

# China: Decarbonizing the economy

## Gauging the economic impact of China's transition to 'net zero'



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### Key points

- A successful transition to carbon neutrality will require China to undertake transformational changes in its economic and energy systems over the coming decades
- Slower economic growth won't be enough to curb carbon additions. Instead, China needs to rebalance its economy towards the energy-lite services sector and shift its energy use away from fossil fuels
- Overhauling the world's largest energy system will require trillions in investment. While China has led the world in building renewable power capacity, significantly more investments are needed to meet the net-zero goal
- The green transformation will create winners and losers. The renewable energy and electric vehicle industries will benefit from a strong influx of capital and favourable regulatory changes. However, traditional industries that rely on fossil fuels will face a grim future, suffering concentrated, as opposed to systematic damages
- The net effect of China's decarbonisation drive is hard to quantify, although both positive and negative impacts will discernibly be large and long lasting. Beyond the domestic implications, the changing needs of the world's largest energy user will have far-reaching ramifications for the rest of the world

In the [first piece](#)<sup>1</sup> of our three-part report, we considered the rationale behind Beijing's commitment to tackle climate-related challenges and the likely path it will take to reach carbon neutrality by 2060. The analysis showed that eliminating greenhouse gases (GHGs) of the world's largest emitter – within the time frame committed – will be a challenging feat and will require the Chinese economy and energy system to undergo dramatic changes over the coming decades. This report investigates these necessary changes for the green transformation and identifies the likely winners and losers of the process.

### Green transition reinforces existing macro trends

In our previous report, we explained how GHGs are connected to three macro variants – GDP growth, energy intensity of the economy and carbon intensity of energy use – in a simple equation below:

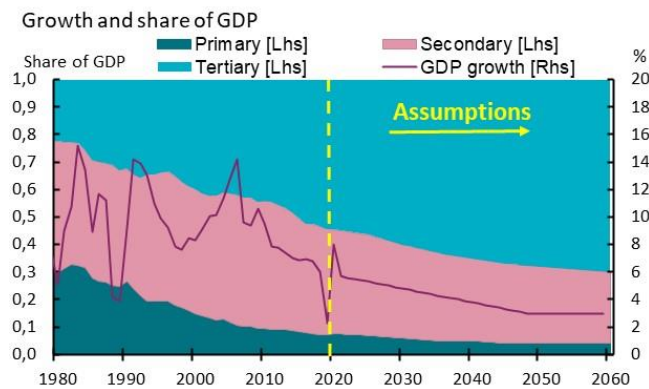
$$\text{GHG emission} = \text{GDP} \times \underbrace{\frac{\text{Energy use}}{\text{GDP}}}_{\text{Energy intensity of the economy}} \times \underbrace{\frac{\text{Emission}}{\text{Energy use}}}_{\text{Carbon intensity of energy use}}$$

This relationship highlights how the size and structure of an economy, along with its energy mix, can determine the scale of its GHG emissions. China's economy has undergone significant structural changes over the past decade. Trend

<sup>1</sup> Yao, A. and Shen, S., "[China: Path to Net-Zero](#)", AXA-IM Research, 18 March 2021

growth peaked at above 11% before the global financial crisis and has since been on a steady decline. Our projection assumes this slowdown will continue in the decades ahead, until it reaches 3% at the end of 2050, from which a steady state should prevail until the end of the projection period (Exhibit 1). While slower economic growth will help to lower incremental GHG *increases*, this is far from satisfactory for a country aiming to *reduce* emissions. To offset the current and anticipated growth in GHGs, China will have to focus on reducing energy use and making its economy less carbon intensive.

### Exhibit 1: Constantly changing economic landscape



Source: CEIC, AXA IM Research, as of April 2021

Reduced energy use could occur via a continued transition towards a services-based economy. The services sector is much less energy intensive – consuming as little as 1/5 of the energy per unit of output compared to the industrial sector. The services share of the Chinese economy has increased steadily to 55% and is on its way to reach over 70% in 2060, by our estimate (Exhibit 1). On the flipside, the share of the energy-heavy industrial sector is expected to fall from 39% to 25%. Within this, manufacturing will account for 18% of GDP – higher than that of the US (11%) and European Union (14%) – reflecting China’s effort to preserve its manufacturing base. Exhibit 2 shows how these compositional shifts of the economy,<sup>2</sup> along with improved energy efficiency,<sup>3</sup> could offset over 60% of carbon emissions in 2060, without any changes to the types of fuel China consumes.

### Trillions needed to rebalance the energy mix

While the reduction in energy intensity could occur naturally, altering the energy mix towards less carbon-intensive fuel sources will require the intervention of the government.

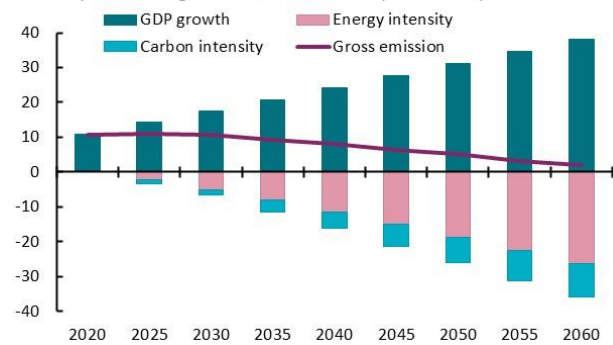
<sup>2</sup> It is important to stress that these macro changes are not a result of Beijing’s action to eliminate greenhouse gases, but the natural gravity of economic maturity. The transition towards a services and consumption-based economy, with lighter energy needs, will occur regardless China’s climate policies. However, efforts to decarbonise will help to strengthen the existing macro trends and possibly accelerate the transformation.

<sup>3</sup> It is worth noting that improved energy efficiency can also contribute to the reduction in energy intensity. For example, China’s industrial sector GDP grew by 35% over the past decade, while its energy use increased by only

Significant progress in renewable energy penetration would not have been possible in China without the vast official investment, subsidies and sweeping regulatory changes over the past decade. However, despite these advances, China is still at an early stage in building a carbon-free energy system given the continued dominance of coal.

### Exhibit 2: Drivers of decarbonisation

Decomposition of gross carbon emission (Bn Tonnes)

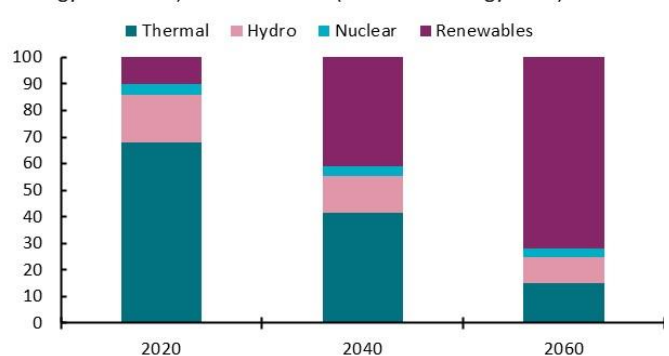


Source: Tsinghua, UBS, AXA IM Research, as of April 2021

Drastic changes are therefore needed to rebalance the country’s energy mix – from fossil fuels to cleaner energy – and such an undertaking will require trillions in new investments (Exhibit 3). A recent study by the Tsinghua university<sup>4</sup> shows that RMB138 trillion (\$21.6trn) – equivalent to 2.5% of annual GDP over the next 40 years – will need to be spent to support the upcoming green transformation.<sup>5</sup>

### Exhibit 3: Drastic changes to the energy mix

Energy mix: 2020, 2040 and 2060 (% of total energy used)



Source: Tsinghua, AXA IM Research, as of April 2021

24%. A 27% reduction in energy intensity was achieved through improved production methods and the adoption of energy conservation techniques.

<sup>4</sup> Xie, Z.H. et al., “China’s long-term low-carbon development strategy and pathway” Institute of Climate Change and Sustainable Development Tsinghua University, July 2020

<sup>5</sup> Other studies – for example, one led by Dr Jun Ma, Chairman of the China’s Green Finance Committee – have suggested even bigger numbers based on the aggregation of provincial carbon reduction plans.

## Decarbonisation will create winners

Among the largest beneficiaries of these new investments will be the renewable energy industry. China has grown its wind and solar power capacity to 500GW from practically zero a decade ago. However, at the current installation rate of 75GW, it still falls far short of the 250GW annual installation needed to meet its net-zero goal (Exhibit 4). Beijing is planning to significantly raise investments over the coming decade, building more wind and solar farms, refining existing technology, and improving power storage and transmission infrastructure, to fast track the industry away from fossil fuels.

Rapid cost reductions of renewables will help to expediate this transition. 2020 was a watershed year when the marginal costs of wind and solar power converged with that of coal. Industry experts expect these cost reductions will continue to drive down the prices of clean energy to be only a fraction of that of coal by 2060 (Exhibit 5). These cost reductions, aided by favourable regulations and growing public demand for cleaner fuel, will help to transform China's energy landscape.

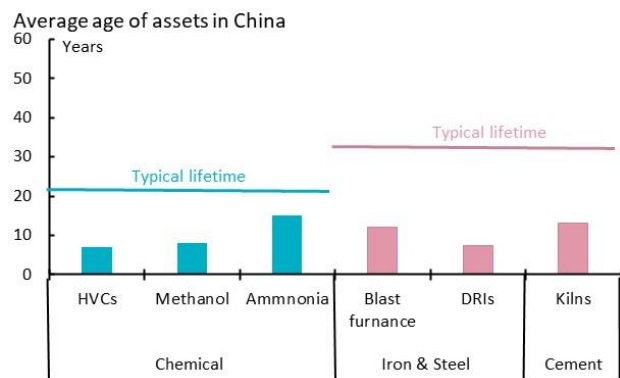
Another beneficiary of decarbonization is the electric vehicle (EV) industry. Like renewable energy, China went from an insignificant player to the world's largest producer and consumer of EVs within a decade (Exhibit 6).<sup>6</sup> Despite reaching a considerable scale, future growth of the industry is supported by three forces. First, China's car ownership will continue to grow as the middle-class expands.<sup>7</sup> Second, the transition to carbon-free transportation will raise demand for EVs. Besides the environmental considerations, improved technology and products, along with cost reduction<sup>8</sup>, are making EVs increasingly more attractive than traditional combustion-engine cars. Finally, improved public infrastructure – more charging stations and smarter roads

compatible with autonomous driving – will add to EV's appeal. Beijing expects the share of EV in total vehicle sales to surge from the current 5% to 20% by 2025, and 50% by 2035.

## Those who fail to adapt lose

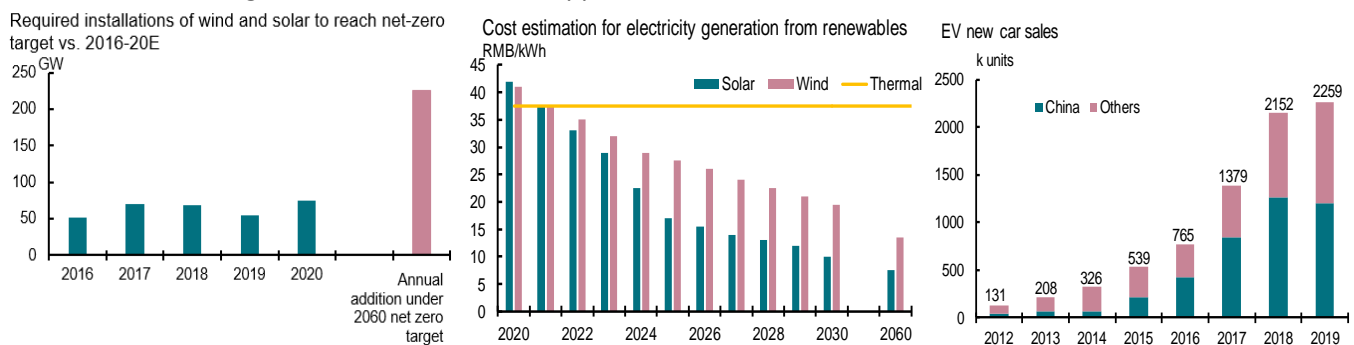
Contrary to the winners, China's green transformation will create casualties too. Chief among them are coal-related industries – from upstream mining and processing, to the downstream coal-fired power plants and sectors that rely on traditional energy. While this is the common fate for all fossil fuel companies globally – as the world reins in greenhouse gases – China's problem is particularly acute given its relatively young capital stock. The International Energy Agency estimates that the average age of assets in China's chemical, iron and steel, and cement industries is around 10 to 20 years, compared to a typical lifespan of these assets of 30 to 40 years (Exhibit 7). Replacing a relatively young capital stock is more likely to create stranded assets with negative wealth and financial spill-over effects.<sup>9</sup>

### Exhibit 7: Retiring young capital stock poses risks



Source: IEA, AXA IM Research, as of April 2021

### Exhibit 4, 5 and 6: Significant investments to support decarbonisation will create winners in renewable and EV



Source: Tsinghua, DB, UBS, Berylls Strategy Advisors, and AXA IM Research, as of April 2021

<sup>6</sup> Currently transportation contributes c10% of China's total CO2 emissions. Compared to the 20-25% share in developed countries, China's number is held down by its low car ownership. The split in emissions in the transportation is around 5:3:2 for road, air and sea freight.

<sup>7</sup> At a rate similar to Japan's in 1975, a further increase in China's car ownership offers an aggregate opportunity for EVs.

<sup>8</sup> EV is expected to reach price parity with combustion-engine cars before 2024 in China.

<sup>9</sup> This may also create incentives for Chinese owners to adapt additional technology to minimise the relatively high potential cost of stranded assets, including the use of carbon capture and storage techniques. At this stage, however, such techniques have not been refined to be commercially viable, but this could change as the technology matures over time.

However, the repercussions of these effects are likely to be concentrated rather than widespread. Rapid downsizing of some industries will be discernibly painful for regions that rely on them for employment, investment and tax revenues.<sup>10</sup> But given the coal industry is relatively small – accounting for only 0.3% of China’s total employment and 2.5% of non-financial corporate debt – its demise will unlikely destabilise the overall economy and financial system. China’s top-down macro-management framework could also be better placed to handle these changes through fiscal transfers, re-employment training, debt write-offs and the founding of replacement industries.<sup>11</sup>

Finally, not all companies engaged in the traditional industries are doomed. Reinventions could be possible for those who can access the right technology, capital and manpower needed for a successful transition. As an example, China’s top five coal-power producers are also today the world’s largest investors in renewable energy and their survival in the upcoming energy revolution will reflect their management of this transition.

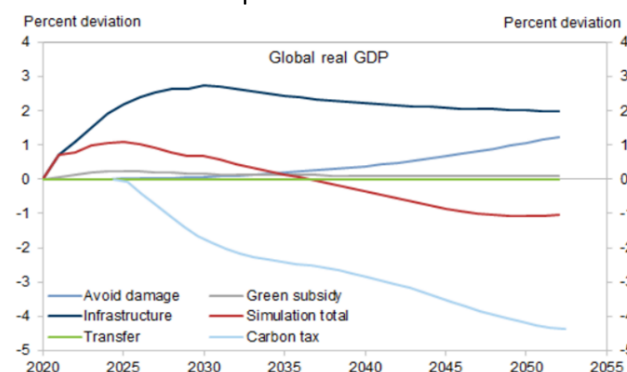
### Profound impacts for China and the world

It is difficult to quantify the far-reaching impacts of China’s transition to a carbon-free economy. The above discussion has focused on the most affected industries, but the collective future changes are likely to be transformational for all walks of life. One global study on the impact of fulfilling the Paris Agreement shows that actions to reduce emissions could boost global GDP growth by up to one percentage point over the next five years (Exhibit 8). However, the positive effects weaken beyond 2025 and eventually turn negative after 2035 as the burden of internalising carbon costs outweighs the diminishing gains from infrastructure investment and climate-related damage avoidance. The gains and losses eventually offset one another, resulting in a net-neutral effect over time.

Applying this crudely to China, one could argue that the boost from increased investment to replace the nation’s coal-dominant energy stock will be greater than the world average. Loss prevention from environmental degradation could also be larger for a country that has suffered badly from air and water pollutions, and climate-related damages.

On the other hand, China may also endure higher costs for having to replace a younger capital stock. These costs, by the way, could be captured going forward by the price of carbon as a unified and nationwide carbon trading scheme gets underway. Industry experts believe that carbon priced in China need to go up 10-fold from their current 30 to 40 yuan per tonne to reflect the true cost of pollution under the 2060 commitment.

Exhibit 8: Global impacts of decarbonisation



Source: IMF, AXA IM Research, as of April 2021

Finally, a successful overhaul of the world’s largest energy system will likely have broad-based global ramifications. Reduced reliance on foreign supplies of fossil fuel – oil, gas and coal – will improve China’s balance of payments but weigh on global energy prices. The latter will impact trade revenues and the wealth of commodity producers with implications for geopolitical stability for regions like the Middle East and Latin America. Improved energy self-sufficiency could also moderate the importance of the South China Sea as a major energy shipping route for China, helping to calm tensions in the region. Finally, the pre-eminence of the US dollar as a global reserve currency can in part be attributed to its link to the pricing and trading of oil, creating what is known as the ‘petrol-dollar’. But with oil becoming a less important fuel source for China and the rest of the world, such support for the dollar could wane, potentially creating room for the Renminbi to play a bigger role in the future global monetary regime.

<sup>10</sup> For example, the wholesale exit of small coal miners following China’s anti-pollution campaign in early 2010s had a devastating impact on the regional economies of Shanxi and Inner Mongolia.

<sup>11</sup> IEA estimates that the job-creation rate of wind and solar power, and energy efficiency industries is 1.5-3 times that of traditional energy

industries. Hence, with proper training and assistance, job losses from the old industries could be absorbed by the expansion of new industries.

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