup>14</sup> International Energy Agency, *World Energy Outlook 2014*, 2014.
- <sup>15</sup> The Diplomat, “China’s Energy Security Achilles Heel: Middle Eastern Oil,” 8 September, 2015.
- <sup>16</sup> PR Newswire, “Platts Report: China Oil Demand Grew 8% Year over Year in October,” 2 December, 2015.
- <sup>17</sup> The Diplomat, 8 September, 2015.
- <sup>18</sup> Council on foreign relations, “China’s environmental crisis,” 18 January, 2016
- <sup>19</sup> Asian Development Bank, “Addressing climate change risks, disasters, and adaptation in the People’s Republic of China,” 2015.
- <sup>20</sup> Robert A. Rohde and Richard A. Muller, “Air Pollution in China: Mapping of Concentrations and Sources.” University of Berkeley.
- <sup>21</sup> Ibid.
- <sup>22</sup> Reuters, “China to ‘declare war’ on pollution, premier says,” 4 March, 2014.
- <sup>23</sup> Lin, Jiaqiao, “China’s political system in brief”. [REEL.org.cn](http://REEL.org.cn)
- <sup>24</sup> Ibid.
- <sup>25</sup> World Resource Institute, “Statement: WRI calls China INDC ‘A serious and credible contribution,’” 30 June, 2015.
- <sup>26</sup> World Resources Institute, “A closer look at China’s new climate plan (INDC),” 2 July, 2015.
- <sup>27</sup> Ibid.
- <sup>28</sup> The Guardian, “China’s coal-burning in significant decline, figures show.” 19 January, 2016.
- [changepartnership.org](http://changepartnership.org)

- <sup>29</sup> Carbon Pulse, “China’s national ETS to go big from the start-official,” 8 December, 2015.
- <sup>30</sup> Ibid.
- <sup>31</sup> Reuters, “China’s Shenzhen to cancel surplus carbon permits’ 23 April, 2014.
- <sup>32</sup> IETA and CDC Climat, “China: An emissions trading summary”. 2015.
- <sup>33</sup> See CE Delft report “Calculation of additional profits of sectors and firms from the EU ETS,” March 2016 and Carbon Market Watch “Policy brief: Industry windfall profits from Europe’s carbon market,” March 2016.
- <sup>34</sup> European Commission, “ETS proposal Impact assessment”. SWD(2015) 135 final
- <sup>35</sup> IEA “World Energy Outlook 2013”. 2013.
- <sup>36</sup> European Commission, ‘Quarterly report on European electricity markets’. Volume 1, 2015.
- <sup>37</sup> World Coal Institute, “Coal and steel,” 2009.
- <sup>38</sup> Reuters, “Can China reform its bloated steel sector,” Andy Home, 3 February, 2016.
- <sup>39</sup> Ernst and Young, “Global steel 2015-2016 Globalize or customize: finding the right balance,” 2016.
- <sup>40</sup> Reuters, “China steel capacity reduction to cut 400,000 jobs - Xinhua,” 26 January, 2016.
- <sup>41</sup> Reuters, “China allocates 100 billion yuan to deal with job losses from capacity cuts: ministry,” David Stanway, 25 February, 2016.
- <sup>42</sup> Reuters, “Can China reform its bloated steel sector,” Andy Home, 3 February, 2016.
- <sup>43</sup> The Guardian, “China to cut 1.8m jobs in coal and steel,” 29 February 2016.
- <sup>44</sup> Bloomberg, “Solar and wind just did the unthinkable,” Tom Randall, 14 January, 2016.
- <sup>45</sup> IRENA, *Renewable Energy Prospects: China, REmap 2030 analysis*, November 2014. Accessed at: <http://www.irena.org/remap/> 11 March 2016.
- <sup>46</sup> Xinhuanet News, “China ranks first worldwide in PV power capacity,” 21 January, 2016.
- <sup>47</sup> Fortune, “China is utterly and totally dominating solar panels,” Katie Fehrenbacher, 18 June, 2015.
- <sup>48</sup> IEEFA, “Record wind and solar installation in China,” 5 February 2016.
- <sup>49</sup> Ibid.
- <sup>50</sup> IRENA and China Water Risk, *Water use in China’s power sector: Impact of renewables and cooling technologies to 2030*, March 2016.
- <sup>51</sup> BBC News, “China ‘deserves more credit’ for renewable energy effort,” Roger Harrabin, 15 June, 2015.
- <sup>52</sup> Reuters, “China steps up efforts to tackle curtailment of renewable energy,” 20 October, 2015.
- <sup>53</sup> McKinsey, *Evolution of the smart grid in China*, 2010, p.20.
- <sup>54</sup> Ibid.
- <sup>55</sup> Natural Resources Defence Council, “Big plans for integrating renewable energy into China’s electricity grid,” 9 March, 2016.
- <sup>56</sup> Reuters, “China targets \$300 billion power grid spend over 2015-20,” 1 September, 2015.
- <sup>57</sup> China Daily, “China to inject \$107b to upgrade rural power grid,” 5 February, 2016.
- <sup>58</sup> China.org.cn, “China’s high-speed train completed for export to Europe,” 8 July, 2015.
- <sup>59</sup> Financial Post, “How to read between the lines of China’s latest Five-Year Plan,” 7 March, 2016.
- <sup>60</sup> The Telegraph, “China’s high-speed rail network is on the global fast track,” Zhao Lei, 21 April, 2015.

<sup>61</sup> Ibid.

<sup>62</sup> CBS, “Energy advocates say we're at tipping point for electric cars,” Bill Hudson, 31 December, 2015.

<sup>63</sup> Bloomberg, “Brussels’ First Electric Taxis Are Made in China,” Mathieu Rosemain, 16 October, 2014

<sup>64</sup> The Diplomat, ‘The Next Step in Beijing's War on Pollution’. 3 February, 2016.

<sup>65</sup> Change Partnership and REEI interview with Dr Wu conducted on 11 September, 2015.

<sup>66</sup> EV Obsession, “Top EV Battery Manufacturers in Q1 2015,” James Ayre, 5 May, 2015.

<sup>67</sup> European Commission, “The European Energy Union Strategy”. 2015.