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PULLING AHEAD ON CLEAN TECHNOLOGY CHINA'S 13TH FIVE YEAR PLAN CHALLENGES EUROPE'S LOW CARBON COMPETITIVENESS

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Summary

- > China's new Five Year Plan is a clear statement of intent to dominate clean technology markets – both at home and abroad.
- > In the last five years China has caught up to the EU on per capita investment in clean energy and overtaken the EU on renewable energy build rates, R&D spending, power transmission grids and electric vehicles. The new Five-Year Plan accelerates China's move into the low carbon economy. By 2020, China plans to more than double its wind energy capacity, nearly treble its solar capacity, and increase electric vehicles by a factor of 10 – far outstripping European deployment. Meanwhile, clean investment in Europe continues to fall.
- > China's new plan poses a strategic challenge for Europe's low carbon economy. While growing markets will lower clean technology costs and create new opportunities for European firms, Europe is at risk of losing its low carbon competitive advantage if its domestic clean energy markets continue to weaken. European governments need to respond by strengthening the EU's clean energy goals and low carbon economic strategies.



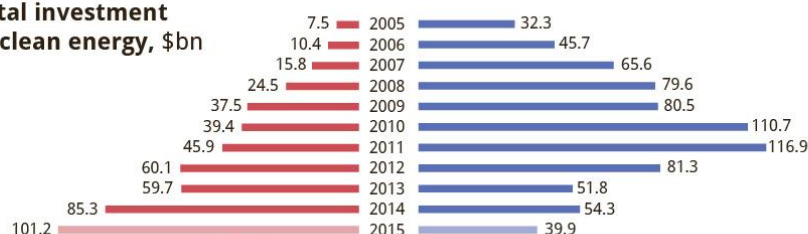
China

China has already overtaken the EU in clean energy investment



EU

**Total investment
in clean energy, \$bn**

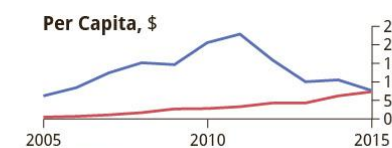


In 2015 China spent **2.5x** more on clean energy than the EU



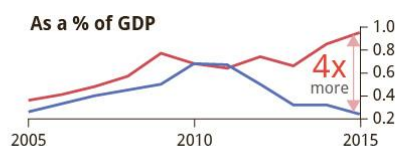
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Per Capita, \$



Sources: BNEF; Xinhuanet

As a % of GDP



**4x
more**



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Key facts: China's 13th Five Year Plan and low carbon growth

- > In the last 5 years, overall **clean energy investment in China has overtaken the EU** – with 2.5 more clean energy investment in China compared to the EU in 2015. **China now invests 4 times more than the EU in clean energy per unit of GDP.**¹ **On a per capita basis, China has drawn level with the EU**, with \$74 per person invested in clean energy in China in 2015 compared to \$78 in the EU.
- > China now has **five out of the world's top 10 wind turbine companies** and **three out of the top 10 solar panel companies** in the world.²
- > In the next five years, China plans to **more than double its wind energy capacity, nearly treble its solar capacity, and increase electric vehicles by a factor of 10.**
- > China has committed to **reduce carbon intensity per unit of GDP by 50% below 2005 levels by 2020**. It also has a new 65% carbon intensity reduction target by 2030, which means **an annual decarbonisation rate of 4% per year to 2030.**
- > China's pledge to meet 20% of its energy needs with non-fossil energy by 2030 will require China to deploy an additional **800–1,000 GW of wind, solar, nuclear, and other zero emission power generation capacity by 2030.**³ This increase in China's low carbon capacity over 15 years is **equivalent to Europe's entire existing electricity generation fleet** (908 GW).⁴
- > Over the next three years, China plans to **cut down 20% of its coal production**, which involves closing down 4,300 coal mines and relocating one million workers.
- > **China's goal of peaking greenhouse gas emissions by 2030 is likely to be achieved before 2025.**⁵
- > China's **green bond market may raise RMB 1.5 trillion** (€210 billion) for renewable energy and environmental projects from now until 2020.⁶ China may also become one of the first countries to issue sovereign green bonds.⁷
- > China's State Grid aims to establish a **Global Energy Interconnection (GEI)** that seeks to serve as a platform for extensive development, deployment and utilization of clean energy globally through the building of interconnected smart grids using ultra high voltage (UHV) technology.⁸

¹ Bloomberg New Energy Finance (2016) **Clean Energy Investment Trends**

² **"Top 10 solar module manufacturers in 2015"**, *PV-Tech*, 21 January 2016 ; **"Ten of the biggest and the best manufacturers"**, *Windpower Monthly*, 30 June 2015

³ B. Finamore, **"Why the US Supreme Court ruling will not derail climate action in China"**, *Chinadialogue*, 16 February 2016

⁴ EWEA (2016) **Wind in Power: 2015 European Statistics**

⁵ Green, Fergus and Stern, Nicolas (2016) **China's changing economy: implications for its carbon dioxide emissions**

⁶ **"China's \$230 Billion Green Bond Thirst to Supercharge Market"**, *Bloomberg*, 4 February 2016

⁷ **"China alone 'could smash 2015's global green bond record'"**, *Environmental Finance*, 4 February 2016

⁸ **"China's state grid to develop global energy interconnection"**, *Xinhuanet*, 21 January 2016



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China's new Five-Year Plan: a strategy for leading the global low carbon economy

In March 2016, China published its official 13th Five-Year Plan (FYP) (2016-2020), which sets out its development pathway for the next five years. This is a key moment for the global development of a clean energy economy.

The Chinese 13th Five Year Plan⁹ is the continuation of the 12th FYP that aims to create a strong foundation for China's green, robust and resilient economy over the next two decades. Among the main objectives of the 13th FYP are:

- > lifting 70 million people out of poverty,
- > doubling its GDP growth (compared to 2010) to RMB 90 trillion (€12.6 trillion) (with annual average growth rate of between 6.5%-7%), and
- > increasing its urbanization rate to 60%.

This paper assesses the targets that have been confirmed and approved by the 13th FYP and other official documents, including targets on greenhouse gas reduction, energy intensity, renewable energy and R&D. Other sectoral targets will be confirmed throughout this year as China releases its sectoral 13th Five-Year plans. Key investment figures that have been already released to the media are included in this analysis.

The 13th FYP prioritises structural reform of its economy, including both demand-side and supply-side reforms. The role of the market will be expanded. Clean technology and high-tech manufacturing and services will complement traditional manufacturing as the new economic driver. More importantly, the Plan states that the principle of 'ecological civilisation' (which emphasizes sustainable development) will guide China's growth and the implementation of development plans going forward.

Five years ago, E3G's analysis of China's 12th Five Year Plan warned of both risks and opportunities for European businesses from China's low carbon goals. Europe's leadership in low carbon technologies five years ago meant it would benefit from the growth in China's clean energy and green markets. However, after five years of impressive growth in its green market and sectors, China has now overtaken Europe in terms of low carbon investment. As a result, Chinese companies have grown and excelled in areas where they hardly existed five years ago.

Some European low carbon business sectors have taken advantage of the growth in clean energy markets, particularly in areas such as offshore wind, advanced grid technologies and systems integration. Europe has also benefitted from major cost reductions in areas such as batteries, LED lighting, solar PV and onshore wind that were enabled in part by the expansion of Chinese clean technology markets.

⁹ "Government report" (*Zhengfu gongzuo baogao*), *People's Daily*, 5 March 2016



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However, damaging EU-China trade disputes (including on solar PV) and an intermittent European domestic market for renewables and energy efficiency measures have meant that the full opportunity for Europe from the Chinese low carbon economy has not been realised.

“The 12th Five Year Plan [2011-2016] presents both risks and opportunities for European business. Europe’s current leadership in low carbon technologies means it will benefit from the growth in China’s clean energy and green markets. ... The rise of global Chinese companies in these sectors, however, means that Europe will face stronger competition for market share, albeit in the context of overall global growth in these sectors.”

- E3G analysis of the 12th Five Year Plan, March 2011¹⁰

Under the 13th FYP, China is ramping up its low carbon economic ambitions further and is now posing an even stronger challenge to European businesses in the clean economy. The Plan seeks to accelerate the Chinese government’s strategy of using China’s vast internal market to create domestic demand and champions, as well as reduce the cost of green technologies and services. This will be carried out hand-in-hand with its aggressive ‘going out’ strategy for its companies to capture the potentially large overseas market, especially in developing countries, through programmes such as the Silk Road and One Belt One Road (OBOR) trade initiatives. In energy, this is manifested by China’s State Grid’s ambition to establish a Global Energy Interconnection (GEI) that seeks to serve as a platform for extensive development, deployment and utilization of clean energy globally through the building of interconnected smart grids using ultra high voltage (UHV) technology.¹¹

China’s ‘outward push’ will be supported by new funding vehicles such as the Asia Infrastructure Investment Bank (AIIB) and China’s South-South Fund, which will use a portion of its some of its \$3.1 billion budget to launch 10 low-carbon industrial parks and infrastructure projects (including renewable energy) in developing countries.¹²

¹⁰ E3G (2011) **Chinese Challenge or Low Carbon Opportunity?**

¹¹ “China’s state grid to develop global energy interconnection”, *Xinhuanet*, 21 January 2016

¹² “Spotlight: China plays responsible role in fighting climate change, promoting African development”, *Xinhuanet*, 8 December 2015



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2011-2015: China catches up to the EU on clean investment

The last 5 years has seen China become a global low carbon competitor, challenging Europe's competitive advantage in clean energy.

In 2011, China embarked on a green economic transition by enacting its 12th Five Year Plan (2011-2015) that introduced its first carbon intensity reduction target, low carbon industry policy emission trading scheme (ETS) as well as massive investments in new energy sources. The government had supported the transition through large-scale public investment, increasing the role of the market as well as structural reform.

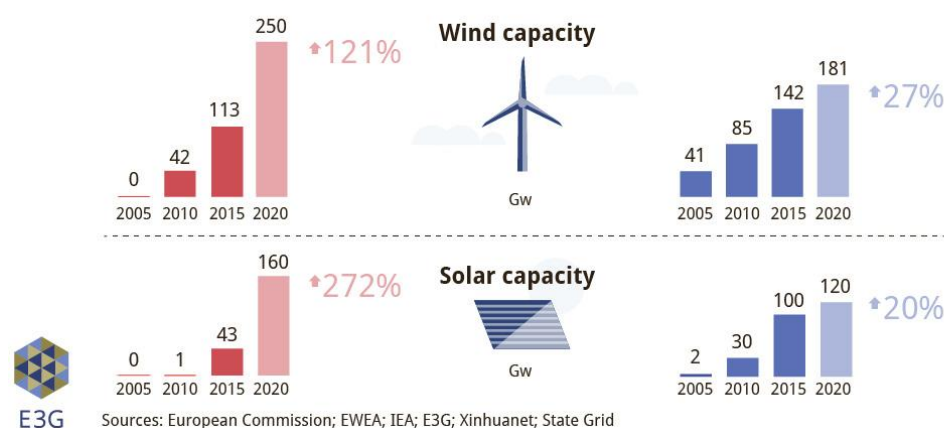


China

China is reinforcing its commitments to clean energy.
In the next five years, the EU risks being left further behind



EU



Five years on, China has over-achieved most of its green targets and now has the largest installed capacity of hydro, wind and solar power of any single country in the world. It has added more than 200 GW of renewable power capacity since 2011 (compared to an increase of 147 GW of renewable capacity in the EU).¹³

In the last 5 years, overall clean energy investment in China has overtaken that of the EU – with 2.5 more clean energy investment in China compared to the EU in 2015. Remarkably, this difference is even more pronounced as a proportion of GDP, with the rate of Chinese clean energy investment now 4 times that of the EU.¹⁴ On a per capita basis, China is drawing level with the EU, with \$74 per person invested in clean energy in China in 2015 compared to \$78 in the EU.

Between 2011 and 2015, clean energy investment grew by 120% in China, while in the EU it fell by 66%.

¹³ "Some thoughts on important issues related to grid planning under the 13th FYP" (*guanyu 'shisanwu' dianwang guihua nuogan zhongda wenti de sikao*), *Xinhuanet*, 4 January 2016; "NEA: Our Country has the largest installed solar capacity" (*nengyuanju: woguo chengwei quanqiu guangfufadian zhuangjirongliang zuida guojia*), *State Grid news*, 8 February 2016

¹⁴ Bloomberg New Energy Finance (2016) *Clean Energy Investment Trends*



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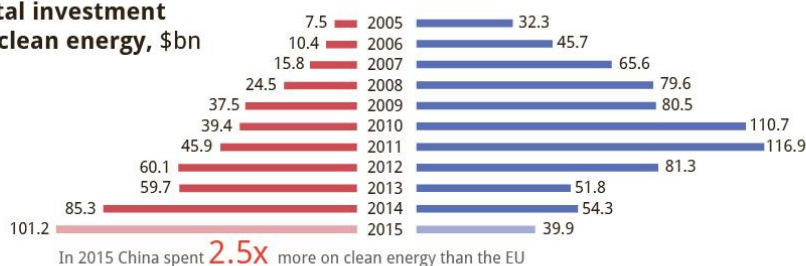
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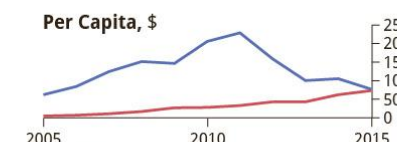
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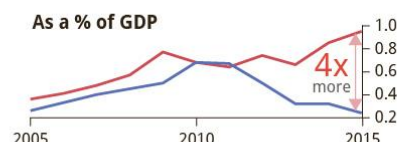
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Per Capita, \$



Sources: BNEF; Xinhuanet

As a % of GDP



During that period, Chinese solar panel and wind turbine manufacturers have quickly penetrated the market. China now has five and three out of the top ten solar panel and wind turbine companies in the world, respectively.¹⁵

Significantly, China's coal consumption fell for the first time this century in 2014, when it dropped by 2.9% - followed by a 3.7% drop in 2015.¹⁶ Over the last two years, coal power generation had dropped between 2%-4% while non-fossil generation grew at a rate of 20%.¹⁷ The trend is expected to continue until 2020, as will the increase in the use of gas at the expense of coal. In Europe meanwhile, coal use fell by 6% between 2012 and 2014 but remained flat in 2015.¹⁸

2016-2020: China accelerates its clean energy shift

The new Five Year Plan aims for a major growth in China's low carbon economy, which will set it up to dominate global clean energy markets.

China's new 13th FYP sets out the tools and foundation for strengthening China's green economy. With a strong emphasis on 'ecological civilisation', the Plan seeks to mainstream green growth across the economy via an elaborate set of market reform (e.g. resource pricing), green finance and industrial policy measures.

Climate targets

By 2020, China aims to reduce its carbon intensity and energy intensity by 18% and 15% respectively¹⁹. This means that China has committed to bringing down carbon intensity per unit of GDP about 50% below 2005 levels by 2020, a more ambitious goal

¹⁵ "Top 10 solar module manufacturers in 2015", PV-Tech, 21 January 2016; "Ten of the biggest and the best manufacturers", Windpower Monthly, 30 June 2015

¹⁶ "Analysis: Decline in China's coal consumption accelerates", Carbon Brief, 26 February 2016

¹⁷ Li Ying, "China's power sector and the economic 'new normal'", Chinadialogue, 25 January 2016

¹⁸ "Europe's Hooked on U.S. Coal, But That Can't Last", Bloomberg View, 22 December 2015

¹⁹ People's Daily, 5 March 2016, Op. cit.



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than the 40-45% reduction pledge that China made at the Copenhagen climate summit.

By 2020, China aims to invest a total of RMB 2.3 trillion (€310 billion) in clean energy²⁰, with close to 1,000 GW of cumulative non-fossil power generation capacity. Total investment in the energy saving and environmental protection sector is estimated to reach RMB 17 trillion (€2.28 trillion) during the 13th FYP period.²¹

In 2014, China set out its decarbonisation ambition in a bilateral announcement with the US as well as in its Intended Nationally Determined Contribution (INDC) in 2015. This includes the aim to peak its greenhouse gas (GHG) emission before 2030.

Its new 65% carbon intensity reduction target by 2030 means an annual decarbonisation rate of 4% per year all the way from 2005 to 2030. And its pledge to meet 20% of its energy needs with non-fossil energy by 2030 will require China to deploy an additional 800–1,000 GW of wind, solar, nuclear, and other zero emission power generation capacity by 2030.²² This increase in China's low carbon capacity over 15 years is equivalent to Europe's entire existing electricity generation fleet (908 GW).²³

Many believe that the Chinese government will over-achieve its 2030 targets, just as it is going to over-achieve its 2020 target.²⁴ China's goal of peaking greenhouse gas emissions by 2030 is likely to be achieved before 2025.²⁵ This is because China's climate ambition is driven by its own self-interest to overcome its serious environmental and pollution problems (including climate risks) as well as address its energy and climate security. The 'green' economy is now seen as an engine rather than a trade-off for economic growth.

Reduction in coal

The Chinese energy system remains highly reliant on coal. However coal consumption and production is also set to continue its downward trends during the 13th FYP period. In coming years, thermal powered electricity output is expected to decline at an annual rate of 2%-4%, while the contribution of non-fossil fuels is expected to increase by more than 20 % annually.²⁶ Over the next three years, China plans to cut down 20% of its coal production, which involves closing down 4,300 coal mines and relocating one million workers. The government is setting aside RMB 30 billion (€4.1

²⁰ "2.3 trillion yuan to be Invested in Important Projects of Renewable Energy" (*kezaisheng nengyuan wunian xintou 2.3 wanyi, jiangjianshe duoge zhongda gongcheng*), *Xinhuanet*, 29 January 2016

²¹ "Investment in energy conservation and environment protection is likely to reach RMB 17 trillion under 13th FYP" (*"shisanwu" jienenghuanbao shichang touzi youwangda 17 wanyi yuan*), *Xinhuanet*, 8 August, 2015

²² B. Finamore, "Why the US Supreme Court ruling will not derail climate action in China", *Chinadialogue*, 16 February 2016

²³ EWEA (2016) *Wind in Power: 2015 European Statistics*

²⁴ "China will 'far surpass' 2020 climate target, says top envoy", *Climate Home*, 24 February 2016

²⁵ Green, Fergus and Stern, Nicolas (2016) *China's changing economy: implications for its carbon dioxide emissions*

²⁶ "China's coal-burning in significant decline, figures show", *The Guardian*, 19 January 2016



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billion) for this transition.²⁷ China will also set up measures to curb the construction of new coal power plants, including slowing down the approval and construction of plants.

Low carbon infrastructure investment

China will also continue large-scale investment in low carbon infrastructure – RMB 3.8 trillion (€510 billion) on rail²⁸ and RMB 2.4 trillion (€330 billion) on grid²⁹ (including an estimated investment of RMB 175 billion (€23.5 billion) on smart grid)³⁰ during the 13th FYP.



China

Building on its dominance in wind and solar energy, China is taking up its next clean energy challenges



EU

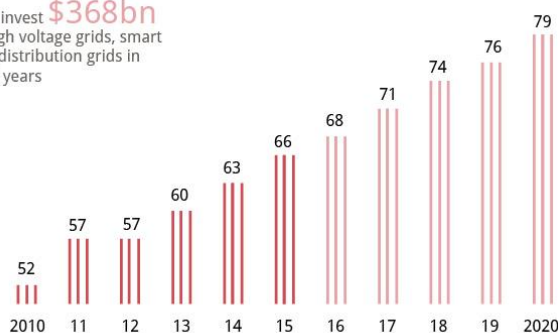
Yearly investment, \$billion

China will invest **\$368bn** in ultra-high voltage grids, smart grids and distribution grids in the next 5 years



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Source: Caixin Energy



Clean transport

China is also becoming strongly competitive on electric vehicles. From a total production of just over 8,000 five years ago, cumulative electric vehicle production in China grew to nearly half a million by 2015.³¹ Much of this is for the domestic market: in 2015 cumulative electric vehicle sales in China reached 450,000 – 50% higher than the EU.

By 2020, China aims to increase cumulative production and sales of clean energy vehicles tenfold, to 5 million each.³²

²⁷ "China plans to close down 4300 coal mines and prohibits new coal mines over the next three years" (weilai 3nian zhongguo niganbi 4300 zuomeikuang bing jinzhi xinmeikuang), *CN Buxian*, 27 January 2016

²⁸ "China plans to invest \$538 billion in railway in 5 years: Report", *Chinadaily*, 4 January 2016

²⁹ *Xinhuanet*, 4 January 2016, Op. cit.

³⁰ "State Grid will maintain high investment in smart grid construction under the 13th FYP" (*guowang wenbu tuijin zhinengdianwang jianshe, "shisanwu" touzi renjiang baochi gaowe*), *IOT World*, 14 January 2016

³¹ "Torrent and undercurrent - A look back to clean energy vehicles in 2015" (*jiliu yu anjiao - 2015 nian zhongguo xinnengyuan qiche huiwang*), *auto.sohu*, 8 February 2016

³² "Production and sales targets of new energy vehicles are set at 5 million" (*xinnengyuan qiche chanxiaoliang she mubiao 500 wanliang*), *news.163*, 6 March 2016



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China

Building on its dominance in wind and solar energy, China is taking up its next clean energy challenges



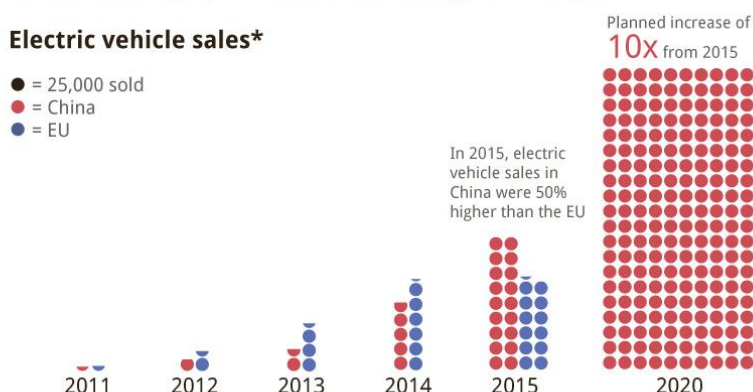
EU

Electric vehicle sales*

- = 25,000 sold
- = China
- = EU



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Sources: EU Commission; EV Obsession; Auto Sohu; Autohome; news.163. *including Plug-in Hybrid electric vehicles

Emissions trading

China has also announced its plan to establish a nationwide CO₂ emission trading system by 2017, which will cover the main industrial activities such as power, iron and steel, cement, paper, chemicals and nonferrous metals sectors. It is estimated that the national market would regulate 3-4 billion tonnes of carbon dioxide a year by 2020, less than half of China's total.³³ Comparatively, trading volume in the EU was around 5 billion tonnes of CO₂ in 2015.³⁴

Low carbon finance

To help achieve its clean energy ambitions, the 13th FYP will also increase the role of financial market in promoting green growth by creating new instruments and mechanisms such as energy and pollution rights, green asset securitisation, green bonds, a green stock index, and green industry and carbon funds.³⁵ China's green bond market may raise RMB 1.5 trillion (€210 billion) for renewable energy and environmental projects from now until 2020.³⁶ China may also become one of the first countries to issue sovereign green bonds.³⁷

Innovation

China is also restructuring its innovation and research programmes to make them more effective in driving innovation-led growth. Its national programme issued in 2006 has a target of research and development (R&D) reaching 2.5% of GDP by 2020³⁸ – around €390 billion. China had spent more on R&D in absolute terms than the EU

³³ "China's pilot CO₂ markets look to expand as national trading looms", *Reuters*, 25 September 2015

³⁴ "Global CO₂ trade volume down 19% in 2015, value up 9% -Point Carbon", *Carbon Pulse*, 11 January 2016

³⁵ "Ten major development in green finance under the 13th FYP" ("*shisanwu*" *shiqi lvsejinrong fazhan shida lingyu*), *Finance Sina*, 5 February 2016

³⁶ "China's \$230 Billion Green Bond Thirst to Supercharge Market", *Bloomberg*, 4 February 2016

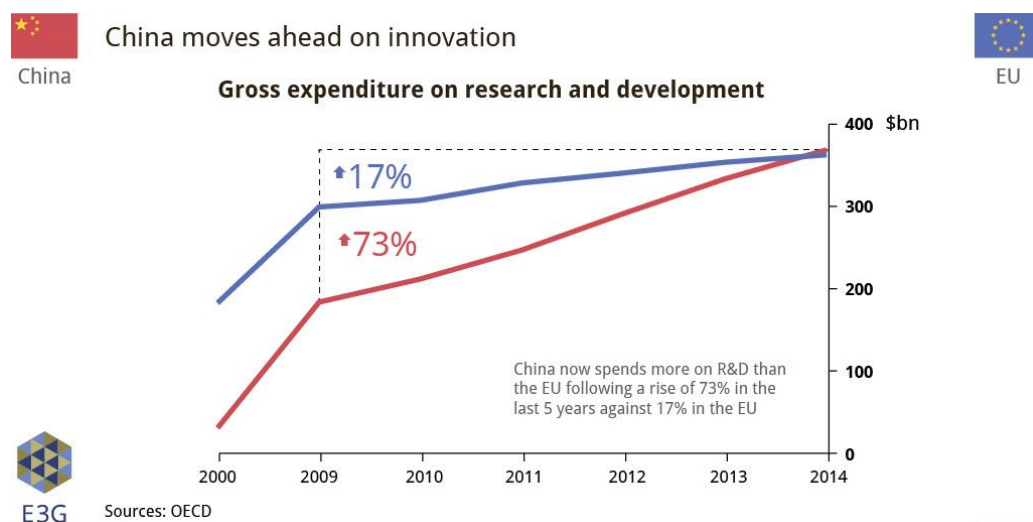
³⁷ "China alone 'could smash 2015's global green bond record'", *Environmental Finance*, 4 February 2016

³⁸ China State Council (2006) "The National Medium- and Long-Term Program for Science and Technology Development (2006-2020)"



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for the first time in 2014 (2.05% compared to 1.94% of GDP respectively)³⁹, and is poised to lead the world in total R&D spending by 2019.⁴⁰



How should Europe respond?

The Chinese Five Year Plan is a wake-up call for European low carbon competitiveness.

China's rapid movement into the low carbon economy should serve as a wake-up call to Europe. Over the next five years, China aims to expand its lead not only in the solar and wind sectors but also strategic areas such as high-speed rail, grids, information communications technology (ICT), batteries and electric vehicles. Although European companies currently maintain a technology edge in some of these sectors, their competitive advantage will be greatly reduced if no meaningful actions are taken in Europe in the medium term, as exemplified by China's recent technology leapfrog in areas such as high-speed rail, solar and wind.

While China accelerates its investment in the green economy, Europe is facing structural challenges and a slowing of its overall investment, including in clean energy.

Yet in contrast to China where clean energy targets are accelerating China's transition to a low carbon economy, Europe's climate and energy targets actually represent a deceleration of the pace of change.

³⁹ "China spends more on R&D than EU for first time in 2014: OECD", *Xinhuanet*, 4 February 2016

⁴⁰ "Higher R&D Investment in Renewable Energy Technologies Critical for Clean-Energy Innovation & Climate Action", *Breaking Energy*, 13 May 2015



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The EU's 2030 targets: a deceleration of the pace of change

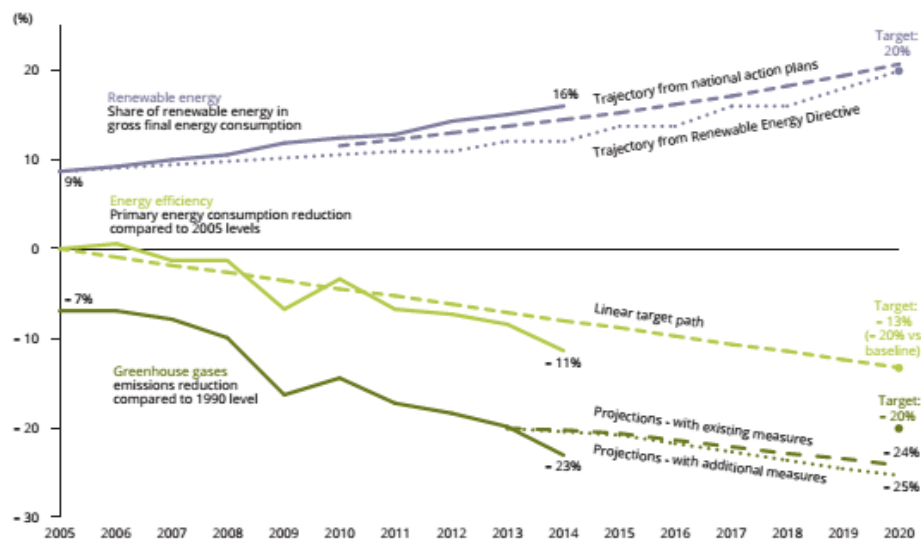
Current EU targets for 2020 include: 20% reduction in greenhouse gas emissions, compared to 1990; 20% renewable energy; and 20% improvement in energy efficiency compared to the baseline. For 2030, EU targets include: at least 40% reduction in greenhouse gas emissions, compared to 1990; at least 27% renewable energy; and at least 27% improvement in energy efficiency.

Between 2005 and 2014, the EU's **greenhouse gas emissions** fell from -7% to -23% below 1990 levels - an average reduction of 1.6% percentage points per year. It has now already exceeded its 2020 target of 20% emissions reduction. The EU's 2030 greenhouse gas reduction target of at least -40% below 1990 levels implies annual emissions reductions of only 1% per year: far less than the EU has achieved over the last decade.

Between 2005 and 2014, **renewable energy** grew from 9% to 16% of final energy consumption – an annual addition of 0.70%. This is higher than the 0.66% increase needed to reach the 2020 target, and the 0.69% increase to reach the 2030 target.

Between 2005 and 2014, the EU reduced its absolute **energy use** by 11%, an annual reduction of 1.1%. This compares to a reduction of only 0.3% per year needed to meet the 2020 target, and 0.6% per year to meet the 2030 target.

EU progress on climate and energy targets (source: EEA)⁴¹



Without vibrant domestic clean energy markets, European companies will be at a competitive disadvantage when marketing low carbon goods, services and technologies abroad.

⁴¹ European Environment Agency (2015) **Trends and projections in Europe 2015: Tracking progress towards Europe's climate and energy targets**.



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The current EU political agenda offers a window of opportunity to turn this situation around. The EU Energy Union and Capital Markets Union programmes together offer critical opportunities to safeguard Europe's low carbon competitiveness.

The EU's Energy Union seeks to make Europe "number 1 in renewable energy" and drive "a fundamental transformation of Europe's energy system" towards "an integrated continent-wide energy system where energy flows freely across borders".⁴²

"Our vision is of strong, innovative and competitive European companies that develop the industrial products and technology needed to deliver energy efficiency and low carbon technologies inside and outside Europe."

- European Commission Energy Union strategy, 25 February 2015

Over the next year, the EU will launch major strategies and legislative reforms on energy innovation and competitiveness, renewable energy, power market design, transport decarbonisation and energy efficiency. In addition, legislation will be put in place to ratify and implement the EU's commitments on climate change and emissions reductions agreed as part of the Paris Agreement.

In parallel, the EU is developing a 'Capital Markets Union' which seeks to increase investment levels throughout the EU, utilising non-bank finance, to meet the estimated €200 billion per year needed for Europe's transition to a low carbon economy.⁴³

Europe's core interests lie in maximising the benefits and minimising the risks of China's 'green rise'. This can only be achieved by implementing strong medium-term decarbonisation targets and integrating Europe's economic growth, energy and environmental agendas. Progress on these policy areas will be key:

- > Ensuring strong EU domestic demand for low carbon goods and services by strengthening EU emissions reduction, renewables and efficiency targets and market frameworks.
- > Continue to drive innovation by promoting large scale investments (through meaningful reform of its Capital Markets Union) in the Energy Union and its new Energy Union Integrated Strategy on Research, Innovation and Competitiveness.
- > Developing a robust and reciprocal EU-China relationship in the areas of low carbon cooperation, co-development of technology, access to investment and services, government procurement and intellectual property.

⁴² European Commission (2015) **The European Union Leading in Renewables**; European Commission (2015) **A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy**

⁴³ European Commission (2015) **Capital Markets Union Action Plan**