



Can China turn the climate transition challenge into an opportunity?

China emits a third of the world's CO₂. Although China's per capita emissions are still lower than the Organisation for Economic Co-operation and Development (OECD) countries' average, the issue of energy transition is crucial to the global climate challenge. It is also crucial to the sustainability of the Chinese economic model, which is one of the most exposed to the physical risks of climate change.

The Chinese authorities have formally undertaken to achieve carbon neutrality by 2060, and have clearly initiated this transition. However, the objective of carbon neutrality can only be achieved with policies and resources that are far more ambitious than those announced.

China could turn the climate challenge into an opportunity, by providing the renewable energy production capacity for which it is currently well positioned, thereby tapping into new sources of growth. But here again, the challenges will be manifold.

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55%

share of coal as a primary source of energy in China

14 to 17 trillion US dollars

amount of investment needed in the transport and energy sectors to achieve carbon neutrality by 2060 in China according to the World Bank

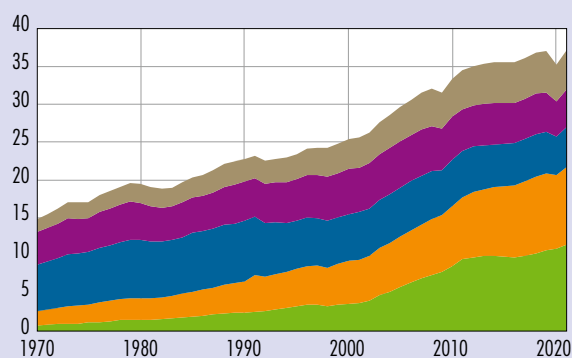
80%

China's share of global production of solar panels

Annual CO₂ emissions by geographical area

(in billions of tonnes of CO₂ per year)

China Europe
Asia (excl. China) United States Other



Source: Global Carbon Project.



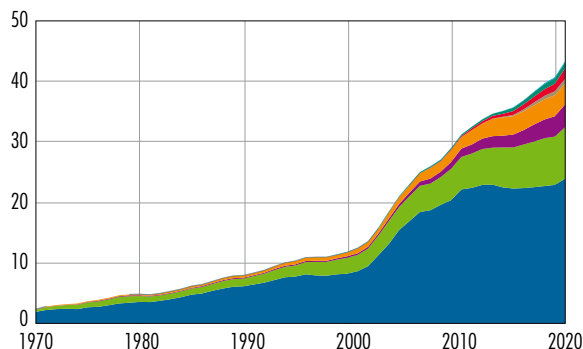
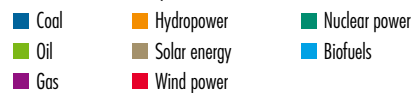
1 An unsustainable growth model in the context of climate change

Since the start of economic reforms in 1978, China has experienced a phase of development and strong growth. Between 2001 and 2021, its population grew by around 200 million, and its GDP soared by a factor of almost 1.5. This rapid development has been largely driven by an exceptionally high level of investment, which averaged 41% of GDP over the period. This share is twice as high as in the European Union or the United States, particularly in construction and manufacturing. The large allocation of investment to the most energy-intensive sectors, combined with an industrial base that is less efficient than in developed countries, has resulted in highly energy-intensive economic growth. Against this backdrop of sustained, rather extensive, growth and highly energy-intensive GDP, China's energy consumption has risen considerably over the past two decades (see Chart 1).

The impact on greenhouse gas emissions is assessed according to the energy source used. To meet this demand, China's energy mix has been, and remains, heavily dependent on coal (55% of the total in 2021 – see Chart 2 – compared with 11% in the United States, for example). By 2022, coal production had reached an all-time high at over 4.5 billion tonnes, i.e. a 4.5-fold increase since the beginning of the century. Despite concerns about air quality and China's commitment to decarbonisation, coal mining is therefore a dynamic activity. It continues to fuel an industrial ecosystem, which is concentrated in the

C2 Energy consumption in China, by source

(in thousands of TWh)

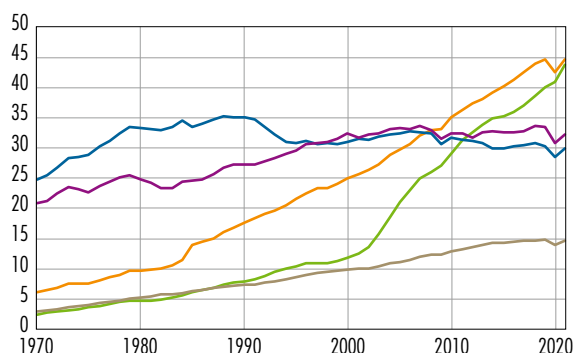


Source: National Bureau of Statistics of China.

north-east of the country and which is similar to those in the coal-mining regions of Europe during the industrial revolution. Managing decarbonisation will be all the more complex as the regime's productivist ideology has been associated with this industrial ecosystem since the 1980s and as energy independence argues in favour of maintaining coal. Non-carbon energies are thus making their way into the energy mix, but they are still a minority (16% of energy sources in 2021). As a result of this high-carbon mix, combined with highly energy-intensive growth, China emits three times more CO₂ for each unit of GDP produced than the United States (and more than six times more than France). With a GDP equivalent to 18% of world GDP, China accounted for 31% of global CO₂ emissions in 2021 (see Chart 3).

C1 Primary energy consumption by geographical area

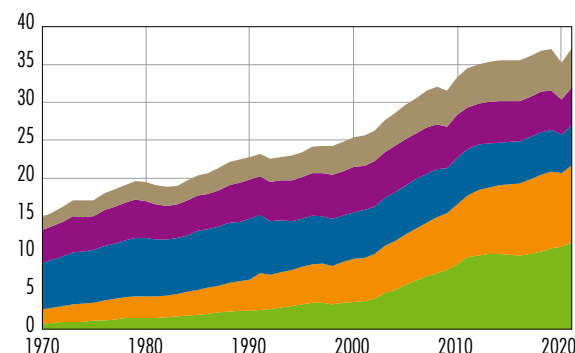
(in thousands of TWh)



Source: BP, Statistical Review of World Energy 2022.

C3 Annual CO₂ emissions by geographical area

(in billions of tonnes of CO₂ per year)

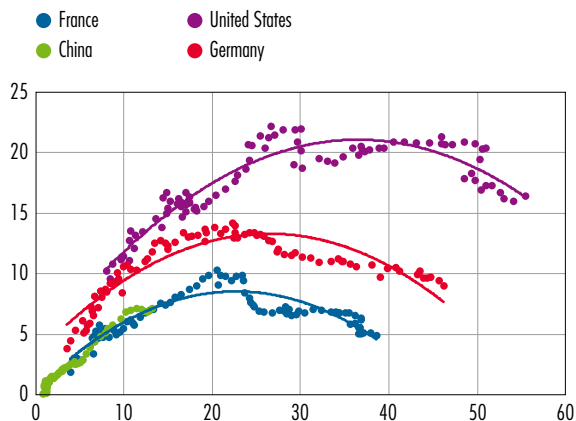


Source: Global Carbon Project.



C4 CO₂ emissions per capita and GDP per capita

(x-axis: GDP per capita, in thousands of US dollars per year;
y-axis: CO₂ emissions per capita, in tonnes per year)



Source: World Bank, World Development Indicators.

In the past, the development of advanced countries has been associated with a rise in CO₂ emissions per capita, with a dip observed from disparate income levels, but higher than those currently observed in China (see Chart 4 above for an illustration of France, Germany and the United States). Black et al. (2022) show that compliance with the Paris agreements requires CO₂ emissions per capita in China to start declining before 2030, when GDP per capita in the country will have reached a level close to USD 20,000. In order to achieve its decarbonisation objective, China must therefore start to reduce per capita emissions earlier than other economies, including France, have done in the past. France stands out for the early transition of its energy mix linked to the large-scale deployment of nuclear power plants.

2 The carbon neutrality strategy, marked by greater efforts in recent years

The “net zero” objective will require in-depth transformations of the Chinese economy

China has pledged to peak emissions in 2030, while reducing its carbon intensity (CO₂ emissions/GDP), and then to achieve carbon neutrality (“net zero”) by 2060. In its Nationally Determined Contributions (NDCs) on decarbonisation submitted to the United Nations General Assembly in 2020, China announced its intention to reduce its carbon intensity by over 65% by 2030 compared with 2005 levels. It also pledged to raise the

share of non-fossil fuels in primary energy consumption to around 25% by 2030 and increase its total installed capacity of wind and solar power to over 1,2 billion kW by 2030 (almost double the capacity in 2021). The 14th Five-Year Plan calls for a reduction in the carbon intensity of growth of 18% between 2020 and 2025.

Alongside the transformation of the energy mix, one of the levers is to rebalance the growth model in favour of less energy-intensive sectors (International Monetary Fund – IMF, 2022 a). This is also one of the strategic priorities established by the Chinese authorities in the country’s economic planning. In 2018, the industrial and energy-producing sectors accounted for 78% of total emissions, with the industrial sector representing 33% (Crippa et al. 2021). This reflects i) a very high share of the manufacturing sector in GDP, ii) a still large share of heavy industry and iii) still limited energy efficiency in the industrial sector. Nevertheless, the trend for these three factors is towards a reduction in energy consumption.

However, a significant rebalancing would require far-reaching structural reforms (strengthening safety nets, making the labour market more flexible, reforming state-owned enterprises, etc.; IMF, 2022 b). This would take time, especially if the Chinese authorities do not show greater commitment (Cabrilac, 2022). The Covid crisis, which disrupted the Chinese economy, in particular due to a strict zero Covid policy, and which weighed heavily on private consumption, contributed to slowing down this transition.

China is now the largest investor in renewable energies

Faced with the health risks associated with air pollution even more than the impacts of climate change, the Chinese authorities have long supported the development of non-carbon energy sources in the country. Since 2011, despite rising energy needs, coal-fired power plant capacity has increased only very little, although it is expected to pick up again in 2021 and 2022 (see Chart 3 above). The country has thus become the world’s largest investor in renewable energy capacity (USD 380 billion in 2021, compared with USD 215 billion in the United States, the second largest investor, according to the International Energy Agency).

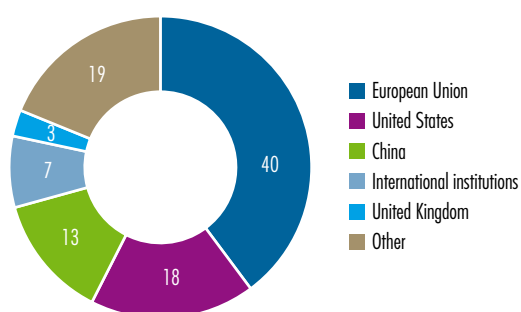


In addition, the Chinese authorities' commitment to green multilateral initiatives is clear. In particular, the People's Bank of China (PBoC) participated together with seven other central banks (including the Banque de France) in the launch of the Network for Greening the Financial System (NGFS) in 2017. Within this framework, China particularly stressed the importance of preserving the environment, beyond climate change. China (the PBoC) co-chairs the G20 Sustainable Finance Working Group with the United States, and is an active member within the group.

The Chinese authorities have also taken initiatives to develop green finance. In 2015, the PBoC defined the types of projects that may be eligible for the issuance of green bonds in its Green Bond Endorsed Projects Catalogue. This initiative has contributed to the rapid emergence of this market segment. In the first quarter of 2022, China was the second largest country in terms of outstanding green bonds issued (with USD 250 billion, or 13% of the global total; see Chart 5), after the United States (USD 334 billion). However, according to data from the Climate Bonds Initiative, 42% of green bonds issued in China in 2021 did not comply with international standards. The taxonomy was revised in 2021 to exclude all projects associated with fossil fuels.

As regards monetary policy, beyond including "green" securities within monetary policy collateral (already in place since 2018; Macaire and Naef, 2021), the PBoC has also introduced a cheap refinancing facility dedicated to green projects, the Carbon Emission Reduction Facility (CERF).

C5 Outstanding green bonds, by region of issue, first quarter 2022 (%)



Source: Climate Bonds Initiative.

Note: International institutions mainly include multilateral development banks.

The impact of these mechanisms in support of the energy transition is difficult to estimate; it will depend on the amounts ultimately invested, as well as on the actual impact of green financing on carbon emissions. However, the Chinese authorities are using these programmes to send out a strong signal.

In July 2021, the Chinese authorities launched a unified market for CO₂ emission allowances in Shanghai, which covers almost 40% of the country's CO₂ emissions. Given the current price of carbon allowances, which is one of the lowest in the world (CNY 58 per tonne on average in 2022, i.e. EUR 8.2, compared with more than EUR 80 per tonne on the European market), the free supply of allowances and the lack of binding targets in terms of energy intensity, this new market is not a factor of rapid change. However, it is an important tool available to the authorities, which could activate it in the medium term.

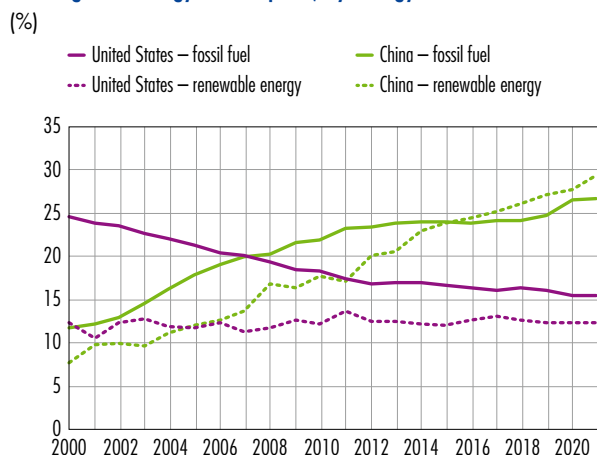
3 Achieving carbon neutrality will require more ambitious policies and resources

Efforts to reach the targets have so far been insufficient

China's commitments to achieve "net zero" are encouraging, but will need to be followed by much more ambitious efforts to make the path to net zero credible (Aglietta et al., 2022). The target of reducing the carbon intensity of growth by 18% between 2020 and 2025 is commendable, but as GDP growth continues in absolute terms, it de facto authorises an increase in emissions of close to 25% over the length of the plan. Furthermore, this target appears increasingly difficult to achieve. According to figures published by China's National Bureau of Statistics, the carbon intensity of growth dropped by 3.8% in 2021, and by just 0.8% in 2022. In order to meet the target of the five-year plan, it would have to fall by an average of 5.1% per year over the next three years, which seems ambitious. In addition, the greening of China's energy mix should not overshadow the fact that, because of persistently high GDP growth, despite a recent slowdown, China's share of global fossil fuel consumption is continuing to rise (see Chart 6). Faced with energy supply risks, particularly during episodes of drought that hamper hydroelectric power generation, China has approved the construction of coal-fired power plants with a total capacity of 106 GW in 2022, which represents a 10% increase in its current capacity (and 5%



C6 Share of China and the United States of global energy consumption, by energy source



Source: World Bank.

of the world total). Under these conditions, the road ahead to reach a carbon emissions peak in 2030, and then carbon neutrality in 2060, will be particularly difficult.

China is comparatively more exposed to the consequences of climate change. In China, even more than in the rest of the world, the path to reduction has become necessary due to the physical risks posed by climate change to the sustainability of the growth model. According to the Intergovernmental Panel on Climate Change (IPCC), China ranks among the continental countries most exposed to climate change. The average temperature has risen by 1°C over the last thirty years, more than anywhere else in the world, as have the number of extreme events. According to the World Bank, climate risk poses a major threat to the Chinese economy, with annual GDP losses estimated at between 0.5% and 2.3% by 2030 (World Bank, 2022). In addition, given the scale of the efforts required, the cost of the energy transition would be higher for China than for other major economies. According to the IMF, a carbon tax compatible with a “net zero” scenario for 2050 would significantly lower GDP (by between 1% and 1.5% of a percentage point per year), in particular through a reduction in investment (IMF, 2022 c). This effect could be offset by infrastructure investment, particularly in renewable energies.

Capital losses and huge investment needs

Like most emerging countries, one of the difficulties that China faces in its energy transition is the fact that its current coal-fired power plants are fairly new. Their average age

is 13 years, a figure similar to that of India, to be compared with 41 years in the United States and 34 years in Europe. A rapid energy transition would result in a large accumulation of stranded assets, especially if China continues to build new coal-fired power plants (Zhang et al., 2021).

Achieving carbon neutrality will require a sharp increase in investment and a revision of the regulatory framework. According to the World Bank, at least USD 14 trillion (0.97% of GDP per year) worth of investments will be needed in the transport and energy sectors to achieve net zero by 2060 (World Bank, 2022), with a more sustained effort over the next decade to kick-start the transition (an additional 0.13 point of GDP per year). According to another estimation, which includes additional sectors of activity (construction, agriculture and industry), the amount of investment needed will represent 2% of GDP on average between now and 2060 (CICC Research and CICC Global Institute, 2022). The transition to low-carbon of China’s energy-producing sector, which is the country’s most polluting sector, must be a priority if emissions are to decline rapidly (World Bank, 2022; International Energy Agency, 2021). This will also make it possible to anticipate the growing demand for electricity from other economic sectors, linked to the continuing rise in GDP, coupled with the increasing electrification of production facilities. Cui et al. (2021) identify possible but costly ways of making the use of coal-fired power plants compatible with climate commitments, through early decommissioning and a reduction in the operating hours of the remaining plants. Liu et al. (2022) also estimate that transforming the energy mix and improving energy efficiency could only contribute around 75% of cumulative emission reductions up to 2060. The remainder would then have to be offset by negative emission solutions (carbon capture), which are currently very costly.

In addition, this transition will only be possible if the regulatory framework is revised, in particular, with i) the extension of the carbon market created in 2021, by making it more restrictive through prices and a wider sectoral coverage, and ii) increased financial support from the authorities, aimed at directly stimulating innovation, but also at attracting private capital. It will also require reducing oligopolistic effects in the energy sector, which are holding back the transition (Song and Zhou, 2021).



Estimates of the final impact of the transition on Chinese growth are very wide-ranging. World Bank simulations suggest cumulative impacts on GDP of between -2.0% and $+0.3\%$ by 2060. The World Bank considers this range as bearable for China, even at its lowest level. It could nevertheless be reduced by making the labour market more flexible and better adapting the education and professional training framework. However, the impacts will disproportionately affect the poorest households (Liu, 2019; Wang et al., 2019), and will be geographically and sectorally concentrated. The industrial and coal-producing provinces in the north-east of the country are likely to experience the greatest reductions in emissions and the strongest impact on their economic model (Du et al., 2017).

China wishes to turn the challenge into an opportunity

Given its leading position in the renewable energy sector, China could turn the climate challenge into an opportunity. The transition to a less carbon intensive economy could be a driver of economic growth, innovation and job creation, with the advantage of reducing its dependence on imported fuels and thus strengthening its energy

security. In 2020, China was home to more than a quarter of the world's renewable energy production capacity, of which 36% for solar energy. Today, China's renewable energy sector accounts for more than 4 million jobs, more than half of the world total. The country is expanding its capacity to produce the strategic minerals and metals needed to develop the renewable energy industry (60% of global production by 2021, according to the US Geological Survey), and is stepping up investments abroad to strengthen its position (Bonne et al., 2022). China is also the world leader in refining these products, and bears its environmental cost. In 2021, it manufactured almost 80% of lithium-ion batteries and 80% of solar panels. Because of its dominant position in this field, China could nevertheless suffer from shortages of critical metals that it does not produce or only a small amount, from increasing difficulties in accessing Western technologies, and from protective measures taken by other trading powers, as shown by the measures recently taken by the United States under the Inflation Reduction Act. The opportunities for China are therefore real, as shown by the very rapid development of electric vehicle production, but they remain uncertain because of the scale of the efforts required.



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