

Coal, Capital, and Climate: Theorizing China's Green Transition under State Capitalism

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I. Introduction

Coal is the dirtiest fuel on Earth, releasing more greenhouse gases per kWh than any other source of energy.¹ No country consumes more of it than China, which accounted for 58% of global coal use in 2023.² This dependence is not accidental. For decades, China's rapid economic rise has been entangled with coal, originating from Mao Zedong and Deng Xiaoping's political and market reforms that established a foundation of unchecked industrial expansion based on coal dependency. The consequences are stark: in 2023, China produced 35% of global CO₂ emissions—more than the United States, European Union, India, and Japan combined—while coal accounted for 60.9% of the country's total energy consumption.³ In recent years, responding to rising temperatures and worsening air pollution, Xi Jinping has championed an “ecological civilization” and pledged ambitious climate goals, including peaking emissions before 2030 and achieving carbon neutrality by 2060.⁴ However, in 2020 the COVID-19 pandemic exposed the fragility of these efforts, as the pandemic-driven economic downturn was reversed using coal-heavy stimulus packages that undermined much of China's decarbonization efforts.⁵ Since then, Xi has introduced measures to curb new coal development and reprioritize renewable energy, but their impact has been insufficient to keep China on track for its climate goals.⁶

This paper examines China's energy trajectory through two competing theoretical lenses. Andreas Malm's theory of “fossil capital” posits that the structural embedding of fossil fuels in the formation of industrial capitalism renders decarbonization unlikely without a fundamental and complete shift away from capitalism's core imperatives.⁷ Conversely, Jonas Nahm's “green growth model” asserts that achieving economic growth and meeting climate objectives is

¹ International Energy Agency, “Coal,” IEA, July 11, 2023, <https://www.iea.org/energy-system/fossil-fuels/coal>.

² International Energy Agency, “Coal – Global Energy Review 2025 – Analysis - IEA,” IEA, 2025, <https://www.iea.org/reports/global-energy-review-2025/coal>.

³ International Energy Agency, “The Changing Landscape of Global Emissions – CO₂ Emissions in 2023 – Analysis,” IEA, 2023, <https://www.iea.org/reports/co2-emissions-in-2023/the-changing-landscape-of-global-emissions>.

⁴ Xinhua Net, “Xi Stresses Efforts to Build Ecological Civilization - People's Daily Online,” People's Daily Online (People's Daily Online, August 29, 2017), <https://en.people.cn/n3/2017/0829/c90785-9261328.html>.

⁵ David Sandalow et al., “GUIDE to CHINESE CLIMATE POLICY 2022” (The Oxford Institute for Energy Studies, 2022), <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>; Xinlu Sun and Zhifu Mi, “Factors Driving China's Carbon Emissions after the COVID-19 Outbreak,” *Environmental Science & Technology* 57, no. 48 (November 16, 2023): 19125–36, <https://doi.org/10.1021/acs.est.3c03802>; Qingqing Wang et al., “Coronavirus Pandemic Reduced China's CO₂ Emissions in Short-Term, While Stimulus Packages May Lead to Emissions Growth in Medium- and Long-Term,” *Applied Energy*, August 21, 2020, 115735, <https://doi.org/10.1016/j.apenergy.2020.115735>.

⁶ Lauri Myllyvirta, “Analysis: Record Drop in China's CO₂ Emissions Needed to Meet 2025 Target,” Carbon Brief, February 22, 2024, <https://www.carbonbrief.org/analysis-record-drop-in-chinas-co2-emissions-needed-to-meet-2025-target/>.

⁷ Andreas Malm, “The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry,” *Historical Materialism* 21, no. 1 (2013): 17, <https://doi.org/10.1163/1569206x-12341279>.

possible—and potentially even more successful—in capitalist, export-led growth models.⁸ In evaluating these perspectives, this paper argues that despite China’s ambitious climate commitments and rapid mobilization of investment into renewables in the past decade, these efforts remain fundamentally constrained by China’s underlying imperative of maintaining high levels of industrial output.

II. Political History

Understanding China’s current position on climate and energy requires looking back at how its modern political and economic foundations were built. Many of the institutions, policies, and market practices that shape China’s approach to growth and climate today are the product of decisions made decades ago by its political leaders. What follows is a brief overview of the relevant history that has shaped China’s approach to the climate crisis it faces today. It is not a comprehensive account—modern Chinese politics is complex and continues to evolve even as this paper is being written—but it provides the essential context for understanding the historical forces that continue to shape China’s present challenges.

On October 1, 1949, from atop Tiananmen Gate in Beijing, Mao Zedong proclaimed the founding of the People’s Republic of China, marking the beginning of Chinese Communist rule.⁹ At the time, Mao inherited a nation burdened by its largely agrarian and underdeveloped economy, as well as a population that was largely still opposed to the Communist Party.¹⁰ In the following decade in a period known as the “New Democracy,” Mao implemented a series of reforms aimed at consolidating political control and winning the support of the rural peasantry.¹¹ Recognizing that China needed to undergo a democratic revolution before achieving socialism, Mao sought to strategically co-opt elements of capitalism as a transitional step.¹² Through a series of legislative measures, he decentralized economic authority to local governments and granted farmers limited market freedoms, including the ability to sell surplus production and participate in local markets.¹³ In 1958, Mao launched the Great Leap Forward campaign, which was aimed at rapidly transforming China into a global industrial power capable of surpassing Great Britain.¹⁴ Rooted in the ideology of self-reliance and the principle of “walking on two

⁸ Jonas Nahm, “Green Growth Models,” *Oxford University Press EBooks*, July 7, 2022, 444, <https://doi.org/10.1093/oso/9780197607855.003.0018>.

⁹ “Mao Zedong: Biographical and Political Profile,” *The Asia Society* IV, no. 1 (1984), https://afe.easia.columbia.edu/special/china_1900_mao_early.htm.

¹⁰ Tony Saich, *Governance and Politics of China*, 5th ed. (Bloomsbury Publishing, 2024), 48, <https://ebookcentral.proquest.com/lib/columbia/reader.action?docID=31683406&c=UERG&ppg=1>.

¹¹ Felix Wemheuer, *A Social History of Maoist China: Conflict and Change, 1949-1976* (Cambridge: Cambridge University Press, 2019), 48–84.

¹² Saich, *Governance and Politics of China*, 51.

¹³ Christopher Howe, D. H. Perkins, and Yuan-Li Wu, “Market Control and Planning in Communist China. Harvard Economic Studies Vol. CXXVIII.,” *The Economic Journal* 77, no. 306 (June 1967): 17–18, 114, <https://doi.org/10.2307/2229332>.

¹⁴ Saich, *Governance and Politics of China*, 52.

legs”—developing agriculture and industry simultaneously—the campaign sought to decentralize production and place it directly in the hands of the people.¹⁵ Initiatives like the Backyard Furnace Campaign exemplified this push, as small, local communities were mobilized to produce steel and industrial output locally by literally building backyard coal furnaces.¹⁶ To fuel this production, Mao pushed local governments to increase coal capacity.¹⁷ This movement marked the beginning of China’s accelerated industrialization and led to the widespread integration of coal into the national economy as a key energy source. However, due to overestimated production figures driven by an intense focus on industrial output, government mismanagement of taxes, and natural disasters, the Great Leap Forward ended in famine and the deaths of an estimated 30 million people.¹⁸ The failure of the campaign significantly weakened Mao’s political standing, leading to a temporary retreat from radical economic policies.¹⁹ However, in the mid 1960s, Mao reasserted control through the Cultural Revolution—a decade-long political upheaval aimed at purging capitalist and traditional elements from Chinese society.²⁰ This period further destabilized the country by disrupting education and industry while deepening social divisions.²¹ By the time of Mao’s death in 1976, China was left economically stagnant and politically fractured, setting the stage for a dramatic shift in direction under Deng Xiaoping’s reform era.²²

At the Third Plenum of the 11th Central Committee in December 1978, Deng Xiaoping emerged as the new leader of China, announcing a transition from Mao’s socialist class struggles to a new era of economic reform.²³ This shift marked the beginning of the “Reform and Opening-Up” period, during which market-oriented mechanisms and elements of capitalist production were strategically employed to accelerate growth.²⁴ The reforms were driven by Deng’s belief that China needed to catch up with the Western world through economic development, regardless of whether the means were socialist or capitalist.²⁵ As he famously put it, “It does not matter whether a cat is black or white, so long as it catches the mouse.”²⁶ Over the next decade, the government prioritized gross domestic product (GDP) growth over all else, often threatening to “下海” any officials (throw them into the sea) if they stood in the way of

¹⁵ Saich, *Governance and Politics of China*, 52.

¹⁶ Saich, *Governance and Politics of China*, 30.

¹⁷ Reuters, “Factbox: Timeline of China’s Long Love Affair with Coal,” Reuters, January 11, 2011, <https://www.reuters.com/article/business/environment/factbox-timeline-of-chinas-long-love-affair-with-coal-idUSTRE70A2EC/>.

¹⁸ Vaclav Smil, “China’s Great Famine: 40 Years Later,” *BMJ* 319, no. 7225 (December 18, 1999): 1619–21, <https://doi.org/10.1136/bmj.319.7225.1619>.

¹⁹ Tony Saich, *Governance and Politics of China*, 5th ed. (Bloomsbury Publishing, 2024), 53, <https://ebookcentral.proquest.com/lib/columbia/reader.action?docID=31683406&c=UERG&ppg=1>.

²⁰ Saich, *Governance and Politics of China*, 54.

²¹ Saich, *Governance and Politics of China*, 54.

²² Saich, *Governance and Politics of China*, 55.

²³ Saich, *Governance and Politics of China*, 58.

²⁴ Saich, *Governance and Politics of China*, 59.

²⁵ Barry Naughton, *The Chinese Economy: Transitions and Growth* (Cambridge: MIT Press, 2006), 99.; Chen Jian, “From Mao to Deng: China’s Changing Relations with the United States | Wilson Center,” Wilson Center, November 2019, <https://www.wilsoncenter.org/publication/mao-to-deng-chinas-changing-relations-the-united-states>.

²⁶ Jian, 2019.

economic growth.²⁷ Deng's reforms shifted from a centrally planned economy to a more market-oriented economy, which was implemented through decentralization of government decision making in the economy.²⁸ Deng shifted towards a more capitalist economic approach by setting prices based on the market rather than a state-designed plan and legalizing privately owned businesses.²⁹ These changes effectively unleashed the full force of China's industrial potential, marking the start of China's modern economic model which prioritized output above all else. In order to meet Deng Xiaoping's aggressive growth goals, the coal industry saw massive expansion, with the Ministry of Coal Industry doubling coal consumption in order to meet GDP goals.³⁰ In the late 1980s, as inflation fueled by rapid economic growth began to strain everyday life and political unrest peaked with the Tiananmen Square massacre, Deng leaned even more heavily on consumerism and market reforms, using economic prosperity as a tool to rebuild public support for the Communist Party.³¹ By the time Deng stepped down from power, China had undergone a profound economic transformation. The economy had grown substantially, average living standards had markedly improved, and the country had begun to reassert itself on the global stage. Yet, this success was built on a foundation of unchecked industrial expansion, coal dependency, and environmental degradation—a weakness that has continued to create problems for China to this day.

In 2012, Xi Jinping emerged as China's president campaigning on a promise to achieve the "Chinese Dream." In the early years of his presidency, Xi launched a widespread anti-corruption campaign and funded massive and incredibly unsustainable infrastructure projects in order to increase employment and boost the economy.³² However, as the environmental consequences from decades of production-driven growth became increasingly visible—most notably during the 2013 "airpocalypse," when pollution levels in Beijing soared to over 20 times the WHO's recommended limits—Xi was forced to confront the ecological limits of China's development model.³³ This pivot became more pronounced in his 2017 address to the 19th Party Congress, where he emphasized the need to build an "ecological civilization," framing environmental protection as central to national rejuvenation and long-term prosperity.³⁴ In line with this rhetorical shift, China introduced a series of climate and energy policies,

²⁷ Richard Smith, *China's Engine of Environmental Collapse* (London: Pluto Press, 2020), 93.

²⁸ Saich, *Governance and Politics of China*, 60.

²⁹ James Dorn, "China's Post-1978 Economic Development and Entry into the Global Trading System," Cato.org, October 10, 2023, <https://www.cato.org/publications/chinas-post-1978-economic-development-entry-global-trading-system#marketization-private-sector-development>.

³⁰ Richard Smith, *China's Engine of Environmental Collapse* (London: Pluto Press, 2020).

³¹ Tony Saich, *Governance and Politics of China*, 5th ed. (Bloomsbury Publishing, 2024), 64-68, <https://ebookcentral.proquest.com/lib/columbia/reader.action?docID=31683406&c=UERG&ppg=1>.

³² Melissa Albert, "Xi Jinping | Biography & Facts," in *Encyclopædia Britannica*, March 19, 2018, <https://www.britannica.com/biography/Xi-Jinping>.

³³ Joshua M. Ferreri et al., "The January 2013 Beijing 'Airpocalypse' and Its Acute Effects on Emergency and Outpatient Visits at a Beijing Hospital," *Air Quality, Atmosphere & Health* 11, no. 3 (December 29, 2017): 301–9, <https://doi.org/10.1007/s11869-017-0538-0>.

³⁴ Xinhua Net, "Xi Stresses Efforts to Build Ecological Civilization - People's Daily Online," People's Daily Online (People's Daily Online, August 29, 2017), <https://en.people.cn/n3/2017/0829/c90785-9261328.html>.

including the “Nationally Determined Contributions” under the Paris Agreement and the “30-60” dual carbon goals, pledging to peak carbon emissions before 2030 and achieve carbon neutrality before 2060.³⁵ These commitments were accompanied by major investments in renewable energy, electric vehicles, and green finance mechanisms. It is important to note here that because the state owns many of the companies that stood to benefit from these policies, they were eager to invest to ensure progress was made to meet those goals and to take advantage of new lucrative opportunities for economic growth, rather than genuine concern for global warming.³⁶ However, after the COVID-19 pandemic lockdowns, China relied heavily on infrastructure and heavy industry based stimulus packages to aid in economic recovery.³⁷ In order to power these stimulus packages, China fell back on carbon-intensive sources—primarily coal. In 2020 alone, China built over three times as much new coal capacity than the rest of the world combined.³⁸ Since then, Xi has taken some efforts to downsize their carbon-intensive energy use by limiting the production of new coal plants, but these efforts remain constrained by China’s underlying imperative of maintaining high levels of industrial output.

III. Environmental History

China’s environment has also played a role in shaping the country’s energy system alongside political and economic factors. Vast geographic diversity, extreme climate variation, and uneven resource endowments have made both development and decarbonization particularly complex. This section provides a brief overview of how geography, climate, and natural resources have influenced China’s energy choices and the challenges they pose for the green transition.

China’s environment is home to some of the most diverse landscapes and climates of any nation, making their green energy transition particularly complex to navigate amid rapidly changing climate conditions. In the west, harsh deserts and plains render the region nearly completely uninhabitable, while the east is filled with fertile plains and river valleys, where poor farmers in deltas and basins support the food supply for wealthier populations in coastal

³⁵ David Sandalow et al., “GUIDE to CHINESE CLIMATE POLICY 2022” (The Oxford Institute for Energy Studies, 2022), 40, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

³⁶ Christian Shepherd and Jinpeng Li, “How China Came to Dominate the World in Renewable Energy,” Washington Post (The Washington Post, March 3, 2025), <https://www.washingtonpost.com/climate-solutions/2025/03/03/china-renewable-energy-green-world-leader/>.

³⁷ Qingqing Wang et al., “Coronavirus Pandemic Reduced China’s CO2 Emissions in Short-Term, While Stimulus Packages May Lead to Emissions Growth in Medium- and Long-Term,” *Applied Energy*, August 21, 2020, 115735, <https://doi.org/10.1016/j.apenergy.2020.115735>; Xinlu Sun and Zhifu Mi, “Factors Driving China’s Carbon Emissions after the COVID-19 Outbreak,” *Environmental Science & Technology* 57, no. 48 (November 16, 2023): 19125–36, <https://doi.org/10.1021/acs.est.3c03802>.

³⁸ “China Dominates 2020 Coal Plant Development AGGRESSIVE PURSUIT of COAL PUTS 2060 CARBON-NEUTRAL GOAL at RISK” (Global Energy Monitor, February 2021), <https://globalenergymonitor.org/wp-content/uploads/2021/02/China-Dominates-2020-Coal-Development.pdf>.

megacities like Beijing and Shanghai.³⁹ The north faces extreme cold, while the south endures blistering heat and humidity. During the summer months, southern regions are often impacted by severe flooding even as northern areas simultaneously suffer from drought.⁴⁰ Due to China's geographic and climate variation, the distribution of China's renewable energy resources are also very regional—hydropower dominates in the west and south, wind power in the north, and solar power in the west.⁴¹ However, renewable energy only accounts for a small portion of energy consumption. Due to China's natural resource allocation, with vast coal deposits and extremely limited oil and natural gas reserves, over half of the country's energy consumption comes from coal.⁴²

As global temperatures continue to rise and the effects of climate change intensify, China is experiencing disproportionately severe impacts. China's average annual temperature is rising faster than the global average, contributing to an increase in the frequency and severity of extreme weather events.⁴³ Frequent summer heatwaves worsen air quality, while heavy rainfall combined with wetland loss from urban expansion leads to more severe flooding.⁴⁴ Rising up to 10 millimeters a year, sea level rise driven by global warming threatens China's coastal megacities, where nearly half of the population lives.⁴⁵

As China faces increasingly severe and frequent impacts of climate change, the urgency to respond grows. Yet at the same time, global warming is making the country's green energy transition more complex and challenging. Due to the country's significant regional variation in weather and renewable energy resources, energy supply is inconsistent, expensive, and logistically difficult to transmit across long distances.⁴⁶ Hydropower, for example, is highly sensitive to weather conditions and can be reduced or halted altogether during droughts—an increasingly common occurrence due to climate change.⁴⁷ Similarly, solar power becomes less efficient when air pollution blocks sunlight, which has only gotten more severe over time.⁴⁸ As a

³⁹ David Sandalow et al., "GUIDE to CHINESE CLIMATE POLICY 2022" (The Oxford Institute for Energy Studies, 2022), 28, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

⁴⁰ Sandalow, "GUIDE to CHINESE CLIMATE POLICY," 28.

⁴¹ Sandalow, "GUIDE to CHINESE CLIMATE POLICY," 28.

⁴² "STATISTICAL COMMUNIQUÉ of the PEOPLE'S REPUBLIC of CHINA on the 2024 NATIONAL ECONOMIC and SOCIAL DEVELOPMENT," National Bureau of Statistics China, February 28, 2025, https://www.google.com/url?q=https://www.stats.gov.cn/english/PressRelease/202502/t20250228_1958822.html&sa=D&source=docs&ust=1756691184977109&usq=AOvVaw0LKZ3CVKClRGu1yPWBQlL.

⁴³ Shuqiao Liu, ed., "Blue Book on Climate Change of China Unveiled," China Meteorological Administration, July 19, 2023, https://www.cma.gov.cn/en2014/climate/ClimateUpdate/202307/t20230719_5657000.html.

⁴⁴ Tianshu Chen et al., "Heatwave Exacerbates Air Pollution in China through Intertwined Climate-Energy-Environment Interactions," *Science Bulletin* 69, no. 17 (May 18, 2024): 2765–75, <https://doi.org/10.1016/j.scib.2024.05.018>; Sandalow, 2022.

⁴⁵ Zurui Ao et al., "A National-Scale Assessment of Land Subsidence in China's Major Cities," *Science* 384, no. 6693 (April 19, 2024): 301–6, <https://doi.org/10.1126/science.adl4366>.

⁴⁶ Sandalow, "GUIDE to CHINESE CLIMATE POLICY," 28-31.

⁴⁷ Sandalow, "GUIDE to CHINESE CLIMATE POLICY," 31.

⁴⁸ Bart Sweerts et al., "Estimation of Losses in Solar Energy Production from Air Pollution in China since 1960 Using Surface Radiation Data," *Nature Energy* 4, no. 8 (July 8, 2019): 657–63, <https://doi.org/10.1038/s41560-019-0412-4>.

result, many provinces prefer to rely on local coal-fired power plants rather than face the reliability risks and infrastructural challenges of importing renewable energy from other parts of the country.⁴⁹

IV. Political Theory Background

This paper will explore China’s decarbonization efforts by applying two contrasting political theories: Andreas Malm’s critique of capitalism as a fundamental barrier to decarbonization, and Jonas Nahm’s defense of green growth as a pathway to addressing the climate crisis within the capitalist framework.

Andreas Malm’s theory of the “fossil economy” offers a foundational critique of capitalist decarbonization. He defines the fossil economy—also known as “business as usual”—as a system of self-sustaining economic growth driven by the continuous consumption of fossil fuels.⁵⁰ Malm traces back its origins to industrial Britain, where coal-powered steam engines emerged as the dominant energy source not because of any technical superiority, but because of its compatibility with capitalist imperatives. Despite water power being cheaper, more powerful, and more efficient, capitalist manufacturers preferred coal for its ability to exploit labor.⁵¹ Coal allowed factory owners to relocate production to urban centers to concentrate labor, provided a reliable, weather-independent energy source with predictable working hours, and could be stored away from where it was consumed, placing energy production out of sight and out of mind for humans.

Malm presents a radical rethinking of the drivers of ecological destruction: the degradation of the planet cannot be attributed solely to universal human tendencies toward growth or consumption, but rather as the outcome of a specific historical formation—capitalism—which operates as a “biophysical omnivore” with a uniquely insatiable appetite for surplus-value extracted through fossil energy.⁵² In the context of China, these insights complicate optimistic narratives about the country’s green transition. Driven by economic reform led by Deng Xiaoping in the 1980s, China’s shift towards a capitalist economy resulted in a dependence on fossil energy that continues to inhibit China’s attempts to decarbonize. Malm’s theory helps explain why China’s economy remains tightly coupled with fossil fuels: coal offers the spatial and temporal flexibility that renewable energy lacks. It enables large-scale, centralized production, and the reliable energy delivery necessary for China’s insatiable economic growth goals. In his paper, *China as Chimney of the World: The Fossil Capital Hypothesis*, Malm argues that this structure has been further reinforced by global capitalism as advanced capitalist countries in search of cheaper labor and energy relocate

⁴⁹ Dialogue Earth, “Coal Power Is No Cure for Guangdong,” Dialogue Earth, May 4, 2023, <https://dialogue.earth/en/energy/coal-power-is-no-cure-for-guangdong/>.

⁵⁰ Andreas Malm, “The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry,” *Historical Materialism* 21, no. 1 (2013): 17, <https://doi.org/10.1163/1569206x-12341279>.

⁵¹ Malm, “The Origins of Fossil Capital,” 33.

⁵² Malm, “The Origins of Fossil Capital,” 60.

industrial production into China, thus forcing China to continue consuming coal in order to sustain global production.⁵³ Without deprioritizing this growth China will continue its unending struggle to reach complete decarbonization.

Contrasting Malm’s critique of capitalism, Jonas Nahm’s theory of “green growth models” offers a state-centric approach that works in tandem with capitalism by focusing on how states can leverage industrial policy to support both economic development and environmental protection. In his green growth models, Nahm argues that states should use their institutional capacities to steer markets, build domestic coalitions, and strategically shape green industrial outcomes in order to achieve decarbonization while creating new opportunities for jobs, innovation, and economic expansion.⁵⁴

Nahm highlights China and Germany as case studies for how green growth is particularly successful in export-led economies. Despite having legacy manufacturing industries that would be expected to oppose a green transition, China and Germany have seen the emergence of strong domestic coalitions in support of green industrial policy.⁵⁵ This support, argues Nahm, stems from the fact that these economies are especially well-positioned to benefit from “going green.”⁵⁶ Export-led manufacturing economies already have well established global trade networks as well as the institutional frameworks to help new firms enter export markets, making it much more feasible to scale up green industries and reach international markets.⁵⁷ Additionally, countries with export-led economies often have extensive manufacturing infrastructure in place, which allows new firms to produce green technologies at scale, meeting global demand while staying competitive on price.⁵⁸ As a result, this economic potential motivates governments to back green industries and impose stricter regulations on polluting sectors. This dynamic reflects what political scientist Nina Kelsey terms a “green spiral,” where early policy support for green industry leads to market success, which in turn reinforces political and economic momentum for continued decarbonization.⁵⁹ As green industries grow, production becomes more efficient and costs continue to fall, thus making renewable technologies like solar panels and electric vehicles more accessible not only domestically but also to other countries.⁶⁰ This model suggests that under certain conditions, capitalist states like China can achieve decarbonization not by retreating from economic growth, but by reshaping it to support a green transition.

⁵³ Andreas Malm, “China as Chimney of the World,” *Organization & Environment* 25, no. 2 (June 2012): 146–77, <https://doi.org/10.1177/1086026612449338>.

⁵⁴ Jonas Nahm, “Green Growth Models,” *Oxford University Press EBooks*, July 7, 2022, 444, 447–448, <https://doi.org/10.1093/oso/9780197607855.003.0018>.

⁵⁵ Nahm, “Green Growth Models,” 459.

⁵⁶ Nahm, “Green Growth Models,” 447.

⁵⁷ Nahm, “Green Growth Models,” 450.

⁵⁸ Nahm, “Green Growth Models,” 460.

⁵⁹ Nina Kelsey, “International Ozone Negotiations and the Green Spiral,” *Global Environmental Politics*, October 20, 2021, 1–24, https://doi.org/10.1162/glep_a_00631.

⁶⁰ David Gelles et al., “China’s Clean Energy Boom Could Win the Race to Power the Future,” *The New York Times*, June 30, 2025, <https://www.nytimes.com/interactive/2025/06/30/climate/china-clean-energy-power.html>.

V. Discussion

China's recent investment in clean energy aligns with key elements of Jonas Nahm's green growth models, particularly the idea that states can use industrial policy to promote both economic development and environmental goals. In 2024, Chinese clean energy investment reached 6.8 trillion yuan (\$940 billion USD).⁶¹ This push was backed by a range of policies: laws requiring factories to derive a portion of their energy from renewable sources, the introduction of a national emissions trading system, feed-in tariffs to encourage renewable energy production, and mandates requiring automakers to ensure that a growing share of their fleets are electric.⁶² These policies have already begun delivering economic returns. When including the value of production, clean energy sectors—including renewables, nuclear power, electricity grids, energy storage, EVs, and other infrastructure needed for decarbonization—contributed 13.6 trillion yuan (\$1.9 trillion USD) to China's economy, accounting for just over 10% of total GDP.⁶³ These sectors grew three times faster than the broader economy and were responsible for 26% of total GDP growth.⁶⁴ Without the clean energy sector, China wouldn't have met their annual 5% GDP growth target.⁶⁵ These investments in clean energy have also initiated the first sustained decline in China's carbon emissions, slowing down by 1% since March 2024—a notable shift for China's emission trends, but not yet enough to meet Xi's goal of decarbonization by 2030.⁶⁶ In line with Nahm's theory, these outcomes demonstrate how state-led industrial policy can create a positive feedback loop, where climate goals and economic growth reinforce one another through targeted investment and coordinated institutional action.

The economic success of China's green transition did not emerge on its own, but rather, it was made possible by the central role of the state in shaping and directing the process. Following the framework of Nahm's green growth model, over the last 20 years the Chinese government has used its institutional capacity to gradually orchestrate a green transition in an economically and politically feasible manner. With power highly centralized under Xi's leadership, the government dictates environmental policies and regulations across the country. Central to China's decarbonization efforts are the five-year plans drafted by the State Council, which not only sets national development priorities but also include issue-specific subplans on energy,

⁶¹ Lauri Myllyvirta, "Analysis: Clean Energy Contributed a Record 10% of China's GDP in 2024 - Carbon Brief," Carbon Brief, February 19, 2025,

<https://www.carbonbrief.org/analysis-clean-energy-contributed-a-record-10-of-chinas-gdp-in-2024/>.

⁶² Myllyvirta, "Analysis: Clean Energy Contributed a Record 10% of China's GDP."

⁶³ Myllyvirta, "Analysis: Clean Energy Contributed a Record 10% of China's GDP."

⁶⁴ Myllyvirta, "Analysis: Clean Energy Contributed a Record 10% of China's GDP."

⁶⁵ Myllyvirta, "Analysis: Clean Energy Contributed a Record 10% of China's GDP."

⁶⁶ Lauri Myllyvirta, "Analysis: Record Solar Growth Keeps China's CO2 Falling in First Half of 2025 - Carbon Brief," Carbon Brief, August 20, 2025,

<https://www.carbonbrief.org/analysis-record-solar-growth-keeps-chinas-co2-falling-in-first-half-of-2025/>.; Lauri

Myllyvirta, "Analysis: Record Drop in China's CO2 Emissions Needed to Meet 2025 Target," Carbon Brief, February 22, 2024,

<https://www.carbonbrief.org/analysis-record-drop-in-chinas-co2-emissions-needed-to-meet-2025-target/>.

emissions, and industrial reform.⁶⁷ These plans, in turn, determine who the government gives grants and loans to, as well as inform sectoral action plans that establish concrete targets and timelines for major industries and regional governments. This level of long-term planning is enabled by the structure of China's economy, in which many major firms are state-owned, with 71% of Chinese Fortune 500 companies being owned by the state.⁶⁸ Within the clean energy sector, this has allowed the government not only to set decarbonization targets but also to actively manage how industries meet them. For example, the 13th and 14th Five-Year Plans set aggressive regulatory standards, which were paired with state-backed support systems—such as grants and loans from state-owned banks and feed-in tariffs from the government.⁶⁹ This has helped to ensure that firms have access to the tools needed to comply with the new laws. This system also offers a crucial layer of support for emerging clean energy industries that might otherwise struggle to survive in a solely market-driven economy. By absorbing financial risk and insulating firms from short-term market pressures, the state creates the conditions for green sectors to scale without facing early insolvency.⁷⁰ In return, firms are able to smoothly adjust to new regulations and maintain economic growth while becoming more environmentally sustainable.

As China has expanded its renewable energy infrastructure and transitioned its economy to support the clean energy sector, it has paved the way for broader adoption of green growth strategies, both domestically and internationally. The early successes in renewable energy—driven by massive amounts of money invested by the government—gave Chinese policymakers increased confidence in the potential for clean energy to drive economic growth.⁷¹ This momentum carried over into the electric vehicle (EV) sector, where the government “combined stringent regulatory incentives to generate domestic demand with financial support for a growing number of EV manufacturers.”⁷² This created the conditions for China to become the world's largest EV market, attracting the attention of foreign automakers dependent on access to Chinese consumers.⁷³ As a result, automakers in Germany that were previously resistant to electrification began shifting their stance, seeing EV adoption as an economic opportunity. In response to China's growing EV dominance, German car manufacturers became more supportive of climate policy at home and started supporting Germany's climate goals in their domestic

⁶⁷ Song, Xiaoying, “Glossary: Decoding How China Talks about Energy and Climate Change,” Carbon Brief, March 27, 2025, <https://interactive.carbonbrief.org/glossary/china/index.html#section-five-year-plan>.

⁶⁸ Qin Mei, “Fortune Favors the State-Owned: Three Years of Chinese Dominance on the Global 500 List,” www.csis.org, October 7, 2022, <https://www.csis.org/blogs/trustee-china-hand/fortune-favors-state-owned-three-years-chinese-dominance-global-500-list>.

⁶⁹ David Sandalow et al., “GUIDE to CHINESE CLIMATE POLICY 2022” (The Oxford Institute for Energy Studies, 2022), 248, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

⁷⁰ Jonas Nahm, “Green Growth Models,” *Oxford University Press EBooks*, July 7, 2022, 449-450, <https://doi.org/10.1093/oso/9780197607855.003.0018>.

⁷¹ Nahm, “Green Growth Models,” 450-451.

⁷² Nahm, “Green Growth Models,” 454.

⁷³ Nahm, “Green Growth Models,” 454.

projects, more than three times the capacity approved in 2019.⁸³ Despite Xi Jinping's post-pandemic promise to "strictly control" coal, China has allowed coal development to continue largely unabated.⁸⁴ In 2024, the country was responsible for 93% of new global coal power construction.⁸⁵ Xi's actions suggest that he has no intention of letting coal fade from China's energy sector any time soon. In April 2025, China announced a new policy allowing coal-fired power plants to be built through at least 2027.⁸⁶ Just a few months later, in a Joint EU-China agreement on climate, any commentary on coal was notably missing.⁸⁷ Beyond traditional coal use, China has also been pouring immense resources into the coal-chemical industry, which produces the petrochemicals used for manufacturing plastics and other materials that make up the world's demand for cheap, mass-produced consumer goods.⁸⁸ Experts estimate that the planned expansions in the coal-chemical industry could add another 2% to China's CO₂ emissions by 2029, while the industry's own projections anticipate continued capacity growth until at least 2035.⁸⁹

China's coal consumption—despite public announcements of downscaling—highlights a recurring pattern of Xi evading his climate commitments. Another instance of this phenomenon can be found within China's climate goals and emission regulations. Unlike many other countries, China only sets carbon intensity targets, which are measured in emissions per unit of GDP, rather than absolute caps.⁹⁰ This provides Chinese manufacturers with a loophole by making it possible for emissions to rise as long as GDP grows faster. Additionally, while China's State Forestry Administration boasts that forest cover expanded from 13% in 1981 to over 20% in 2010, this narrative conveniently ignores the country's role as the world's largest timber importer, sourcing 56% of their timber from imports.⁹¹ Experts claim that the carbon footprint of

⁸³ Smith, "Why China Cannot Decarbonise."

⁸⁴ Xinhua Net, "Remarks by Chinese President Xi Jinping at Leaders Summit on Climate | English.scio.gov.cn," The State Council Information Office, April 23, 2021, http://english.scio.gov.cn/topnews/2021-04/23/content_77433094.htm.

⁸⁵ Lauri Myllyvirta and Qi Qin, "Guest Post: Why China Is Still Building New Coal – and When It Might Stop - Carbon Brief," Carbon Brief, August 12, 2025, <https://www.carbonbrief.org/guest-post-why-china-is-still-building-new-coal-and-when-it-might-stop/>.

⁸⁶ Wanyuan Song, "China Briefing 17 April 2025: US-China Tariff War; AI and Data Centres; Coal Construction 'till 2027' - Carbon Brief," Carbon Brief, April 17, 2025, <https://www.carbonbrief.org/china-briefing-17-april-2025-us-china-tariff-war-ai-and-data-centres-coal-construction-till-2027/>.

⁸⁷ "Joint EU-China Press Statement on Climate," European Commission, 2025, https://ec.europa.eu/commission/presscorner/detail/en/statement_25_1902.

⁸⁸ David Sandalow et al., "GUIDE to CHINESE CLIMATE POLICY 2022" (The Oxford Institute for Energy Studies, 2022), 136, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

⁸⁹ Lauri Myllyvirta, "Analysis: Record Solar Growth Keeps China's CO₂ Falling in First Half of 2025 - Carbon Brief," Carbon Brief, August 20, 2025, <https://www.carbonbrief.org/analysis-record-solar-growth-keeps-chinas-co2-falling-in-first-half-of-2025/>.

⁹⁰ Song, Xiaoying, "Glossary: Decoding How China Talks about Energy and Climate Change," Carbon Brief, March 27, 2025, <https://interactive.carbonbrief.org/glossary/china/index.html#section-five-year-plan>.

⁹¹ "China's Role in Promoting Global Forest Governance and Combating Deforestation" (World Economic Forum, July 2022), 12,

China's timber imports may substantially or entirely offset the climate benefits of their domestic afforestation efforts.⁹²

These failures reflect a fundamental question in Nahm's green growth model: if a country's economic growth is, at its core, based in fossil energy, can it truly demonstrate green growth? This paradox can be traced back to a history of Chinese policies that prioritize growth over sustainability, beginning during the foundations of China's capitalist system. Mao Zedong's push for rapid industrialization during the Great Leap Forward in the 1950s set the stage for a development model that relied heavily on coal as a primary energy source. Mao's emphasis on self-reliance and decentralized production encouraged local communities to harness coal for small-scale industrial projects, creating an industrial infrastructure that became deeply dependent on coal and embedding it into China's economic identity. Under Deng Xiaoping, this coal-dependent growth model was further integrated. In 1982 during the Reform and Opening-Up period, Deng set ambitious GDP targets—doubling per capita GDP first to \$500 by 1990, and then to \$1000 by 2000—pushing officials to prioritize growth at any cost.⁹³ He promised promotions for the provinces that saw the most growth, gave local officials and state-owned-enterprise owners profit-sharing deals, allowed them to sell over-quota output for personal profit—which led to further expansion of coal mines.⁹⁴ This also created “GDP tournaments” where local officials competed with each other to achieve the highest growth numbers.⁹⁵

Fast forward to the present day, and Xi Jinping continues this rapid pace of industrialization—propelled by an insatiable drive to increase GDP. Under Xi, massive infrastructure projects like the Belt and Road Initiative have been greenlighted, further expanding China's carbon footprint. Many of these projects serve no other purpose than to contribute to the GDP due to a bizarre Chinese accounting practice: even if a product has no use value, it still gets counted in the GDP.⁹⁶ This means that unsold steel, uninhabited apartment skyscrapers, and empty airports still contribute to the growth of a local province—and, more importantly, increase the likelihood of promotion for a local official. The vast majority of this growth is powered by coal, which continues to provide the backbone of China's energy system.⁹⁷ Seen through the lens of Malm's fossil economy theory, China's reliance on coal is not an

https://www3.weforum.org/docs/WEF_China%E2%80%99s_Role_Promoting_Global_Forest_Governance_and_Combating_Deforestation_2022.pdf.

⁹² David Sandalow et al., “GUIDE to CHINESE CLIMATE POLICY 2022” (The Oxford Institute for Energy Studies, 2022), 207,

<https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

⁹³ Richard Smith, *China's Engine of Environmental Collapse* (London: Pluto Press, 2020), 92.

⁹⁴ Reuters, “Factbox: Timeline of China's Long Love Affair with Coal,” Reuters, January 11, 2011,

<https://www.reuters.com/article/business/environment/factbox-timeline-of-chinas-long-love-affair-with-coal-idUSTRE70A2EC/>.

⁹⁵ Smith, *China's Engine of Environmental Collapse*, 98.

⁹⁶ Smith, *China's Engine of Environmental Collapse*, 98.

⁹⁷ British Petroleum, “Statistical Review of World Energy 2022,” *BP*, 2022,

<https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2022-full-report.pdf>.

accident but a structural outcome of its state-capitalist growth model. Malm defines the fossil economy as one where growth becomes inseparable from rising fossil fuel use.⁹⁸ In Britain, steam power triumphed over water because it allowed capitalists to make higher profits.⁹⁹ A similar logic operates in China: Mao's push for coal-based industrialization established the material base, Deng's market-oriented growth targets and "GDP tournaments" rewarded officials who made the most profit regardless of social or ecological costs, and Xi's energy-intensive GDP expansion continues the pattern. In both cases, fossil fuels were adopted not simply for their technical properties but because they fit the priorities of the prevailing capitalist growth model. This helps explain why "green growth" falters in China: once economic expansion is bound to fossil energy, that dependence continually reinforces itself.

In addition to China's systemic reliance on coal, decades of administrative decentralization have produced fragmented "provincial fortresses" that deepen fossil dependence and obstruct the transition to renewable energy. During the New Democracy period and in the Great Leap Forward reforms, Mao took steps to decentralize administrative power to local officials, in an attempt to win the popularity of the peasantry.¹⁰⁰ Later, Deng's reforms gave even more decision-making power to the localities, giving officials control over production choices, output levels, and distribution.¹⁰¹ This stemmed from Deng's belief that economic reforms should allow market mechanisms to address allocation and distribution inefficiencies, and that local governments were better positioned to take advantage of these opportunities.¹⁰² The delegation of power to local officials, combined with the intense regional competition driven by Deng's GDP tournaments has fragmented governance across provinces and posed a major obstacle toward renewable energy. Unlike most advanced economies, China uses a "fair dispatch" approach to electricity allocation, in which electricity is distributed based on province-by-province administrative quotas rather than market demand or energy efficiency.¹⁰³ This system originated with the 1985 "Interim Provision on Providing Incentives for Power Generation Financing and Implementing Multiple Electricity Tariffs," introduced during Deng's reform era, when the electricity market was liberalized and decision-making power was returned to local officials.¹⁰⁴

⁹⁸ Andreas Malm, "The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry," *Historical Materialism* 21, no. 1 (2013): 17, <https://doi.org/10.1163/1569206x-12341279>.

⁹⁹ Malm, "The Origins of Fossil Capital," 32-34.

¹⁰⁰ Christopher Howe, D. H. Perkins, and Yuan-Li Wu, "Market Control and Planning in Communist China. Harvard Economic Studies Vol. CXXVIII.," *The Economic Journal* 77, no. 306 (June 1967): 17-18, 114, <https://doi.org/10.2307/2229332>.

¹⁰¹ Tony Saich, *Governance and Politics of China*, 5th ed. (Bloomsbury Publishing, 2024), 60, <https://ebookcentral.proquest.com/lib/columbia/reader.action?docID=31683406&c=UERG&ppg=1>.

¹⁰² Saich, *Governance and Politics of China*, 60.

¹⁰³ David Sandalow et al., "GUIDE to CHINESE CLIMATE POLICY 2022" (The Oxford Institute for Energy Studies, 2022), 50, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>.

¹⁰⁴ Xiaoli Zhao and Chunbo Ma, "Deregulation, Vertical Unbundling and the Performance of China's Large Coal-Fired Power Plants," *Energy Economics* 40 (November 2013): 474-83, <https://doi.org/10.1016/j.eneco.2013.08.003>; Mun Ho, Zhongmin Wang, and Zichao Yu, "China's Power Generation Dispatch" (Resources for the Future, April 2017), <https://media.rff.org/archive/files/document/file/RFF-Rpt-ChinaElectricity.pdf>.

This system has led to the formation of what some scholars describe as “provincial fortresses,” where local governments protect their own energy assets to maintain high GDP growth—a key factor determining promotions for officials.¹⁰⁵ Even the central government is often unable to overcome these local interests, as decades of administrative decentralization have fragmented authority to the point where national directives are routinely ignored or selectively implemented. As a result, when there is surplus renewable energy in one province and demand in another, power often fails to flow across borders due to this policy protectionism, despite sufficient transmission infrastructure and policy support from the central government.¹⁰⁶ Conversely, coal-fired power plants remain prioritized and overutilized, favored by provincial authorities who depend on their reliable energy supply to maintain local growth.¹⁰⁷ The example of “provincial fortresses” supports Malm’s fossil economy theory, which argues that the issue is not simply a policy failure but a deeper structural conditioning: the appetite of capitalism for power sources that maximize profits, along with the systems built around it, binds China to fossil energy.¹⁰⁸

VI. Conclusion

China’s pursuit of decarbonization illustrates both the possibilities and the limits of green growth under state capitalism. On the one hand, massive state-led investments in the clean energy sector have generated real economic returns, reshaped global supply chains, and lowered the barriers to clean energy adoption abroad—aligning closely with Nahm’s account of how states can strategically mobilize green industries within capitalist frameworks. On the other hand, as Malm’s fossil economy theory argues, these gains are consistently undermined by the structural imperatives of coal-based industrialization and growth maximization, reinforced by China’s historical foundations and contemporary political incentives. The result is an energy system that expands on both clean and fossil fronts simultaneously, resulting in contradictions between China’s climate pledges and its development model. Looking ahead, the release of China’s 15th Five-Year Plan in the coming months will be a crucial test: it has the potential either to deepen these contradictions or to mark a decisive turning point toward a genuinely transformative climate strategy. Its outcome will not only shape the trajectory of China’s own green transition, but also exert profound influence on the global fight against climate change.

¹⁰⁵ David Sandalow et al., “GUIDE to CHINESE CLIMATE POLICY 2022” (The Oxford Institute for Energy Studies, 2022), 50, <https://chineseclimatepolicy.oxfordenergy.org/wp-content/uploads/2022/11/Guide-to-Chinese-Climate-Policy-2022.pdf>; Hao Zhang, “Prioritizing Access of Renewable Energy to the Grid in China: Regulatory Mechanisms and Challenges for Implementation,” *Chinese Journal of Environmental Law* 3, no. 2 (December 3, 2019): 167–202, <https://doi.org/10.1163/24686042-12340041>.

¹⁰⁶ Ye Qi, “Fixing Wind Curtailment with Electric Power System Reform in China,” n.d., <https://www.brookings.edu/wp-content/uploads/2018/04/fixing-wind-curtailment-with-electric-power-system-reform-in-china.pdf>.

¹⁰⁷ Sandalow, “GUIDE to CHINESE CLIMATE POLICY,” 50.

¹⁰⁸ Andreas Malm, “The Origins of Fossil Capital: From Water to Steam in the British Cotton Industry,” *Historical Materialism* 21, no. 1 (2013): 59–60, <https://doi.org/10.1163/1569206x-12341279>.