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Greening the Red Giant: China's Quest for a Sustainable Future

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ABSTRACT

China is facing significant environmental and climate challenges. Its current development is characterised by increasing coal use, energy-intensive technology growth, and limited transparency regarding climate policy progress. As the world's leading emitter, China has a substantial global carbon footprint. The Chinese development in the field of climate action is often portrayed too optimistically in Europe, overlooking many of China's domestic constraints and systemic challenges. A lack of reliable and transparent data with regard to China's actual environmental and climate policy progress complicates assessments and fact-based policy-making. Europe should adopt a cautious and strategically calibrated approach towards China with regard to climate cooperation, engaging selectively only in areas where cooperation clearly aligns with European interest, without abandoning its own global climate responsibilities.

Keywords

China

Climate Change

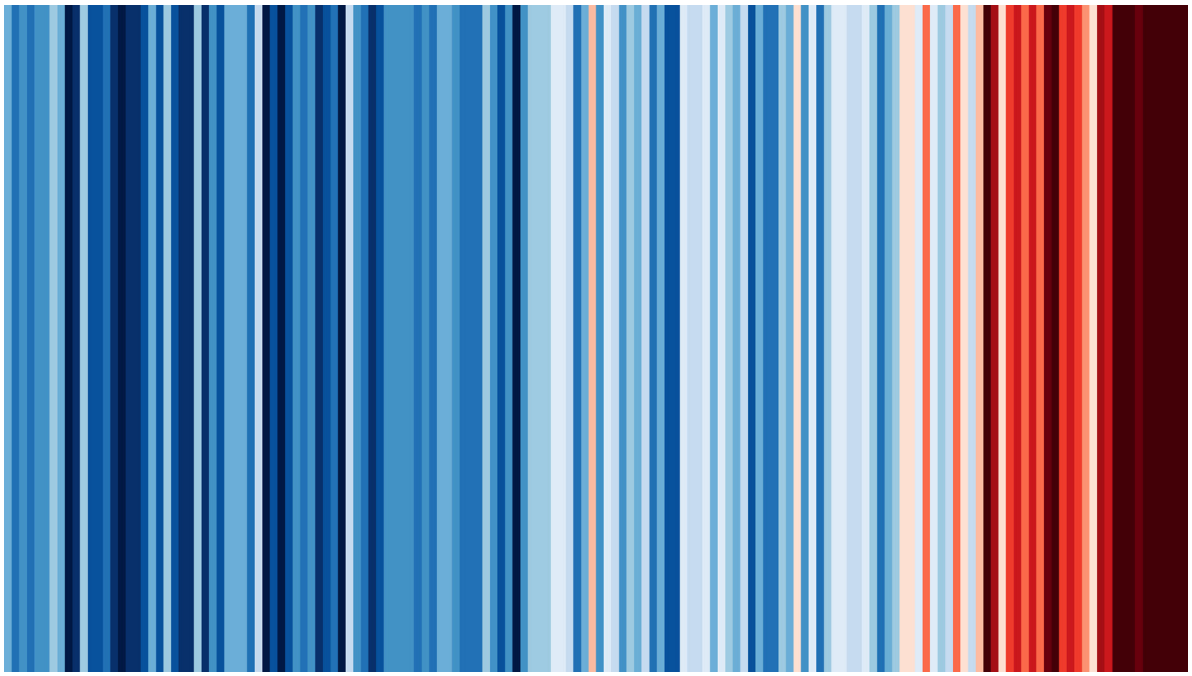
Environmental Policy

Green Technology

CO_2 Emissions

Emissions

Renewable Energy



Climate strips of China: Professor Ed Hawkins (University of Reading)
https://showyourstripes.info/s/asia/china/all

Introduction

Since the 1980s, China has undergone rapid economic development, which gradually integrated the country into the global market and was accompanied by enormous environmental degradation. Large-scale infrastructure projects, forced industrialization and resource extraction, urbanization, and intensified agricultural production have had a significant impact on the ecosystem. As a result, China consistently ranks low in international environmental indices, such as the Environmental Performance Index of the *Yale Center for Environmental Law & Policy*, [1] although some areas like air pollution appear to be slowly improving in recent years.

As the world's largest CO_2 emitter, the country also makes a substantial contribution to climate change. Despite investments in renewable energy, coal consumption in China remains high and is increasing in absolute terms. Furthermore, economic growth continues to take precedence over ecological considerations. The state-driven emphasis on digitalization and emerging technologies such as artificial intelligence is – aside from its social and ethical implications – very resource- and energy-intensive. At the international level, China is not only the largest emitter of green-house gases but also leaves a significant carbon footprint through its trade and investments.

China's per capita greenhouse gas emissions currently amount to approximately 9 tons. This corresponds to almost 30 percent of the globally emitted greenhouse gases. [2] Between 1990 and 2021, the country's emissions increased by an average of 4.7 percent. 85.5 percent of

China's greenhouse gas emissions are carbon dioxide (CO_2) and 8.3 percent are methane (CH_4); 3.9 percent are nitrous oxide (N_2O). Since 2006, China's five-year plans have set the goal of reducing harmful greenhouse gas emissions and promoting renewable energy.

Development of Chinese CO_2 emissions

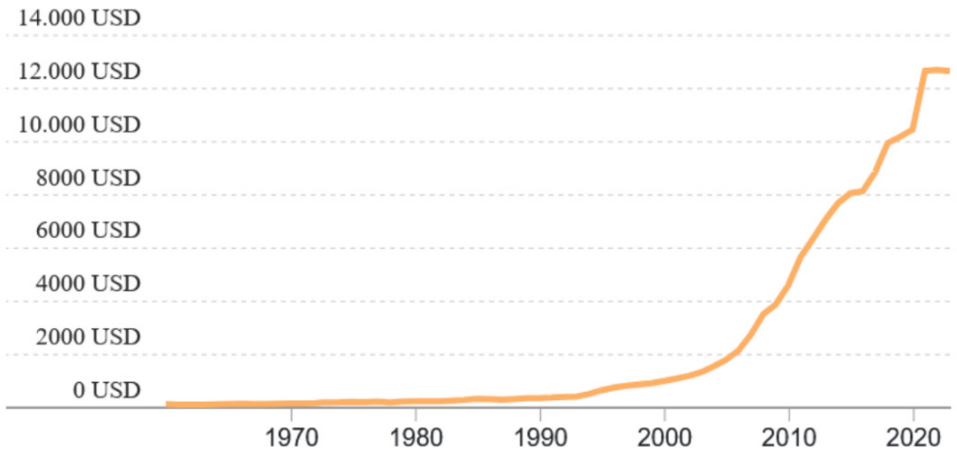
Although China rejected binding climate protection measures at the 2009 Copenhagen Climate Change Conference, it began changing its position and presenting itself as an international pioneer in climate protection in subsequent years. At the beginning of the 2000s, Chinese leaders promoted the concept of "common but differentiated responsibility", which asserts that developing countries should prioritise economic development. As industrialised countries had been emitting greenhouse gases for a longer time, they were responsible for leading the way in climate protection and supporting developing countries through technology transfer and environmental funds. *[3]* Already under international pressure due to its high emissions, China emphasized its position by forming coalitions with other countries: first the "Group of 77", then the "BASIC" (Brazil, South Africa, India, and China), and finally the "Like-Minded Developing Countries". *[4]* At the 2013 climate negotiations in Warsaw (COP19), China nonetheless agreed to the framework of Intended Nationally Determined Contributions (INDCs), committing to self-determined national measures for emissions reduction. In 2015, it set national targets through 2030, which were updated in 2020. These include raising the share of non-fossil fuels in primary energy consumption to around 25%, reducing carbon intensity — CO_2 emissions per unit of GDP — by more than 65% from 2005 levels, and increasing forest stock by 6 billion cubic meters compared to 2005. *[5]* However, China's shift is only partly driven by climate ambitions; more crucial is its strategic interest in leading emerging markets for "green technologies" *[6]* such as renewables, lithium-ion batteries, and electric vehicles.

The relationship between economic development and environmental degradation has been discussed internationally for many years under the theoretical framework of the "environmental Kuznets curve". According to this approach, environmental damage initially increases with economic growth as production and consumption expand, but then falls again once a certain level of per capita income is reached, as societies begin to invest in environmental protection and clean technologies. However, due to the large number of influencing factors, it is difficult to determine the exact gross domestic product (GDP) per capita value at which the trend reverses. Studies on China also show that, after the aforementioned increase and subsequent decrease in environmental degradation, it can increase again due to rebound effects. *[7]* Therefore, the assumption of positive environmental effects through progressive economic development and growing prosperity is not clearly verifiable.

Another consideration focuses on the decoupling of economic growth from CO_2 emissions. Thus, GDP can continue to grow while emissions decrease or at least do not increase further.

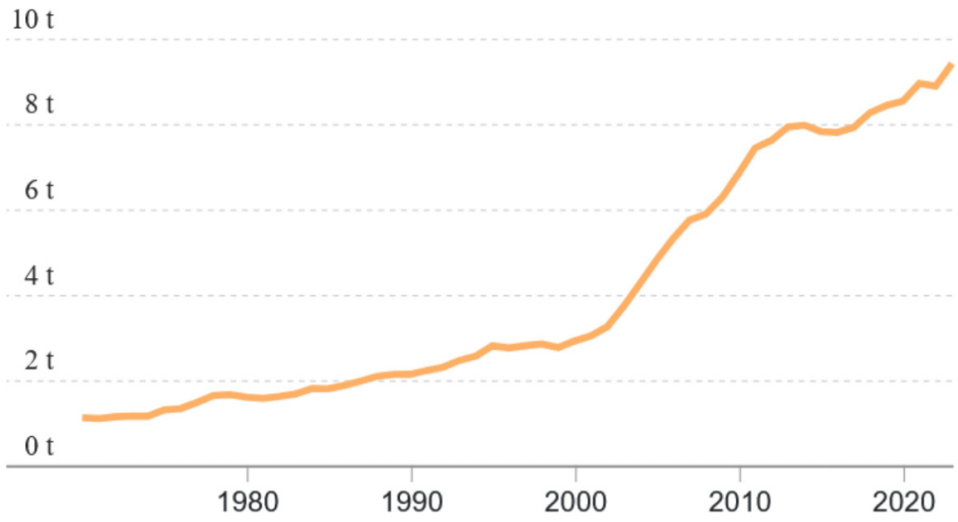
This decoupling can be achieved, for example, through expanding renewable energy sources, improving energy efficiency, and developing "green technologies". China, as the following descriptions will show, has implemented many of these measures. However, contrary to the public discourse, it is unlikely that China has already reached its CO_2 peak. *[8]* Nevertheless, studies conclude that relative decoupling of emissions from GDP can be observed in China, i.e. emissions are growing more slowly than GDP. However, there are significant regional differences regarding the dependence of economic development on available fossil fuels *[9]* , and China's current economic challenges complicate assessments even more. *[10]* The country is undergoing a long-term restructuring of its economic model, shifting from cheap mass production to sectors characterized by advanced technology, innovation capacity, and sustainability. Additionally, new import-export structures are evolving in terms of volumes and partner countries. The consequences of the COVID-19 pandemic and geopolitical tensions with the United States present further challenges. The resulting slowdown in economic growth therefore makes it difficult to clearly assess the long-term development of greenhouse gas emissions.

Fig. 1: Development of GDP per capita in PR China (2023)



Source: World Bank: People's Republic of China - Data Commons. Available online at https://datacommons.org/place/country/CHN?hl=de, checked on 6/24/2025.

Fig. 2: CO_2 Emissions per capita in PR China (2023)



Source: World Bank: People's Republic of China - Data Commons. Available online at https://datacommons.org/place/country/CHN?hl=de, checked on 6/24/2025.

In conclusion, it is clear that there is a correlation between economic growth and CO_2 emissions (see Figures 1 and 2) and it is not evident that an improvement is occurring. Only in the mid-2010s, CO_2 emissions temporarily levelled off to some extent, due to changes in the economic structure, some progress in energy efficiency and investments in renewable energies. Examples of this include the closure or modernisation of old, inefficient coal-fired power plants and steelworks, an anti-corruption campaign that limited local industrial production, and a fall in CO_2-intensive cement production. However, these effects were temporary and not indicative of far-reaching decarbonisation, as the data from subsequent years (2018 onwards) demonstrates.

China's vulnerabilities

Possible effects of climate change have been discussed in China already for over two decades and dealt with in national climate reports and the reports of the Intergovernmental Panel on Climate Change (IPCC). The country is affected by rising temperatures, droughts and, in its southern parts by floods and storms. China's densely populated and economically important coastal agglomerations, where around a third of China's gross domestic product is generated, are particularly at risk. According to calculations, China's economic output could shrink significantly by 2050 due to the effects of climate change. *[11]* Depending on the assumed impact, conservative estimates suggest a loss of between 2% and 10% of GDP. However, environmental stress is not a new phenomenon in China, and a distinction must be made between challenges caused by natural environmental conditions and anthropogenic problems.

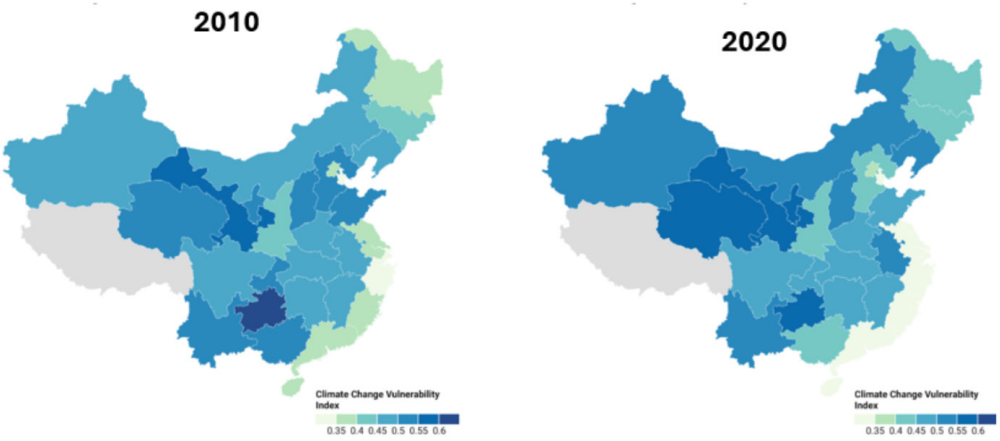
China is the fourth largest territorial state in the world at 9.6 million square kilometres in size. The country's area spans across multiple climate zones with significant elevation variations, a 14,500-kilometer-long coastline, and inhospitable regions such as high mountain landscapes and deserts, which cover about two-thirds of the land. With an estimated population of 1.41 billion people, it is the most populous country in the world after India (1.45 billion). Some 90 percent of the population resides in the eastern parts of the country, in regions that historically had fertile farmland and abundant rainfall. These areas are characterized by intensive agricultural use and high population density. The rapid economic development of the last four decades primarily took place along the east coast, with its provinces thriving and strongly integrated into the global market, while the western regions are less populated, less developed, and therefore economically less advanced in comparison. Overall, however, the nature-induced challenges across China have intensified due to industrial development, urbanization, and changing consumption patterns.

The arable land has long been in an unfavourable ratio to the population size, and it has significantly shrunk due to economic development. Between 2013 and 2019, the arable land decreased by 5%, and more than a third of the remaining land is now affected by degradation, acidification, and salinization. The ancient industrial regions in Northeast China and the industrial centres along the Yangtze and Pearl River Delta have long been subjected to the impacts of acid rain, chemical pollution from agriculture, industry, and mining, as well as inadequate waste management. However, efforts to control and reduce these issues have shown progress, with a declining trend in soil contamination over the years. *[12]* The annual rate of loss of arable land has accelerated, increasing from 6 million mu in 1957-1996 to over 11 million mu between 2009 and 2019. *[13]* To maximize yields on the remaining lands, fertilizer application has been intensified. By 2018, it was 6.4 times higher than in 1978, yet the resulting grain yield in 2018 was only 2.2 times that of 1978. Both the loss of productivity and adherence to the officially defined "red line" of 120 million hectares — the minimum area of cultivated land deemed essential for food security — are regularly monitored by the government, *[14]* as pressure to convert available land for further economic development remains high.

In addition to the soil, the air and water in China are also heavily polluted. In the mid-2000s, China's environmental authority first pointed out that environmental degradation could cancel out the positive effects of economic growth, as the costs were almost equal to the value of annual economic growth. *[15]*

The effects of climate change are already being felt in many regions of China as the graphic below shows. Forecasts predict that temperature rises in China will exceed the global average, extreme weather events will increase significantly, and risks will be unevenly distributed regionally. As in other regions of the world, low-income populations in China will be particularly hard hit because they generally live in areas with poorer infrastructure and lack the resources to prepare themselves. *[16]*

Fig. 3: Development of Climate Change Vulnerability in Chinese provinces



Source: Li, Qin; Zhu, Lei; Shi, Xunpeng (2024): Measuring regions' vulnerability and adaptation to climate change in China: An application of hybrid assessment approach. In Sustainable Development 32 (4), pp. 3115–3132.

Nevertheless, the Notre-Dame Global Adaptation Initiative Index (ND-GAIN), that rates 192 countries based on their vulnerability to the impacts of climate change and their adaptation readiness, sees China as having a low vulnerability and good level of preparedness. The economic resources and infrastructure of the country are key factors in this assessment, including coastal protection measures to safeguard land and ports from rising sea levels and typhoons, transportation systems to maintain supply chains during extreme events, and energy systems to ensure socio-economic stability. These enhance China's resilience to climate change. *[17]*

Environmental policy and administration

Until the mid of the 1970s, China had no environmental administration and therefore no systematic approach to addressing environmental issues. Although environmental protection offices emerged at the beginning of the reform and opening-up period in the 1980s, they were unable to act effectively due to their weak position within political structures and their poor financial and technical resources. However, by the mid-1990s, around 2,200 environmental monitoring stations existed. The State Environmental Protection Agency (SEPA) finally received its own budget in 2007. Previously, it had been financed by fines levied for industrial pollution, among other things. This meant that it was ultimately financially dependent on environmental offences. In 2008, the agency (SEPA) was upgraded to a ministry, which was then reorganised in 2018 as the Ministry of Ecology and Environment (MEE). Relatively independently of environmental governance, China had a National Coordination Group for Climate Change (NCGCC) that organised its participation in climate negotiation processes.

Key state actors in the field of climate change today include the Ministry of Ecology and Environment, which has been responsible for the national adaptation strategy since 2018,

the National Development and Reform Commission (NDRC) and the National Energy Administration (NEA). However, there is a vast array of other actors – state-owned enterprises, provinces, and cities – with diverse interests that operate within a complex matrix of vertical and horizontal governmental competencies.

This reflects the economic and social dynamics that unfolded following the transition from a planned to a market economy in 1978. Liberalisation and decentralisation – i.e. the transfer of responsibilities to subordinate levels of government – granted lower levels of government greater decision-making autonomy. The local authorities were given a certain degree of autonomy, with the aim of facilitating economic development that was tailored to the specific conditions of each locality. Although the overarching priorities and growth targets were set by the political leadership, there was a clear allocation of responsibility for local development to the cadres at the local level. Indeed, these measures successfully stimulated economic dynamism, but also led to local self-will and promoted a certain degree of administrative fragmentation. Concurrently, enforcing policies, laws and minimum standards on a nationwide scale became more challenging. The current political leadership has been countering these implementation deficits for over a decade with recentralisation measures, but in doing so has also curbed many positive local initiatives and reduced public engagement. This also restricts the work of NGOs, which have previously made significant contributions to environmental and climate protection.

A key element in the management of local cadres was the "Cadre Performance Evaluation System", which initially defined growth targets as career-relevant in the 2000s. However, it has since been modified to encompass environmental targets as well. Research has indicated that this measure has the capacity to exert a favourable influence on the development of local CO2 emissions, provided that there is enhancement in the effectiveness of environmental management over the entire term of office of a cadre. This would imply that implementation of measures is not confined to those that appear opportune in the short term, and that environmental protection is factored into the enhancement of the location's attractiveness for investment. *[18]*

With regard to the legal framework, the Environmental Protection Law originally enacted in 1989 was revised in 2015. Among other changes, it introduced mandatory environmental information disclosure and expanded the authority to impose fines on polluting enterprises. *[19]* According to Chinese lawyers who represent companies facing such accusations, these provisions have been enforced with increasing rigor in recent years. In addition, the 2018 Environmental Impact Assessment Law requires that potential ecological consequences of construction projects be evaluated and approved in advance. A constitutional amendment in 2018 elevated the importance of environmental protection by assigning the State Council responsibility for "directing and managing [...] ecological conservation" (Art. 89). However, neither an individual right to environmental protection nor a corresponding state duty is enshrined in the constitution. In contrast to the rights-based and court-centred models of liberal

constitutional states, it can be concluded that China's constitutional framework primarily considers environmental protection to be the state's responsibility. [20]

As shown above, the field of environmental and climate protection in China has been characterised by continuous bureaucratic restructuring. While the party-state experimented with various regulatory approaches and market mechanisms during the Reform and Opening period (1978–2012), ecological issues have been increasingly subject to party discipline since 2013, a period characterised by a personalised concentration of power. [21] For many decades, environmental and climate protection were not significant factors for political career and job promotion opportunities, as economic considerations and local protectionism dominated. The centralization of the last decade now coordinates environmental issues more strongly at the national level and enforces environmental standards more rigidly. However, this simultaneously reduces the former embedding of environmental bureaus in the respective local administrations and inhibits exchanges at the provincial, municipal, and county levels that would enable locally acceptable compromises between ecological and socio-economic concerns to be found.

Environmental and climate discourse in China

"Ecological civilisation" has become a central term in the ideological repertoire of the Chinese leadership since the 18th Party Congress in 2012. It is meanwhile integrated into the state's modernisation goals and has even found its way into the preamble of China's constitution. It complements environmental and climate policies and the related public discourse by adding a "moral" dimension, burdening consumption with ecological considerations. Consumers are thus encouraged to act ecologically to support the state's environmental and climate protection goals. New catchphrases, such as the often-used reference to "clear water and green hills that are mountains of gold and silver", aesthetically enhance the topic and are intended to verbally mitigate the more rigid demands of environmental and climate protection against the background of the objective of a "beautiful nature".

Until approximately a decade ago, climate change was widely viewed within China as a Western strategy aimed at hindering the country's development. More recent surveys, however, suggest a growing public awareness of the impacts of climate change and an increasing willingness among the population to prioritize environmental protection over purely economic interests. Despite this shift in public perception, climate change is still rarely framed as a national concern in mainstream media; instead, it is predominantly depicted as an international issue. Surprisingly, climate change also remains underrepresented on social media, even though its effects are becoming increasingly visible. [22] For political leaders, this framing offers strategic advantages: It allows to position China as a leader in international climate diplomacy and a representative of the Global South—particularly in light of the political vacuum expected after 2025, following the Trump administration's withdrawal from the global

climate agreement. On the foreign policy front, this serves to enhance China's soft power by showcasing leadership on a critical global challenge. Domestically, the government can use the country's rising international prominence to bolster national pride and its legitimacy. [23]

Paths to Decarbonization

China accounts for around a quarter of global energy consumption, and more than half of the world's coal is mined and used in China. [24] Coal power dominates with a current share of 58,8 percent in the energy mix (see Fig. 4). Therefore, the long-term transition to renewable energies and the regulation of the domestic coal industry are central for China's ecological balance. The political aim is to cap coal capacity at 55 percent in the energy mix (see Fig 5 and 6).

However, the coal sector is not easy to regulate. It is not only a major employer, but also represents powerful state-owned enterprises. Furthermore, mine closures or power plant shutdowns have socio-political consequences, particularly in regions overly dependent on coal. [25]Additionally, the difficulty of expanding electricity grids and connecting solar and wind energy suppliers, the regulated electricity price, and the central government's purchase quotas for coal-fired power plants are making it difficult to switch from fossil fuels to renewable energy sources. Interventions in the industry inevitably impact electricity and consumer prices, leading regulatory attempts to face various resistances. Measures such as the introduction of stricter limits and efficiency standards for power plants are often only implemented half-heartedly.

The 14th Five-Year Plan (2021-2025) envisions expanding further coal-fired power plants with a capacity of 200 gigawatts. While electricity consumption declined in major industrial and emerging economies due to the pandemic, it increased in China. Following significant power outages, 2022 saw the approval for constructing numerous new coal-fired power plants with a total volume of 106 gigawatts. As renewable energies are being expanded at the same time, the relative target of the energy mix described above still can be maintained.

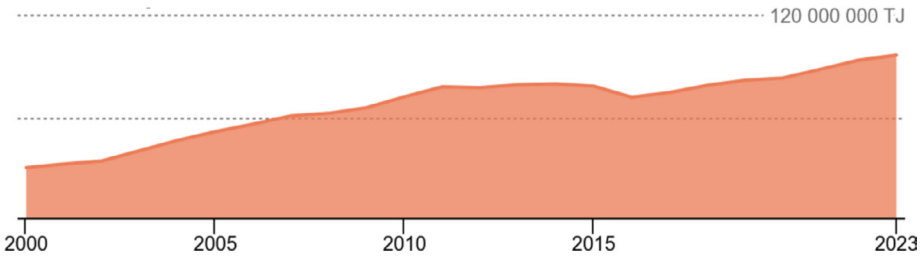
Another way to reduce harmful emissions is to introduce carbon markets. China began implementing an Emissions Trading System (ETS) in 2011 with regional pilot programmes; nationwide implementation followed in 2021, with gradual expansion into various sectors over the coming years. This incentivises companies to reduce emissions and invest in modern technologies. [26] Unlike the coal industry, where change is met with resistance in various forms, the renewable energy sector's problems lie more in the misallocation of resources, such as the misuse of subsidies, and grid connection issues. The rapid expansion of solar energy in China, for example, is leading to grid bottlenecks and overproduction — the energy generated exceeds available storage and transmission capacities. Thus, the development of new solar power stations appears to be encountering difficulties due to concerns regarding profitability and market volatility. In order to improve grid capacities and increase the

reliability of the energy supply, investments totalling 750 billion euros are planned by 2030 to improve the feed-in of renewable energies. [27] Published in August 2024, China's White Paper on Energy Transition outlines numerous positive developments in the construction of a new energy system and the modernisation of energy management. It demonstrates that China's energy transition is an integral component of the country's long-term development strategy. The ultimate goal is to achieve a low-carbon future, with the shift from resource-intensive to innovation-driven models at the forefront. Over the past ten years, China has successfully increased its share of renewable energy and reduced its coal consumption. The country is also investing in green energy both nationally and internationally, promoting global sustainability goals. [28] While there is no doubt that China is trying to change course in the energy sector, it still faces many challenges, as outlined above. In comparison to other countries that have often been slow and delayed in their commitment to the development of green technology, China has attained a distinctive global standing through substantial investment, scaling, cost reduction, and robust export activities. However, this development should not be mistaken for a green transition, but rather represents the integration of green technologies into China's broader geopolitical agenda.

Fig 4: Chinese electricity consumption (share of energy sources in %)

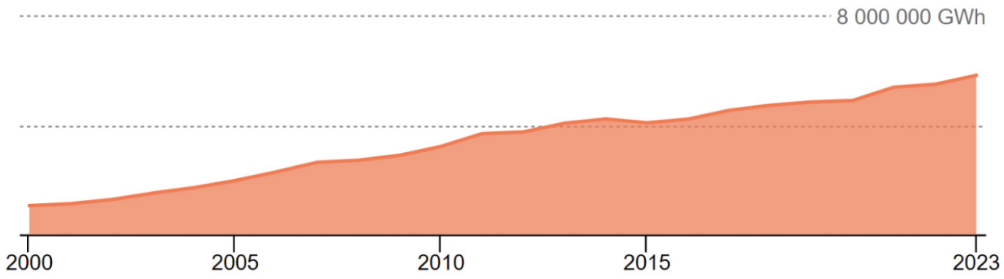
Source: International Energy Agency (2025): Global Energy Review 2025. Available online at https://iea.blob.core.windows.net/assets/ff5e4f91-815f-4f48-874d-4c1da760dded/GlobalEnergyReview2025.pdf, checked on 6/24/2025.

Fig. 5: Total coal production, China



Source: International Energy Agency (2025): Country Report China, 2023, Available online at https://www.iea.org/countries/china/coal (under CC BY4.0)

Fig. 6: Electricity generation from coal, China



Source: International Energy Agency (2025): Country Report China, 2023, Available online at https://www.iea.org/countries/china/coal (under CC BY4.0)

Infrastructure, Transportation, and Urban Planning

In addition to addressing challenges within the energy sector, achieving the climate goals necessitates to identify transformation pathways for the transport and logistics sectors, the construction industry and for existing buildings. The government is actively promoting the expansion of electromobility [29] and granting local authorities the freedom to experiment with so-called "ecocities" and green building technology in pilot areas and model regions. Consequently, many projects have emerged across the country's approximately 650 cities, characterised by labels such as *green, eco, sustainable, low-carbon, intelligent, or smart*. However, experts are sceptical about their success. [30] These initiatives often merely mask the urgent need for improvements to the functionality of urban areas and infrastructure, while in other instances they obscure failed construction projects, such as the *Mentougou Eco-Town* near Beijing, which never progressed beyond the planning phase.

Cement is one of the most widely used building materials in the world. It is produced in almost every country and is central to the development of infrastructure (roads, bridges, buildings, etc.). Carbon dioxide is primarily produced as a by-product of the chemical conversion process during clinker production, a key component of cement. The global cement industry accounts for around 7–8% of global CO_2 emissions per year. According to data from the Carbon Disclosure Project, which lists the historical CO_2 emissions of 122 of the world's largest emitters, the Chinese cement industry has contributed significantly to global emissions: Between 2016 and 2022, it emitted 8.16 billion tonnes of CO_2, accounting for 3.2% of total global emissions. [31] In 2023 alone, China's cement industry emitted 718 million tonnes of carbon dioxide, compared to 177 million tonnes in India, 39 million tonnes in the US, and 106 million tonnes in Europe. [32]

According to a study in the journal Nature, China is responsible for approximately 50% of emissions from global cement production due to its economic growth, rapid industrialisation and urbanisation, and its over 1,000 cement plants. [33] Recently, it has been announced in an action plan of the government that China aims to reduce CO_2 emissions from the cement

industry by around 13 million tons between 2024 and 2025 through industrial upgrading and equipment renewal in the sector. According to this roadmap, half of China's cement clinker production capacity in key regions for air quality improvement will be transitioned to low-emission processes by the end of 2025. Furthermore, it is projected that 80% of the country's total cement clinker production capacity will have completed this transformation by 2028. [34] Since 2018, regulations have already restricted the expansion of new cement capacity. In December 2020, the Ministry of Industry and Information Technology (MIIT) proposed a further tightening of these rules: for every new tonne of capacity added, 1.5 tonnes of outdated facilities must now be shut down, up from the previous requirement of 1.25 tonnes. The objective is to progressively decrease overall cement capacity, thereby addressing the significant overcapacities in the cement sector that have persisted for approximately 15 years, with excess capacity currently standing at around 40-50% above actual demand. This overcapacity largely stems from state-supported infrastructure development since the 2000s, when the construction sector was used as a growth driver. There are a number of other factors that must be considered in this regard, including the long operational lifespan of cement plants, local misincentives and market distortions. [35]

The various projects in the fields of renewable energy, e-mobility, urban planning and the cement sector have one thing in common: they are all subject to the political goal of becoming a global technology and market leader through innovations in these fields. They also aim to position China as well as possible in key markets, such as the automotive industry, through new drive technologies in international competition. China's climate strategy and the associated transformation paths are therefore subordinate to the national development goal of transitioning to a modern digital economy and making China a "socialist world power" by 2050. However, further digitalisation increases energy consumption through data centres, networks, and the production of devices, constituting a new, significant source of greenhouse gas emissions.

China's CO_2 exports

In September 2021, the Chinese president announced to the United Nations that China would no longer finance coal-fired power plants abroad. According to calculations by the Centre for Research on Energy and Clean Air, at that time, 104 coal-fired power plants in 26 countries were planned or under construction with Chinese financing or company stakes; only 13 per cent of these were almost complete. The potential to avoid emissions was therefore significant. However, there remain still many grey areas in the construction and operation of coal-fired power plants, for example as part of industrial parks and other newly launched industrialisation projects. Moreover, China's influence extends beyond the energy sector of the Global South.

For many countries, China has become a reference point for their own development, which is likely to hinder the general transition to a low-carbon economy. Those in power often view

pollution and climate-damaging emissions as a necessary price to pay for their country's development. Consequently, the cost of development is determined in relation to China's experience, focusing on rapid industrialisation and fossil fuels. In many countries, the initial investment in renewable energy is often not prioritised due to the short-term profit expectations of international investors, the focus on fossil fuel-based infrastructure, and the availability of comparatively cheap domestic fossil fuel resources.

Europe and China

In view of the aforementioned points, it is evident that Europe is confronted with several significant challenges of Chinese climate policy:

A key part of China's climate strategy is focused on shifting emissions (within the country and to other countries) rather than reducing harmful greenhouse gases. Although China's exports of CO_2-intensive products (e.g. solar panels) appear to be in line with a climate-friendly agenda, closer analysis shows that the country is actually exporting CO_2-intensive value-added: the production of a "green end product" in China is associated with high CO_2 emissions. While China does export "green" products, the production process often has a negative impact on the climate due to the country's reliance on Chinese coal energy. This is driven by the global trend of relocating production to regions where manufacturing costs are lower, though these regions often have a higher environmental impact. It is therefore crucial to take a differentiated view of Chinese developments and the available information in order to understand the "green paradox" of current Chinese development.

A significant proportion of China's targets (climate neutrality "by 2060", emissions peak "before 2030") are not only established at a later date than in many other countries, but also remain (legally) non-binding. This is coupled with an ambitious rhetoric that primarily serves to cultivate China's international image, while the actual progress in decarbonisation remains limited. It is evident that Chinese decision-makers prioritise economic and industrial policy goals over climate and environmental protection, especially in economically weaker provinces or during periods of economic downturn. Despite the existence of a legal framework in China comprising numerous environmental and climate protection laws and regulations, deficits in implementation and monitoring, especially at the local level, remain. This has resulted in inconsistent climate protection measures across different regions. Furthermore, given the challenges associated with independently verifying China's emissions data and reports, a lack of transparency has a detrimental effect on the possibility of trust-based cooperation for Europe. Finally, in the global marketplace, the state-sponsored support of Chinese enterprises has the effect of creating market distortions and facilitating the development of a leading global position in specific technologies and standard-setting. In summary, the issues of rhetoric and greenwashing, along with the lack of commitment and transparency, represent significant challenges to cooperation. Europe should therefore adopt a realistic and cautious approach towards China. While China is a key player in

global climate policy, the risks of cooperation must be taken seriously. A combination of security and economic policy vigilance is recommended, alongside with selective cooperation that protects European interests while maintaining own global climate responsibilities.

Conclusion and recommendation

China has undergone an interesting development with regard to environmental and climate issues: After a period of self-sufficiency and "home-grown" environmental problems under Mao, China began to import environmental degradation from other countries in the 1980s as part of the mass production of cheap consumer goods for the global market. When production sites were relocated to China, the environmental costs and greenhouse gas emissions were also outsourced. Progressive economic development and ever-greater integration into world trade from the 2000s onwards, coupled with increasing Chinese foreign investment, ultimately resulted in the country becoming an exporter of environmental problems.

As shown above, however, China has made some progress in environmental and climate protection in recent years. It has invested in renewable energy and "green technologies", promoted the decarbonisation of industry, and set targets for reducing greenhouse gas emissions and achieving climate neutrality. Environmental legislation has been tightened, and guidelines are being enforced more stringently. The CO_2 intensity per unit of GDP has decreased.

China's modestly improved environmental performance in recent years, combined with the global search for viable pathways to ecological transformation, has sparked an international debate over the merits of authoritarian environmental governance. One side, drawing on examples from China and East Asia, argues that "authoritarian environmentalism" represents a plausible alternative to democratic models by enabling the swift and centrally coordinated implementation of necessary. *[36]* The opposing view criticizes China's eco-authoritarianism as overly top-down, metrics-driven, and technologically focused, suggesting that it primarily serves as a tool for population control. From this perspective, concerns are raised about the long-term sustainability of such an approach to environmental and climate protection, due to its lack of public participation, transparency, and accountability. Many harsh climate measures — business closures, winter heating bans, the simple relocation of polluting companies from cities to rural areas, and large-scale monitoring of local waste separation as part of the enforcement of environmental standards — annoy the people and turn them against the goals of environmental and climate protection. Better results could be achieved if citizen-led environmental initiatives and projects acted as partners with government environmental protection measures. *[37]*

Another strand of the debate concludes that there are no generalisable differences in environmental balance or capability between democratic and authoritarian developmental states in East Asia. *[38]* From this perspective, the concept of "developmentalism", a technocratic and

growth-oriented approach intended to solve current and future problems, is significant. A focus on unconditional further economic growth coupled with innovation, which is intended to develop or secure competitiveness and at the same time serves legitimacy, leads to investments in "green technologies". Therefore, business-friendly East Asian governments contribute to environmental policy improvements, regardless of the political system. From this perspective, the "authoritarian advantage" assumed in the above debate can be called into question.

As the largest CO_2 emitter and a major industrialized country, China is an indispensable player in global climate policy. However, significant transparency deficits, considerable regional variations in implementation within China, the ongoing high relevance of coal-based electricity, the increasing export of Chinese CO_2 emissions through foreign investment and the relocation of production facilities, as well as China's strategic economic behaviour, require a cautious and vigilant EU stance. The EU should safeguard its strategic interests without harboring naive expectations regarding reciprocity and accountability, nor making too many concessions based on China's perceived importance in climate policy.

The findings outlined above provide the foundation for the following policy recommendations for Europe:

- Require transparency: An independent review of China's emissions and environmental data should be a prerequisite for closer cooperation.
- Cautious cooperation: Cooperation should be linked to verifiable progress and clearly serve European interests.
- Strive for autonomy: European capabilities should be developed to reduce dependence on Chinese supply chains (with regard to "green technologies").
- Ensure fair competition: Instruments such as the Carbon Border Adjustment Mechanism (CBAM) should be employed to prevent market distortion.
- Remain unfazed by greenwashing and the "green paradox": China's portrayal of itself as an investor in "green technologies" and a "climate leader" should be viewed with scepticism to avoid giving too much attention to Chinese national status management in relation to genuine progresses in decarbonisation.

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