

**The Green Divergence: A Critical Political Economy of Energy Transition
Governance in China and the United States**

Dougie Booth

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Department of Economics and Government

University of Essex

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Abstract

States have responded differently to the global challenge of leading a green energy transition from fossil fuels to renewables. Despite its overwhelming advantages at the turn of the century, the United States has largely failed to establish a cohesive federal framework for decarbonisation, while China has emerged as the global leader in renewable energy manufacturing and deployment. This unexpected reversal over the past two decades, which I term *the Green Divergence*, raises an urgent question: why did China achieve relative success in advancing a green economy while the US remained trapped in fossil fuel dependence?

This dissertation argues that the Green Divergence was primarily caused by the contrasting compositions of the two countries' national economies, shaped by the global processes of deindustrialisation in the US and rapid industrialisation in China. In the United States, deindustrialisation produced structural barriers that amplified fossil capital's dominance, weakened pro-transition coalitions, and locked the state into a fossil fuel-dependent economy reinforced by fracking and financialisation. By contrast, China's industrialisation created structural incentives for the state to pursue ambitious renewable policies: urban pollution crises compelled ecological modernisation, manufacturing-led growth incentivised investment in green industries, and surging energy demand allowed renewables to expand without displacing incumbent fuel sources. The significance of this research is twofold. First, it illuminates why the world's two largest emitters have followed divergent energy pathways, offering crucial lessons for designing effective transition governance. Second, it highlights how geopolitical tensions between the US and China can be read through the lens of climate politics, with China's rise as a

“green” hegemon and the US' stagnation revealing competing visions for the world in the twenty-first century.

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“There are decades where nothing happens; and there are weeks where decades happen.”

- Lenin

Whilst Lenin (apocryphally) coined this phrase to describe the slow churning of world-history and its occasional breakneck accelerations through social revolution, it also serves to describe the labours behind this dissertation. On the road to submission, there were long, painful periods of inertia, as arguments were slowly considered and developed, with recurrent setbacks and continual errors encountered along the way. In turn, there were short, euphoric moments of intense productivity, where the stars aligned and monumental breakthroughs were made. Many conversations with my supervisors and other academic colleagues assured me that this was a normal experience. Nonetheless, those long, frustrating periods without observable progression were still agonising, and the bursts of activity were far too short to be sufficiently savoured. The road to doctorhood was made bearable only through the continuous support of those around me. Without their help picking me up from my various slumps and pushing me forward to the final goal, this dissertation would never have seen completion.

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The historical content this dissertation deals with is dire stuff, particularly the events discussed from within the United States. It represents one of the critical junctures in which the struggle to contain the worst excesses of global climate change was lost in a frustratingly weak, disorganised, and incompetent effort to assert limitations over fossil capitalism. The tragic nature of the events being analysed certainly added to the bouts of demoralisation experienced in undertaking this project. This was particularly true when combined with the continued onslaught of climate reaction that has surged in the last few years. In the current situation, it is easy to be pessimistic about our planetary future and fall into hopelessness. In the face of this pessimism, the fellowship and support gifted to us by those around us is a precious thing, a reminder of the incredible capacities of humanity to overcome adversity through solidarity. Facing the historic and ongoing rise of climate barbarism, I am infinitely grateful for everyone, mentioned or not,

who has helped me, directly or not, to complete this dissertation. My only hope is that it may play some tiny, miniscule, infinitesimally small part in our finding a way forward to a better future.

Section 0: Introduction, Background, and Approach

Chapter 0: Introduction

In 2024, the global average temperature exceeded 1.5°C above its pre-industrial level (Copernicus, 2025). In the first quarter of the twenty-first century, the world largely failed to answer one crucial governance question: how to undertake a green energy transition and minimise the catastrophic processes of anthropogenic climate change. In the world's largest economy, Trump's second presidential term has been characterised by a retreat from any attempt to accelerate or even undertake a piecemeal energy transition, with a second withdrawal from the Paris Climate Agreement (Executive Order No. 14162, 2025). This has cast a looming cloud over the rest of the world's efforts to decarbonise, as the climate crisis is destined to intensify if the US fails to cut emissions and provide support for the global transition. In searching for hope in this dire situation, China has emerged as a “global clean energy champion” offering a glimpse of a green alternative (Andrews-Speed and Zhang, 2019). Through the authoritarian governance of the Chinese Communist Party (CCP), China has become the leading producer and user of renewable technologies and appears to have peaked, or will soon peak, its emissions (Centre for Research on Energy and Clean Air, 2024). As the global hegemon falls deeper into the clutches of climate denialism, its geopolitical rival appears to be the only superpower willing and capable of pushing forward a global energy transition.

Finding ourselves in this situation is, in some ways, surprising. Twenty-five years ago, the US had a vast advantage over China in terms of capacity to implement an energy transition. America

had world-leading tech companies, research institutions, access to financing, infrastructure, regulatory expertise, administrative experience and a developing pro-environmental popular consciousness. In every technical aspect, America was better prepared for decarbonisation than China. Deepening the divide, China's emissions soared, and environmental conditions deteriorated during an unprecedented economic boom that made it the world's manufacturing hub. This growth was accompanied by a surge in energy demand, largely satisfied through the expansion of coal power (Malm, 2016).

In the 2000s and early 2010s, many in the West questioned the value of switching to renewables, believing efforts to prevent climate change were futile due to the overwhelming emissions of emerging economies like China. However, the story of the last twenty-five years has led to a complete inversion of these expectations, as China has consistently developed its renewable energy industry with government support, becoming the leading developer, manufacturer and deployer of hydro, wind and solar power. Meanwhile, the US has been gripped by inertia, failing to keep pace with the Chinese party-state's pro-renewable industrial policy. The one-term Biden administration passed multiple measures to attempt to catch up with China, but these efforts are likely to be completely abandoned in Trump's second presidency, which has committed to doubling down on fossil fuel extractivism under the banner of "drill, baby, drill" (Trump, 2025).

This dissertation analyses what it calls the "Green Divergence" - China's growing lead in the manufacturing and deployment of renewables and green technology, in stark contrast to the US' continued reliance on the fossil fuel economy. This concept is an extension and reversal of the Great Divergence, the historical process through which Western Europe and its colonial

extensions, especially the US, achieved unprecedented levels of economic growth, technological progress, and social development during the 18th and 19th centuries (Pomeranz, 2000). Prior to the Great Divergence, Western Europe was economically comparable to other prosperous societies, including Qing China and Mughal India. This transformation laid the groundwork for the modern international order, one dominated by the West, which utilised its economic superiority to reshape the world to its advantage.

Yet today, the US, which previously led this international order, remains dependent upon the fossil fuel economy and is unable to effectively transition to a green economy. This is the case even though this dependency threatens its basic ecological conditions and its leading position in the global economy. In contrast, China rapidly developed a green economy in a process that continues to accelerate with each passing year. It is close to establishing a more prosperous and sustainable economy, based upon cheap and abundant clean energy, with a green industrial base that will secure its central position in the global order for decades to come. If we are truly experiencing the beginning of the Chinese century, as speculated for over twenty years now, then it will be built upon the base of China's success in the energy transition, whilst the US falls behind.

The concept of the Green Divergence relies upon two historical judgements: the US energy transition to a low-carbon economy has been a failure, and China's has been a comparative success. The US' energy transition governance can be judged a failure for several reasons. Firstly, it has been unable to develop a cohesive federal renewable energy policy that guarantees a consistent and rapid pace of energy transition from fossil fuels to renewables. This lack of

central coordination has resulted in a slow buildout of renewable energy capacity compared to its economic potential and climate commitments. Secondly, the US has experienced a surge of carbon nationalism, exemplified by the Trump administration, which has twice reversed the modest climate gains achieved under the Obama and Biden administrations. This political volatility has created an unstable environment for long-term investment in clean energy. Furthermore, the perceived decline in US emissions is largely attributable to two factors that mask the true carbon intensity of its economy. The first is the displacement of coal by natural gas, primarily through the fracking revolution. While this has led to some emissions reductions, the full climatic impact of fracking is difficult to quantify, and natural gas still contributes significantly to global warming. The second factor is the offshoring of carbon-intensive industries to other countries, which artificially deflates domestic emissions figures without truly addressing the global climatic impact of US consumption patterns.

Worst of all, the shale gas revolution and associated growth of fossil fuel infrastructure have effectively locked the US into a fossil fuel-based economy for decades to come, barring a radical change in direction. As China's lead in clean energy technologies advances, there is a growing likelihood that the US may abandon the green race altogether, doubling down on its fossil fuel economy instead of accelerating its transition to renewable energy. Some US states have attempted to fill the void left by federal inaction, implementing their own climate policies and renewable energy targets, with varying success. However, the effectiveness of these state-level initiatives is limited by the lack of federal coordination and the complete absence of transitional governance in more conservative states. This patchwork approach has hindered the scaling-up of

the renewable energy economy and deterred consistent, long-term investment due to policy inconsistency across state lines and the volatility of federal support.

In contrast, China has successfully developed and implemented a central renewable energy policy that consistently advances the pace of its energy transition, with a trajectory of increasingly ambitious targets. China now leads the world in the rapid deployment of renewable energy and green technologies, outpacing all other major economies in terms of capacity additions and manufacturing capabilities. Countering the effects of climate change has become a central pillar of the CCP's ruling ideology, exemplified by Xi Jinping's concept of "Ecological Civilisation." This ideological commitment appears to reflect a genuine concern for building an ecologically sustainable economy, even if the ultimate level of success remains uncertain. Importantly, the CCP has demonstrated both the willingness and the state capacity to discipline fossil capital, curtail its expansion, and undertake a consciously planned phase-out of the fossil fuel economy. Despite significant challenges, China is the state most likely to continue dismantling the fossil economy.

However, it is crucial to acknowledge the complicating factors in China's transition. The Chinese energy mix is still dominated by coal power, which may have only peaked in the last year, with the potential to actually peak in the next couple of years. Thus far, China's energy transition has been characterised primarily by the expansive addition of renewable energy capacity to the existing energy mix, rather than the replacement of fossil fuels. The challenge in the coming years will be to shift this dynamic and begin dismantling its dependency on coal power, a task that remains fraught with economic and social challenges. Moreover, there are concerns about

systemic weaknesses in the Chinese economy and uncertainty about its future trajectory. While the green economy represents China's highest growth sector, an economic downturn akin to the 2008 global financial crisis could potentially force the CCP to reevaluate its commitment to fossil fuel phase-out, especially given the centrality of coal to employment and economic stability in regions like Shanxi and Inner Mongolia.

As a result, this dissertation understands the Green Divergence between China and the US as a qualified one. When compared with each other, China's energy transition has succeeded while the US' has failed. However, China's transition has been a contradictory one and cannot be understood as a straightforward success, only a partial one. Meanwhile, the US failed to implement a central transitional framework, but did manage some small temporary victories in Obama's use of executive orders and Biden's CHIPS Act and Inflation Reduction Act, alongside some more ambitious action at the state-level, meaning it cannot be regarded as an absolute failure.

This dissertation seeks to understand the underlying historical causes of the Green Divergence. Its central research question is: how and why did China rapidly expand its green energy infrastructure and reduce its greenhouse gas emissions while the US remained trapped within a high-emissions and fossil fuel-dependent economy? To do so, the dissertation examines the pivotal moments when the two states' renewable energy policies began to diverge. In the US, this is the beginning of Obama's first term, where the proposed American Clean Energy and Security Act of 2009 sought to initiate an acceleration of the green energy transition at the federal level. The bill, more commonly known as Waxman-Markey, represented the sole opportunity to pass

federal legislation permanently implementing substantial pro-transitional policy in the period of 2001-2020. Before Obama's election, the Bush administration was adamantly opposed to any limitations on fossil fuel activity, whilst after the 2010 midterms, the Democrats lost the majority needed to pass renewable legislation. Once Trump was elected in 2016, there was not even a shred of hope for green federal governance.¹ Why did environmentalists, progressives and the broader Democratic coalition fail to seize upon this opportunity?

In China, there is no comparable standout moment. This is to be expected as a clear characteristic of the Chinese mode of governance is its slow, cautious, experimental and iterative approach to policy-making. However, there are several key points that are analysed together as part of an evolutionary process towards the formulation of a comprehensive energy transition agenda. The first is the passage of the Renewable Energy Law in 2005. This is followed in 2007 with the issuing of China's National Climate Change Programme and Medium and Long Term Development Plan for Renewable Energy. Third, the amendment of the Renewable Energy Law in 2009 to include more substantial and effective support, alongside the introduction of the Rooftop Subsidy Programme and Golden Sun Demonstration Programme in the same year. Also in 2009, came the Four Trillion Yuan Stimulus, which led to significant expansions of China's electrical infrastructure. Then came a ramp-up in China's green policy-making, with the introduction of climate goals into the Five-Year Plans (FYP) in 2011 and 2016, the introduction of pilot emissions trading schemes and the Belt and Road Initiative in 2013. By the end of 2016, the divergence was fixed in place, as Xi Jinping's policy agenda made it clear that China would

¹ One might ask why there is no focus on the Biden-era. This is because by the end of Trump's first term, the divergence had already occurred. Bidenomics can be understood as attempting to limit the expanding gap, but it proved unsuccessful, as Trump's return to the White House has guaranteed that the required continuation and expansion of Bidenomics will not occur.

continue to be the world leader in renewable development, manufacturing and utilisation, whilst Trump pulled out of the Paris Climate Agreement and gave the green light for the unlimited expansion of domestic extractivism by taking a sledgehammer to federal environmental regulations.

This research is important for several reasons. First, understanding why states succeed and fail to undertake green transitions is essential in designing governance frameworks for the immediate future. The US and China, as the two largest carbon emitters, play outsized roles in the global effort to mitigate climate change. We must understand what is limiting and enabling the success of transition in these particular cases if we seek to limit global warming to between 1.5°C and 2°C above pre-industrial levels. Furthermore, the way we conceptualise the challenges of energy transition governance shapes the types of political strategies we perceive as viable in responding to the escalating climate crisis. This dissertation's answer, which locates the impediment to transition in the contrasting economic compositions of the two states' national capitalisms, lends itself to an alignment with an ecosocialist politics, holding that transitional inertia will persist globally until the dominance of fossil capital and the economising imperatives of capitalist markets are confronted. At the same time, it lends itself to a political pessimism by articulating how the very structures that sustain fossil capital have eroded the conditions necessary for fostering political movements capable of challenging its dominance, creating a feedback loop of inaction and crisis.

Beyond its implications for climate policy, this research also provides valuable geopolitical insights into the contestation over global hegemony. The divergent trajectories in energy

transitions not only influence states' respective models of governance but also shape global perceptions of leadership in the transition to a sustainable future. For other states, these cases offer contrasting examples of how different political and economic systems - China's state-led capitalism versus the US' market-driven capitalism - affect the pace and direction of the energy transition. As the old neoliberal order falls apart, how the successes of these competing systems are judged will inform how other states reorganise their governance approaches. Moreover, the success or failure of these transitions will have profound implications for global power dynamics. As China positions itself increasingly as a "green" hegemon in opposition to the US' fossil-fuel-dependent leadership, its trajectories could redefine the contours of international influence, offering lessons, models, and warnings for the rest of the world. Understanding these dynamics is essential not only for advancing energy transition governance but also for navigating the broader shifts in global economic and political systems in the era of climate change.

[0.1] Thesis Statement

This dissertation argues that the divergence in energy transition trajectories between the US and China was primarily caused by the differing compositions of their respective national economies. Specifically, these compositions refer to the varying mix and prominence of different industries, patterns of employment, and developmental stages that characterise each country's economy. The central relevant difference between the American and Chinese economies was the gradual decline of manufacturing in the US (deindustrialisation) and the rapid growth of manufacturing in China (industrialisation), which can be understood as part of a unified process of capitalist development via globalisation. These major economic shifts created very different political and economic landscapes in which each state attempted to govern a transition to a renewable energy

mix. This dissertation analyses how these ongoing structural transformations systematically shaped the possibilities for energy transition governance, creating conditions that prevented the US from effectively undertaking a comprehensive green transition whilst enabling China to become a leader in green energy. The impacts of these economic transformations on the energy transition were multifaceted and interconnected, requiring multiple levels of analysis.

The dissertation demonstrates that in the US, deindustrialisation created three interconnected structural barriers that systematically amplified fossil capital's dominance while undermining the conditions necessary for transformative climate action. First, the spatial displacement of manufacturing to China constituted a metabolic shift that relocated the most severe environmental and health consequences of US consumption patterns overseas, creating fertile ground for climate denialism by obscuring the immediate connection between domestic consumption and ecological degradation. This metabolic shift weakened the material basis for labour-environmental coalitions that had previously driven environmental legislation, as local air quality improvements reduced the urgency of climate action while fossil interests successfully framed remaining extractive industries as essential bastions of working-class employment. Second, the 2008 financial crisis, itself rooted in deindustrialisation's financialisation processes, made the fracking revolution politically and economically expedient as a market-driven solution to multiple crises simultaneously: economic recovery through job creation, emissions reduction through coal-to-gas switching, and energy security through increased domestic production. This reinforced fossil capital's position as an essential pillar of the national economy rather than as an obstacle to climate action. Third, the shift to low-energy service sectors led to stagnant energy demand, creating a substitution dynamic where renewable energy development required directly

displacing existing fossil fuel generation rather than meeting new demand, heightening resistance from incumbent fossil interests and making federal renewable policies politically untenable.

These structural barriers were reinforced by the systematic weakening of pro-transition actors through deindustrialisation's broader political-economic effects. The trade union movement became fragmented and forced into defensive sectoral positions, with key unions aligning with employers against climate legislation to protect dwindling membership in economically devastated regions. The environmental movement underwent a geographic and class recomposition, concentrating in affluent coastal metropolitan areas and becoming increasingly dependent on corporate partnerships, which severed its organic connections to working-class constituencies essential for building legislative coalitions in fossil fuel-dependent states. Presidential leadership, exemplified by Obama's administration, reflected the constraints of post-industrial governance through market-centric transitional imaginaries that prioritised energy security and incremental technological innovation over state-led industrial planning, an approach that proved structurally incapable of challenging fossil capital's entrenched power or mobilising the popular coalitions necessary for transformative change.

Regarding China, this dissertation argues that rapid industrialisation created three interconnected structural conditions that systematically incentivised the CCP to pursue ambitious renewable energy development while limiting fossil industry opposition. First, the spatial concentration of global manufacturing in China's coastal cities created an intense environmental and health crisis that made the consequences of the metabolic rift immediately visible and tangible to both citizens and policymakers in the country's most economically important regions, generating

urgent pressure to pursue ecological modernisation or risk losing the legitimacy gained through economic growth. Unlike the abstract climate debates prevalent in post-industrial economies, China's pollution crisis manifested as an acute, localised catastrophe affecting tens of millions in major urban centres, compelling the state to respond. Second, China's export-oriented development model contained inherent economic contradictions - dependence on foreign investment, rising labour costs, and vulnerability to global market fluctuations - that necessitated climbing the value chain toward high-value manufacturing sectors. The renewable energy industry emerged as an ideal candidate for state-led development, offering long-term growth potential, domestic applicability, and opportunities for global market dominance in an emerging sector where China could leverage its accumulated industrial capabilities. Third, China's explosive energy demand growth created an additional dynamic where renewable development could meet new consumption needs without displacing existing fossil fuel generation, reducing antagonism between energy sectors and providing political space for comprehensive green developmentalism without immediate threats to incumbent interests.

These favourable structural conditions enabled the formation of a broad pro-transition coalition that aligned multiple social forces behind renewable energy development. China's manufacturing-oriented green economy provided industrial working-class employment that contrasted sharply with America's R&D-focused approach, while environmental organisations, green tech capitalists, and nationalists found common cause in supporting renewable development for overlapping but distinct reasons, including environmental protection, economic opportunity, and national security and international leadership, respectively. The turmoil of managing rapid industrial growth fostered a renewed emphasis on state planning among political

leadership, enabling both Hu Jintao and Xi Jinping to prioritise ambitious state-driven renewable energy strategies. This developmental context provided favourable conditions for the evolution of the official ruling ideology from Hu's "Scientific Outlook on Development" to Xi's "Ecological Civilisation" as both leaders chose to incrementally elevate the green transition to a central government priority and ensured continued support for the emerging industry through comprehensive industrial policy coordination.

While this dissertation demonstrates that economic composition provided the fundamental structural context, it recognises that the Green Divergence emerged from the dynamic interaction of structural economic forces with contingent political choices, institutional arrangements, and ideological and cultural factors that could either amplify or constrain structural tendencies. These non-structural factors operated as crucial mediating mechanisms that determined how underlying economic conditions translated into specific policy outcomes. The existing literature has documented numerous elements that contributed to the divergent energy trajectories of the US and China. For instance, the weakness of Obama's leadership on energy and climate policy, particularly in not utilising the 2010 BP Oil Spill as a last-minute attempt to revive the prospect of climate legislation, refraining from employing the office of the President as a "bully pulpit," and failing to counter the anti-renewable narratives of the fossil industry (Rieland, 2010; Harkinson, 2010; Revkin, 2010; Dickinson, 2010; Romm, 2010). Others have identified the key role in the institutional differences, policy-making processes, and policy designs between America's fragmented democratic federal system and China's authoritarian centralised party-state (Gilley, 2012; Lo, 2015; Chen, 2016, 2023; Andrews-Speed and Zhang, 2019; Gallagher and Xuan, 2019; Xiang and Lo, 2024). Similarly, the important role of ideology and

cultural approaches to energy and the environment has been demonstrated across the literature (Sovacool, 2009a, 2009b; Hess, 2014; Smith and Tidwell, 2016; Lewin, 2019; Huang and Westman, 2021).

These factors operated as mediating mechanisms that could either amplify or constrain the effects of underlying economic structures, creating space for contingency and agency within broader patterns of structural determination. For instance, had Obama mobilised his grassroots base and pursued a more populist climate strategy that directly addressed deindustrialisation's consequences through job creation and regional revitalisation, the structural barriers identified in this analysis might have proven less decisive in preventing federal climate legislation. Similarly, China's renewable energy ascendancy was facilitated not only by industrialisation's structural imperatives but also by specific policy choices, such as the decision not to continue down the path of rapid energy sector liberalisation during the early years of the 2000s (Yeh and Lewis, 2004). This dissertation thus positions economic composition as the fundamental driver of the Green Divergence while acknowledging that political agency, institutional design, ideology and cultural factors determined how these structural pressures were translated into concrete policy outcomes. It seeks to build upon the rich contributions of the existing literature, whilst bringing to the surface the role of economic compositions, which are often treated as background contextual factors within the literature.

Furthermore, this dissertation's arguments do not suggest that fossil capital would have refrained from obstructing renewable energy policy had the US avoided deindustrialisation, nor that China could not have adopted environmentally ambitious policies without rapid industrialisation.

Rather, the dissertation demonstrates that these economic transformations created distinct political and economic landscapes that systematically shaped each country's capacity to pursue energy transitions. The analysis reveals how structural economic changes fundamentally determined the possibilities for energy transition governance. It shows how the US faced systematically increased obstacles due to deindustrialisation's erosion of state capacity and pro-transition coalitions, while China's industrialisation created both the imperatives and opportunities for state-led renewable energy development under structurally advantageous conditions. This dissertation thus argues that the Green Divergence emerged not from two independent national strategies but from the contradictory effects of a unified global process of capitalist spatial reorganisation that simultaneously created conditions for China's renewable energy revolution and America's continued fossil fuel dependence.

In order to develop this argument, this dissertation draws upon the theoretical frameworks and methods of critical political economy and historical-materialist policy analysis. Critical political economy is an approach that examines the interrelationships between political and economic structures, with a focus on capitalist accumulation, class power dynamics, social relations, and systemic contradictions (Scherrer, Garcia and Wullweber, 2023). Central to the critical political-economic framework is developing an account of the developmental tendencies of capitalism, particularly how it develops into differing national variations within a global system (Aglietta, 1976). Alongside this is a core concern with the divergent ways in which the state has attempted to regulate and mediate the processes of capitalist development and the role of capital, labour and other social forces in contesting the formation of state policy (Poulantzas, 2000). Historical-materialist policy analysis builds on this foundation to examine how specific policies

are formulated against the backdrop of competing interests among different social forces (Brand et al., 2022). It analyses how policies contribute to societal reproduction and the regulation of social contradictions and crisis tendencies.

This dissertation, drawing from historical-materialist policy analysis, employs a three-part analytical framework of *context*, *actor*, and *process* to structure its investigation. The context analysis examines the broader political-economic landscape, developmental pathways and structural conditions determining the pace and trajectory of the energy transition in each country. The actor analysis examines the key stakeholders, their interests, ideologies, and power relations influencing the levels of support for the transition and the formation of energy policy. The process analysis traces the development and implementation of specific energy transition policies over time, covering the policies' formulation, implementation and evolution. It develops an account of how the various actors, in their shifting coalitions and within the political-economic context of structuring forces and uneven conditions, sought to realise their interests in the formulation of state policy, a process undertaken through social contestation, collaboration and eventual mediation by the state. Whilst the central claim advanced within this dissertation is that the composition of the two states' national economies was the primary cause of the Green Divergence, it seeks to demonstrate that the differing developmental pathways influenced the trajectories and pace of their energy transitions through multiple levels. Through the analysis of context, actor and process, it avoids creating a narrowly economically deterministic account, showing the agency of actors and the contingency of political struggles and development, whilst still demonstrating the central role of economic structures in shaping the historical outcome.²

² Economically determinist here refers to a historical account that argues economic factors are the sole drivers of events, neglecting the roles of human agency, contingency and other factors and thus providing an overly simplistic account which fails to understand the interplay of different aspects of a social system.

[0.2] Chapter Outline:

This dissertation is structured across eight main chapters, with its central argument being developed through a comprehensive comparative analysis. The chapter structure utilises historical-materialist policy analysis' tripartite structure of context, actor, and process analysis to divide up the analysis of the two case studies, before the final chapter serves to synthesise the findings into a comprehensive comparison. This organisation enables the dissertation to demonstrate how divergent economic compositions shaped not only the structural possibilities for renewable energy development but also the formation of social coalitions, the orientation of political leadership, and the concrete policy-making processes that determined transitional outcomes in both contexts, whilst laying them out in a structure that lends itself to systematic comparison.

Chapter 1: Literature Review and Theoretical Development

This chapter establishes the analytical foundation for the dissertation by critically reviewing existing scholarship on energy transitions and developing its theoretical framework. The first section examines dominant approaches in energy transitions research - institutionalism, science and technology studies, and innovation studies - through key works analysing either side of the Green Divergence. While recognising valuable contributions from authors utilising these frameworks, the review identifies a crucial gap: there is inadequate theorisation of how economic compositions fundamentally shape transitional trajectories, with economic compositions often being treated as a contextual detail or just one common factor amongst many. The second section

addresses this limitation by synthesising insights from the critical political economy of energy transitions, metabolic rift theory, and historical-materialist policy analysis. This theoretical integration enables a framework capable of systematic analysis of how different modes of capitalist development create distinct conditions for energy governance. The chapter concludes by operationalising this framework through a tripartite analytical structure - context, actor, and process analysis - that guides the subsequent empirical investigation. This theoretical foundation allows the dissertation to move toward building a comprehensive account of the structural forces driving the Green Divergence.

Chapter 2: The American Context Analysis

This chapter examines the structural conditions that shaped America's energy transition landscape during the Obama era, focusing on how deindustrialisation transformed the political economy of energy governance. The analysis centres on three interconnected developments that systematically disadvantaged renewable energy while amplifying fossil capital's dominance. The first section explores how manufacturing offshoring created a spatial displacement of environmental consequences, fundamentally altering the material basis for climate politics by obscuring connections between consumption and ecological harm. The second section analyses how the 2008 financial crisis and post-industrial economic vulnerabilities made the fracking revolution politically expedient as a seemingly optimal solution to multiple simultaneous crises. The third section examines how the shift toward service-dominated economic composition created stagnant energy demand, forcing renewable development into direct competition with incumbent fossil interests rather than complementing growing consumption. Together, these

structural transformations reveal how America's post-industrial context created systematic barriers to transformative climate action, providing essential insights for understanding the failure of federal energy transition policies despite the apparent political opportunities and scientific consensus on climate change.

Chapter 3: The American Actor Analysis

This chapter analyses the social and political forces that could have formed a pro-transition coalition during the Obama era, examining why they failed to coalesce effectively around climate legislation. The investigation focuses on three crucial actors: organised labour, the environmental movement, and presidential leadership. The labour section explores how deindustrialisation weakened unions while concentrating remaining membership in fossil fuel-dependent sectors, creating internal tensions over climate policy that reflected broader economic vulnerabilities. The environmental movement section traces how post-industrial recomposition shifted the movement's geographic and class base toward coastal metropolitan areas while severing organic connections to working-class constituencies essential for legislative success in fossil-dependent regions. The presidential leadership section examines Obama's political approach, ideological orientation, and conception of energy transition, situating his market-liberal incrementalism within broader patterns of post-industrial governance. Rather than treating these limitations as contingent strategic failures, the analysis reveals how deindustrialisation systematically undermined the political conditions necessary for transformative coalition-building, leaving fossil capital insufficiently challenged despite growing environmental awareness and initial Democratic control of the federal government.

Chapter 4: The American Process Analysis

This chapter traces how the structural and actor-level dynamics examined in previous chapters crystallised in the concrete policy-making process surrounding the Waxman-Markey climate bill. The analysis demonstrates how deindustrialisation's contradictions manifested in legislative failure through two interconnected mechanisms: elite-dominated policy design and consensus-oriented political strategy. The first section examines the United States Climate Action Partnership (USCAP) and its role in shaping the bill's market-centric framework, revealing how the environmental movement's post-industrial transformation predetermined policy approaches that reflected corporate priorities rather than popular economic concerns. The second section analyses Obama's leadership approach during the legislative struggle, exploring alternative pathways that remained available despite structural constraints while explaining why the administration's ideological orientation made transformative intervention unlikely. Rather than attributing defeat to tactical errors, the undemocratic structure of the Senate, or Republican obstruction alone, the chapter reveals how Waxman-Markey's failure was primarily determined by the systematic transformation of American political coalitions through deindustrialisation. The process analysis integrates contextual barriers and actor limitations to demonstrate how post-industrial conditions made comprehensive climate legislation structurally implausible, providing crucial insights into the mechanisms linking economic transformation to political outcomes.

Chapter 5: The Chinese Context Analysis

This chapter examines the structural conditions that enabled China's emergence as a global renewable energy leader, focusing on how rapid industrialisation created fundamentally different incentives and constraints compared to America's post-industrial context. The analysis centres on three interconnected developments that systematically favoured renewable energy development while managing fossil industry resistance. The first section explores how the spatial concentration of global manufacturing in Chinese coastal cities created intense environmental crises that made ecological consequences immediately visible and politically urgent, compelling state response to maintain legitimacy. The second section analyses how China's export-oriented development model contained inherent economic contradictions that necessitated industrial upgrading toward high-value sectors, with renewable energy emerging as an ideal strategic industry meeting multiple development objectives simultaneously. The third section examines how explosive energy demand growth created additive dynamics where renewable capacity could expand alongside existing generation rather than directly displacing fossil fuels, reducing inter-sectoral conflict and providing political space for comprehensive green developmentalism. These favourable structural conditions emerged from China's unique position as the destination for global manufacturing relocation, where industrialisation's contradictions created both imperatives and capacities for state-led renewable development.

Chapter 6: The Chinese Actor Analysis

This chapter examines the social and political forces that coalesced around renewable energy development in China, revealing how industrialisation enabled the formation of a broad

pro-transition coalition, contrasting sharply with America's fragmented landscape. The analysis focuses on three interconnected actor groupings that aligned behind green developmentalism: the industrial working class, broader pro-renewable constituencies, and party-state leadership. The first section explores how China's manufacturing-oriented renewable sector created employment opportunities attractive to traditional industrial workers, reducing labour-environment tensions that plagued post-industrial transitions where green jobs were concentrated in lower-wage service sectors. The second section analyses the convergence of environmental organisations, green technology capitalists, and nationalist constituencies around renewable development, examining how this coalition's strength lay in simultaneously addressing environmental protection, economic development, technological advancement, and energy security objectives. The third section investigates party-state leadership under Hu Jintao and Xi Jinping, tracing how industrial development's ongoing relevance maintained robust state planning capacity while official ideological developments incorporated environmental considerations as central rather than peripheral concerns. This cohesive coalition structure systematically advantaged renewable development while providing political cover for disciplining fossil capital, enabling transformative energy strategies unavailable in fragmented post-industrial contexts.

Chapter 7: The Chinese Process Analysis

This chapter traces the evolution of China's renewable energy policy-making from 2005 to 2016, examining how the structural conditions and actor dynamics analysed in previous chapters materialised in concrete governance outcomes. The analysis follows three distinct policy development phases that demonstrate the dynamic interaction between changing material

conditions created by industrialisation and evolving social force configurations. The first phase examines foundational legislation, particularly the 2005 Renewable Energy Law, revealing how acute energy security crises and mounting environmental pressures compelled initial state intervention into the renewable sector. The second phase analyses policy expansion during the global financial crisis through amendments, subsidy programmes, and stimulus measures, illustrating how external shocks accelerated comprehensive green industrial policy development. The third phase investigates the integration of climate objectives into Five-Year Plans, the Belt and Road Initiative, and the launch of pilot emissions trading schemes, marking the transition from reactive crisis management toward proactive strategic renewable development. This iterative approach reflected China's capacity for adaptive policy-making based on accumulated experience and changing material conditions. The process analysis reveals how developmental state institutions maintained operational relevance through ongoing industrial development, contrasting with post-industrial economies where such planning capacity had systematically weakened, thereby enabling China's comprehensive approach to establishing global renewable energy dominance.

Chapter 8: Looking Across the Pacific: Comparing the Energy Transitions

This concluding chapter provides a comprehensive comparative synthesis that brings together the analytical findings from both case studies to explain the Green Divergence as a unified global phenomenon. Rather than treating American and Chinese experiences as separate national stories, the analysis demonstrates how deindustrialisation and industrialisation represent interconnected processes within global capitalism's spatial reorganisation that simultaneously

undermined transformative climate capacity in the US while enabling renewable revolution in China. The comparison proceeds systematically across the three analytical levels - context, actors, and processes - revealing how their divergent and linked economic compositions produced fundamentally different political economies of energy transition. The chapter addresses alternative explanatory factors, including institutional differences, cultural variations, and resource endowments, while reinforcing the centrality of economic composition in driving divergent outcomes. The synthesis concludes by discussing broader implications for understanding energy transitions under capitalism, contemporary climate governance challenges, and the geopolitical dimensions of the emerging Green Divergence. By integrating critical political economy with detailed empirical analysis, the chapter demonstrates how structural economic forces fundamentally shape national capacities for climate action, providing essential insights for both scholarly understanding and practical policy development in the climate crisis era.

Chapter 1: Literature Review and Theoretical Development

This chapter presents a comprehensive review of relevant literature and develops the theoretical framework underpinning this dissertation's comparative analysis of the Green Divergence - the striking contrast between China's accelerated renewable energy development and America's relative stagnation. The chapter systematically examines the relevant landscape of sustainability transitions research, beginning with an analysis of the dominant approaches that have shaped the field (Köhler et al., 2019). In discussing the three dominant approaches - institutionalism, science and technology studies, and innovation studies - this dissertation draws out their key insights, the causal factors which they prioritise, and their points of differentiation. To effectively map the analytical terrain, it critically engages with key studies of the American and Chinese energy transitions that draw upon and serve as clear representatives of each approach, analysing both comparative and single-country studies (Gallagher and Xuan, 2019; Nahm, 2021; Chen, 2016, 2023; Andrews-Speed and Zhang, 2019; Sovacool, 2009a; Skocpol, 2013).

While building upon these works' substantial contributions, this dissertation extends their insights by examining how the divergent political-economic compositions of the US and China interact with the causal factors they identify to shape their energy transition trajectories in ways that existing frameworks have not fully theorised. The existing literature has thoroughly explored the role of institutional arrangements, governance frameworks, policy design, firm-level specialisation and innovations, and socio-technical interactions, but has paid insufficient attention to how underlying economic structures influenced the formulation, implementation and effectiveness of these differing mechanisms. This dissertation contributes to transitions research

by drawing theoretical resources from the emergent field of critical political economy of energy transitions (Malm, 2016; Haas, 2019; Newell and Simms, 2021; Pearse, 2021; Paterson, 2021; Christophers, 2024), synthesised with insights from metabolic rift theory (Foster, 1999, 2000; Saito, 2023) and historical-materialist policy analysis (Brand et al., 2022).

This integrated framework enables a more comprehensive explanation of how China's industrialising economy facilitated its green developmental state model (Chen, 2016; Chen and Lees, 2016), while America's deindustrialised landscape systematically constrained effective climate policy implementation and enhanced the dominance of fossil capital. The theoretical synthesis this dissertation extends beyond existing critical political economy accounts of the global energy transition, which have not adequately provided a full account of how and why China's capitalist development, characterised by the intensification of the fossil fuel economy, gave rise to the world's largest renewable economy. By integrating critical political economy, metabolic rift theory, and historical-materialist policy analysis, this dissertation is able to trace how the spatial shift of ecological burdens from the US to China created both the imperative and the capacity for China to rapidly develop its renewable energy sector as a strategic industry, while simultaneously explaining the erosion of political and economic conditions necessary for effective climate action in the United States.

[1.1] Energy Transitions Studies: A Critical Assessment of the Dominant Frameworks

Energy transitions are conceptualised in contemporary scholarship as complex, multi-dimensional socio-technical processes that unfold over extended temporal horizons,

fundamentally restructuring societal systems at multiple levels (Sovacool, 2009a, 2016; Geels, 2010; Köhler et al., 2019). This complexity emerges from the intricate interplay between diverse causal factors - economic structures, political institutions, technological innovation pathways, ecological constraints, ideological frameworks, resource endowments, cultural practices, social movements - each exerting distinct yet interdependent influences on transitional trajectories. The complexity of this phenomenon has necessitated multidisciplinary engagement, generating a rich tapestry of analytical approaches characterised by methodological pluralism, varying levels of analysis, and divergent evaluative criteria for assessing transitional outcomes.

The field has consolidated around several analytic frameworks that function as the dominant reference points for subsequent research, establishing paradigmatic ways of conceptualising transitional processes. The intellectual genealogy of these frameworks reveals their roots in three distinct yet complementary scholarly traditions. These three traditions are institutionalism, science and technology studies, and innovation studies. This section critically assesses representative works from each tradition that have substantially contributed to our understanding of the Green Divergence. Rather than providing an exhaustive review of the entire literature, this dissertation strategically examine works that have been particularly influential, exemplify key theoretical positions, or illuminate crucial dimensions of the Green Divergence.

Throughout this assessment, this dissertation highlights areas of agreement and contention both within and between these theoretical traditions. While these approaches share common ground in recognising the multi-dimensional nature of energy transitions, they diverge significantly in which causal factors they prioritise, how they conceptualise the impediments to transition, and

which policy interventions they advocate for. These points of divergence reveal not merely technical disagreements but fundamental ontological and epistemological differences in how scholars understand social change, technological development, and political agency.

By analysing these works' contributions and limitations, this chapter establishes the foundation for this dissertation's theoretical intervention. It argues that while each tradition offers valuable insights, they collectively fail to adequately theorise how the divergent political-economic compositions of China and the US fundamentally shaped their energy transition trajectories. This critical gap necessitates engagement with different theoretical traditions - specifically critical political economy, metabolic rift theory, and historical-materialist policy analysis - to develop a more comprehensive framework for explaining the Green Divergence.

[1.1.1] Institutional Approaches to the Green Divergence

Institutionalist analysis comprises the most substantial body of literature addressing the Green Divergence, emphasising how governance structures, policy frameworks, and institutional arrangements shape renewable energy development trajectories. Institutionalists conceptualise energy transitions as primarily political and administrative processes, emphasising how formal and informal rules, state capacities, and governance mechanisms shape the direction, pace, and outcomes of transitional efforts. Institutionalists generally agree that effective governance is the principal determinant of successful energy transitions, yet they diverge significantly in how they characterise the relationship between institutions and economic structures, the relative importance of different governance levels, and the causal mechanisms linking institutional arrangements to transitional outcomes. The prevalence of institutionalism, in contributing to our

understanding of the Green Divergence, can be explained by the heavy influence of historical institutionalism, which has long favoured comparative analysis, enabling it to develop substantial insights into the key differences in the two transitions.³

Chen's extensive body of work (2016, 2023; Chen and Lees, 2016, 2019, 2022) offers the most comprehensive institutionalist account of China's renewable energy acceleration. Chen's central thesis characterises China's approach as a deliberate “green developmental state” model - a reformulation of the industrial policies pioneered by Japan and the Four Asian Tigers adapted for the renewable energy sector and other emergent green tech sectors.⁴ Chen meticulously documents how this developmental state approach facilitated technological advancement, manufacturing capacity expansion, supply chain securitisation, and global market dominance in the renewable energy sectors. His analysis presents a detailed account of how central state policy-making drove China's rise as the global leader in the energy transition through a deliberate and strategic state-led development model that was economically nationalist, concerned with foreign influence, and aimed at dominating global exports. Chen demonstrates how state guidance, ownership of the largest enterprises in the energy sector, and substantial financial support advanced the Chinese energy transition by enabling the renewable energy sector to accumulate technological advantages, manufacturing capabilities, secured supply chains, and global market share while shielding it from market instability.

³ Lockwood et al. (2017) and Köhler et al (2012) have highlighted that a key difference between institutionalist and STS analyses is that STS primarily focuses on singular case studies, whilst institutionalists often favour comparative studies from which to derive generalisable findings. In part, this is due to different assumptions within the frameworks, with STS holding that “each transition is historically contingent” (Smith et al., 2010 in Lockwood et al., 2016). Whereas institutionalists, drawing on historical institutionalism, seek a systematic understanding of how political action is mediated and constrained through institutions and their interaction.

⁴ The Four Asian Tigers refer here to the economies of South Korea, Taiwan, Hong Kong and Singapore, particularly in the 1970s-90s when they experienced rapid industrialisation.

Chen's (2023) more recent comparative work further strengthens this analysis by directly contrasting China's robust developmental institutional infrastructure with America's less consistent and fragmented approach. This comparison enables Chen to engage with proponents of the "hidden developmental state" thesis regarding the US (Block, 2008; Weiss, 2012; Macneil and Patterson, 2012), demonstrating that while both states are interventionist, there are substantial qualitative and quantitative differences between them in terms of financial support, direct state involvement, economic planning, and policy consistency.⁵ Chen's analysis demonstrates that the difference is not only in the scale and visibility of state intervention, with the US' interventions being obscured for ideological reasons, but also in terms of the coherence and long-term strategic alignment of policies. China's developmental state approach reflects the state's capacity to undertake and effectively implement economic planning with long-term objectives, achieved through a plurality of aligned measures at the central, state and local governmental levels.

Andrews-Speed and Zhang (2019) complement Chen's analysis by providing a more granular examination of China's energy governance architecture. Their neo-institutionalist approach illuminates the complex interplay between central government directives, local implementation dynamics, and state-owned enterprise operations. Their work presents a comprehensive depiction of how Chinese leaders constructed the developmental model through legislation, administrative measures, and control over state enterprises, while also integrating the role of social and

⁵ The "hidden developmental state" thesis, advanced by scholars such as Block (2008), Weiss (2012), and Macneil and Patterson (2012), challenges conventional depictions of the American state as strictly non-interventionist. These scholars argue that despite its rhetorical embrace of free-market principles, the U.S. federal government has continuously played a significant role in economic governance and technological innovation. However, unlike traditional developmental states, this interventionist function remains largely obscured for ideological reasons, operating through less visible channels such as research funding, public-private partnerships, and targeted subsidies rather than through explicit industrial planning. The thesis suggests that while America presents itself as embodying market fundamentalism, in practice it maintains substantial state involvement in strategic sectors.

educational institutions in developing human capital. While sharing Chen's recognition of the state's central role, they place greater emphasis on the complex interplay between the central and local levels of government. They highlight the tensions between central party elites and local government administrators closely tied to state-owned enterprises, illustrated through their analysis of difficulties implementing nationwide carbon trading mechanisms. Additionally, they demonstrate how China's institutional arrangement fostered policy entrepreneurialism, with local governments competing to develop nationally competitive green technology industries, prompting them to innovate their industrial policies for a leading edge.⁶

Gallagher and Xuan (2019) offer a process analysis within an institutionalist framework, directly comparing US and Chinese climate policy development in their work *Titans of the Climate*. Their characterisation of American “deliberative incrementalism” versus Chinese “strategic pragmatism” provides valuable conceptual language for understanding the contrasting policy-making paradigms underlying the Green Divergence.⁷ Their detailed empirical analysis maps policy processes, stakeholder influences, and implementation dynamics in both contexts, examining the political, economic, and social drivers that shape energy policy outcomes in both the US and China. Importantly, Gallagher and Xuan do briefly discuss the role of the two states’ differing economic compositions, noting how the distinct positions of fossil fuel extraction within the two states’ national economies contribute to divergent policy outcomes. They

⁶ Notably, Chen (2016) is not blind to this tension and the role of policy entrepreneurialism, with two key chapters of his book discussing the local development of the Green Developmental State in Jiangsu and Zhejiang province. However, Andrews-Speed and Zhang (2019) very clearly place greater emphasis on the institutional space for local policy experimentation and the tensions between central and local government.

⁷ Whilst these concepts provide a useful encapsulation of the differing institutionalised policy-making approaches, as Wu (2020) notes in a review of the book, Gallagher and Xuan’s (2019) work suffers from limitations in their “disciplinary theoretical engagement.” These central concepts remain insufficiently theorised or elaborated upon, lacking clear indicators or explanatory mechanisms, instead serving primarily as labels of the processes they describe.

highlight that in the US, fossil fuel industries dwarf renewable energy industries, explaining how this enables them to dominate the policy-making process. Regarding China, they discuss the continued importance of heavy industry, coal's outsized role in the national energy mix, and the prevalence of state-owned enterprises in the energy sector as factors influencing the policy-making process. They also note the renewable energy sector's relevance as a strategic industry for China.

A point reflecting some of the disagreements among these institutionalist scholars concerns their predictions about transitional trajectories. During Trump's first term, Gallagher and Xuan (2019) predicted China's prioritisation of climate action would decrease without US pressure and cooperation. In reality, as Chen (2023) documents, the opposite occurred, with CCP support for energy transition becoming even more prominent during this period - suggesting differing interpretations of the primary motivations driving Chinese energy transition policy development. Gallagher and Xuan, perhaps reflecting their comparative methodology and interest in China-US relations, place heavy emphasis on the role of external diplomatic pressure in driving climate action. In contrast, Chen more clearly develops the linkages between economic development and security concerns as the prime driver in China's pursuit of renewable energy development, whilst treating climate diplomacy as a lower priority driver.

Skocpol's (2013) process analysis of the Waxman-Markey bill's failure provides a distinctly different institutionalist perspective on the stagnation of the US energy transition, focused on legislative processes and coalition formation at the federal level. Unlike the other institutionalist works, which emphasise formal governance structures and policy design and implementation,

Skocpol prioritises the role of political strategy and social movement organisation in determining policy outcomes. She attributes the absence of federal-level energy transition legislation primarily to strategic errors committed by environmental organisations, particularly the U.S. Climate Action Partnership (USCAP).

Skocpol (2013) argues that USCAP's reliance on elite lobbying and market-based policy design failed to address the concerns of average citizens, resulting in a weak grassroots movement unable to counter opposition in key battleground states. She suggests that a more effective approach could have led to the bill's passage, framing the failure as a contingent event dependent on different strategic choices by environmental leaders. Notably, Skocpol absolves President Obama of significant blame, suggesting that his leadership style was not the decisive factor in the bill's demise, underplaying alternative formal institutional routes to the bill's passage. Skocpol's analysis has proven influential - and controversial - precisely because it shifts attention from formal institutionalised policy-making processes to discuss the role of informal coalition-building and mobilisation processes as key determinants. This challenges more technocratic institutionalist approaches that focus primarily on policy implementation and administrative capacity.

Despite their differences in focus and methodology, these institutionalist works collectively provide valuable insights into how governance structures, policy-making processes and administrative approaches shaped the Green Divergence. They reveal how different institutional arrangements across the US and China enable or constrain renewable energy policy implementation, how various stakeholders influence policy formulation, and how governance

systems adapt to changing circumstances. Their detailed empirical research documents the specific policy instruments, administrative procedures, and coordination mechanisms that have proven effective in promoting renewable energy development in the two different contexts.

However, while these institutionalist approaches provide crucial insights into governance mechanisms, they face certain analytic limitations when explaining the deeper origins of institutional arrangements and their operation across different contexts. First, while they effectively describe institutional arrangements and policy processes, they tend to underemphasise the role of economic structures in shaping why certain institutional arrangements emerged and proved viable in some contexts but not others. For example, Chen's work, while providing an exceptionally detailed description of the green developmental state's mechanisms and evolution, offers an incomplete explanation of three critical questions: (1) why China adopted this particular model, (2) what political-economic conditions enabled its effectiveness and stability, and (3) why other states like the US failed to adopt similar approaches despite their demonstrated success. Chen (2016, 125) provides only a partial explanation centred on energy security concerns and ecological modernisation responses to environmental crises. He draws heavily on Yeh and Lewis' (2004) account of the CCP's halting of energy market liberalisation in response to energy market failures abroad, growing strain on energy supplies, and fears of foreign control. He also points to the integration of ecological modernisation into China's governing ideology in response to environmental and health crises. However, this account insufficiently theorises the deeper structural conditions that made the green developmental state's construction both possible and heavily incentivised in China's specific political-economic context.

Second, institutionalist approaches tend to treat economic factors as external considerations rather than constitutive elements determining institutional formation and function. Their focus on comparing governance structures and policy-making processes obscures how different modes of capital accumulation create distinct constraints and opportunities for energy transition governance in each context. Even when institutionalists like Gallagher and Xuan (2019) acknowledge economic structural influences, they position these as one factor among many rather than fundamental determinants of the political pathways available. This analytical choice obscures how economic composition systematically shapes political coalitions, resource distributions, and state capacities that condition institutional effectiveness, instead treating them as contextual background factors.

Third, institutionalist approaches frequently misinterpret power dynamics by neglecting the class-based nature of political contestation in capitalist societies. Rather than recognising how capital accumulation and class interests structurally determine which actors can effectively participate in policy-making and the nature of their interests, they reduce power to technical dimensions of institutional position, formal authority, and resource access. This limitation is particularly evident in Skocpol's (2013) explanation of policy failure in the US context. While Skocpol's work provides valuable insights into the political dynamics surrounding Waxman-Markey, it overlooks deeper political-economic factors that underpinned the strategic choices made by environmental groups and policymakers. Her analysis treats the absence of a robust grassroots movement and the bill's unpopular policy design as the result of tactical errors without sufficiently grounding them in an analysis of the class composition of the actors involved and the political-economic context shaping the balance of powers. For instance,

USCAP was dominated by corporate members with dual affiliations in organisations deeply opposed to climate legislation, suggesting that the lack of grassroots mobilisation was not merely a strategic oversight but a deliberate choice aligned with their corporate interests. Furthermore, Skocpol places the responsibility for the lack of grassroots activity on the environmentalist elite, without accounting for why the effort to pursue energy transition legislation was so reliant upon this elite grouping. There is no account of why the working-class base of a possible popular-oriented environmental movement was so fractured and unable to contest the key battlegrounds in the struggle over energy policy.

Collectively, these institutionalist approaches make substantial contributions to understanding governance mechanisms shaping the Green Divergence. However, their predominant focus on formal rules, governance structures, and policy processes often comes at the expense of critical analysis of the underlying economic structures that enable or constrain policy-making and institutional effectiveness. They generally treat economic factors as external considerations or background factors rather than constitutive elements determining institutional formation and function.

[1.1.2] STS Approaches to the Green Divergence

STS approaches to energy transition studies contribute to our understanding of the Green Divergence by foregrounding the cultural, ideological, and imaginary dimensions of energy transitions. Central to the STS literature is the concept of the socio-technical system, which is “the interlinked mix of technologies, infrastructures, organisations, markets, regulations, and user practices that together deliver social functions” (Geels et al., 2017). A core driver of the STS

approach is an aspiration to comprehensiveness and attention to the multi-levelled dimensions of socio-technical systems and their evolution, which can be seen in the expansive definition of the framework they apply. However, where STS distinguishes itself from other approaches, such as institutionalism and innovation studies, is its attentiveness to how cultural narratives, shared beliefs and values, and competing visions of progress and a desirable future shape the development of energy transitions. This is achieved through the deployment of the analytic framework of the socio-technical imaginary. Socio-technical imaginaries are defined as “collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects” (Jasanoff and Kim, 2009). By examining how different actors construct and contest socio-technical imaginaries, STS research reveals the deeply political nature of energy transitions, moving beyond technocratic accounts to explore how power operates through the shaping of collective imagination and the privileging of certain future visions over others.

Sovacool's (2009a) analysis of socio-technical impediments to renewable energy adoption in the US remains a seminal contribution despite predating the full manifestation of the Green Divergence. His work systematically identifies multiple interacting barriers - technical, economic, political, regulatory, and cultural - that collectively inhibit renewable energy diffusion. Sovacool argues that these impediments are embedded within the socio-technical fabric of the energy system rather than existing as isolated technical challenges. His analysis reveals how entrenched interests, established practices, market distortions, and cultural attitudes create systemic resistance to renewable energy integration. His detailed examination of how utility business models, regulatory frameworks, and infrastructure designs optimised for centralised

fossil generation systematically disadvantage distributed renewable alternatives has clearly shaped the consensus around the necessary reforms to enable energy transitions.

In Sovacool's (2009b) analysis of the impediments to the American energy transition, the distinctness of the STS approach becomes apparent in its extensive discussion of the role of culture. Sovacool draws out three key cultural impediments in the US: public apathy emergent out of misunderstanding, the linkages between consumerism and visions of abundance, and a resistance to change joined with a distrust of government. Sovacool argues that the physical removal of power plants from cities and neighbourhoods has removed energy generation from people's minds, whilst informed reflections on energy consumption are similarly missing because energy use is often invisible, leading people to be misinformed about their consumption - such as underestimating the consumption of energy for heating whilst overestimating consumption for lighting. This builds upon a foundation of a generalised American ignorance about the energy system, renewable energy sources and even basic energy concepts. He argues that the lack of awareness and visibility of energy production and consumption contributes to indifference about energy issues and policies.

Sovacool (2009b) further argues that the US' culture of consumerism and abundance, fostered by decades of cheap energy and industrial growth in the post-war boom, has led to a sense of entitlement to energy-intensive lifestyles. There is widespread belief that Americans are entitled to use as much energy as they need, embodied in the vision of American society as one built upon abundance and economic freedom. This impedes efforts to promote energy conservation or efficiency, which could enable the transition to a low-carbon energy system. Finally, Sovacool

highlights that the US has a cultural psyche that is fixated on comfort, freedom and control, which makes the population resistant to technologies or government measures which they believe would impede their freedom or diminish their control. These psychological factors become fixated on the intermittent nature of renewable energies and interventionist government measures to transform energy generation and usage, building upon a natural status quo bias that makes people reluctant to abandon existing technologies they perceive to be reliable and working well.

Complementary STS approaches have explored how social movements, cultural framings, and coalition formation shape energy transitions. Hess (2014) examines how sustainability coalitions form and influence transition politics, highlighting how social movements interact with incumbent regimes through both opposition and collaboration strategies. This approach illuminates how the fragmented nature of American environmental coalitions compared to more coordinated Chinese policy networks influenced divergent outcomes. While sharing Sovacool's recognition of socio-technical entanglements, Hess places greater emphasis on collective action and political contestation as drivers of system change. This perspective shifts emphasis from systemic barriers to the political processes through which different stakeholders negotiate transitional pathways.

Smith and Tidwell's (2016) ethnographic research on contested socio-technical imaginaries in American energy-producing communities further develops our understanding of socio-technical impediments to transition. Examining coal and uranium communities in Wyoming and Colorado, they reveal how residents articulate alternative energy visions that challenge dominant national

narratives. While American national discourse frames energy primarily through consumption - emphasising reliable and affordable energy for consumers - residents of energy-producing communities prioritise production aspects, particularly stable, well-paid employment opportunities. Through detailed ethnographic accounts, they demonstrate how community members link energy production not just to national energy security but to local community stability, intergenerational continuity, and robust social services. Smith and Tidwell introduce the concept of “bounded imaginaries” to describe these alternative visions that remain localised and fail to gain national traction, demonstrating how socio-technical imaginaries connect with social position and power. Their work helps explain why American transitions face stronger local resistance than China's more culturally integrated approach, informing another dimension of the Green Divergence.

Huang and Westman's (2021) analysis of China's Ecological Civilisation concept provides another significant insight into the Green Divergence through the analysis of socio-technical imaginaries, examining how environmental imaginaries emerge from cultural foundations rather than solely through top-down state implementation. Challenging prevailing STS assumptions that Chinese imaginaries are merely state-imposed constructs, they demonstrate how Ecological Civilisation represents a resonance between government environmental discourse and deeply rooted cultural traditions, particularly the traditional concept of “Unity of Man and Nature.” They argue that this cultural grounding helps explain why China's environmental vision has gained widespread acceptance across society and materialised in diverse local contexts. Their research reveals how socio-technical imaginaries can bridge state objectives with cultural values to form a “unified diversity” rather than operating through antagonistic relationships between

national visions and community aspirations. This perspective helps explain how China's environmental governance approach has achieved greater public support and implementation success than comparable efforts in the US, contributing to our understanding of the Green Divergence.

These STS approaches collectively offer crucial insights into dimensions often neglected in purely institutional or economic analyses, particularly regarding how cultural meanings and community experiences shape transitional pathways. They illuminate how technological systems become embedded in social practices, cultural meanings, and identity formations, creating complex interdependencies that resist simple policy interventions. Their attention to multiple system levels - from community experiences to national imaginaries - provides a more nuanced understanding of why apparently similar policies produce different outcomes across contexts.

However, when applied to explaining the Green Divergence, socio-technical approaches, despite their valuable contributions to understanding the role of cultural, ideological, and technological interactions in shaping transitions, face certain analytical gaps in connecting local practices to broader structural dynamics. First, while they effectively map existing socio-technical configurations and identify barriers to change, they offer limited explanations for why certain configurations become dominant while others remain marginalised across different national contexts. Sovacool's (2009a) work identifies how utilities, regulators, and consumers are influenced by entrenched practices but provides limited insight into why similar efforts to overcome these barriers repeatedly fail in the US despite awareness of their existence, while comparable interventions have succeeded in other contexts like China.

Second, socio-technical approaches often treat social arrangements and cultural framings as relatively autonomous from underlying economic structures rather than systematically shaped by them. This analytical choice, while productive for understanding meaning-making processes, obscures how capitalist imperatives fundamentally condition which social practices become dominant and which cultural meanings gain traction. Even analyses like Smith and Tidwell's (2016) that acknowledge economic factors tend to position these as contextual influences rather than determinative structures.

Third, when socio-technical studies examine power relations, they typically focus on relational or discursive forms of power without adequately theorising structural power embedded in economic arrangements. This limitation is particularly evident in analyses of why certain socio-technical imaginaries succeed in becoming dominant while others remain “bounded” or marginalised. The emphasis on discursive contestation and cultural resonance, while valuable, often comes at the expense of examining how economic structures systematically privilege certain imaginaries over others.

Collectively, these STS approaches make substantial contributions to understanding the socio-technical imaginaries, cultural framings, and local and national social histories shaping the Green Divergence. They provide critical insights into the cultural embeddedness of energy infrastructure and the discursive struggles that define transitional pathways. However, their predominant focus on sociocultural dynamics, local community experiences, and discursive contestations often comes at the expense of critical analysis of the economic imperatives that

structurally condition which socio-technical configurations gain dominance across different political-economic contexts. By focusing on cultural narratives and community-level imaginaries as primary explanatory factors while treating capitalist market logics and class relations as contextual background rather than constitutive determinants, these approaches inadequately account for how globalised capital accumulation processes fundamentally shape the materialisation of specific socio-technical systems. This is not to dismiss their contributions but to suggest that structural economic factors deserve greater analytical weight. The resultant analytical gap underscores the necessity of integrating STS's nuanced understanding of socio-technical co-production with a critical political economic framework that directly theorises how capitalist imperatives of profit maximisation, market expansion, national development and labour commodification structurally condition the formation of energy imaginaries.

[1.1.3] Innovation Studies Approaches to the Green Divergence

Innovation studies represent a crucial analytical framework for examining the Green Divergence, focusing primarily on the role of innovation in driving renewable energy transitions - particularly how technological development, firm-level strategies, market dynamics, and knowledge flows accelerate or impede renewable energy transitions. Central to innovation studies is the concept of innovation systems, which examines the complex interactions between firms, research institutions, government policies, and market structures that collectively determine innovation outcomes (Fagerberg, Martin and Andersen, 2013). While innovation scholars broadly agree that technological change is central to energy transitions, they diverge significantly in how they conceptualise innovation processes, the relative importance of different innovation system components, and the relationship between innovation and broader social transformations. Where

innovation studies distinguishes itself from institutionalist and STS approaches is its emphasis on the concrete mechanisms of technological change and industrial transformation, particularly through examining how specialised capabilities, value chain positioning, and industrial specialisation patterns determine which nations succeed in developing and deploying renewable technologies. The innovation studies approach provides unique insights into the Green Divergence by revealing how different national innovation systems produce varied capabilities and how firms develop specialised roles within global renewable energy value chains, explaining why certain countries excel in particular segments of renewable energy development.

Nahm's (2021) book *Collaborative Advantage: Forging Green Industries in the New Global Economy* offers the most comprehensive innovation-focused analysis of the Green Divergence. Through detailed firm-level examination across the Chinese, American and German renewable energy sectors, Nahm reveals how globalisation has shaped different national specialisations within renewable energy value chains. His research demonstrates how America's post-industrial economy has concentrated on advanced research and design while neglecting production and commercialisation - explaining why substantial US public investments failed to develop manufacturing capacity comparable to China's. For example, Nahm documents how Chinese solar manufacturers focused on process innovations that dramatically reduced production costs, while American firms specialised in more fundamental technological innovations that often failed to translate into domestic manufacturing capacity. This analysis illuminates how global innovation networks have distributed different capabilities across national boundaries, with Chinese firms specialising in manufacturing-intensive innovation while American firms focus on design-intensive innovation.

Nahm (2021, 184) notably asserts that American and Chinese governments shared “common political goals” and that they did not employ “fundamentally different industrial policy strategies.” This exemplifies a fundamental methodological divergence between innovation studies and institutionalist approaches to explaining the Green Divergence. Where innovation scholars like Nahm prioritise firm-level specialisation patterns and global value chain positioning as primary explanatory variables, institutionalists like Chen (2016, 2023) argue in the opposite direction, emphasising qualitative differences in state capacity, policy coherence, and institutional arrangements. This methodological difference leads to contrasting interpretations of similar empirical realities. By focusing narrowly on how firms operate within global production networks, Nahm's innovation studies approach systematically downplays the dramatic differences in state-market relations and policy-support mechanisms that institutionalists identify as crucial.

Of course, innovation studies are not blind to the differences in state formations and policy-making. Meckling and Nahm (2021) attempt to address these political dimensions by examining how "strategic state capacity" enables governments to overcome opposition to energy transition policies. They identify four key strategies states employ to counter fossil fuel interests - recruiting allies, aligning interests, limiting access, and quieting opposition - presenting an optimistic assessment of American capacity to implement effective climate policies. Their analysis illuminates how policy entrepreneurs within government agencies can create protected spaces for clean energy development through strategic coalition-building. However, in discussing the US federal government, they focus primarily on early 2000s successes such as electric

vehicle subsidies rather than subsequent failures to pass comprehensive climate legislation. This selective emphasis offers an incomplete picture of American strategic capacity, highlighting innovation studies' tendency to privilege agency and design factors over structural constraints. This again contrasts with the accounts of STS scholars, like Sovacool (2009a), by emphasising agency over the various socio-technical constraints to technological diffusion.

Popp's (2020) research on state-level innovation provides important complementary insights to Nahm's global analysis. Examining how renewable energy policies affect innovation across US states, Popp demonstrates that innovation responds more to overall market size than to policies in specific states. His analysis reveals that while states implement renewable energy policies hoping to become innovation leaders, the resulting technological advances often occur elsewhere, following patterns of pre-existing industrial specialisation. This observation parallels Nahm's findings about global value chains but at different scales, showing how innovation location depends more on broader economic factors than on local policy initiatives. Popp concludes that state governments should coordinate their policies to create larger markets, collaborate on R&D initiatives to avoid duplication, and foster supportive regulatory environments.

Tyfield, Ely and Geall (2015) introduce crucial dimensions missing from other innovation studies by examining how power relations and social practices shape China's environmental innovation landscape. Unlike Nahm's primarily economic analysis of firm specialisation, they examine how low-carbon innovations in China emerge through complex interactions between technological systems, social arrangements, and cultural contexts across three domains: solar energy, electric mobility, and agriculture. Their analysis of China's "compressed modernity" -

where technological leapfrogging enables simultaneous adoption of both legacy and emergent clean technologies - helps explain phenomena that conventional innovation frameworks cannot fully capture. By highlighting how technologies become entangled with cultural values and national identities, they provide insights into why China's innovation system has proven more effective at scaling and implementing renewable technologies despite its continued dependence on foreign expertise. While Nahm and other innovation studies focus primarily on firm strategies and market dynamics, Tyfield, Ely and Geall examine how innovations become embedded in existing institutional structures and potentially disrupt them. This perspective aligns more closely with socio-technical approaches than conventional innovation studies, revealing the increasingly blurred boundaries between these theoretical traditions.

These innovation-focused approaches collectively provide valuable insights into technological development pathways, firm strategies, and innovation systems that influence the Green Divergence. They document how different national innovation systems produce varied capabilities, how firms develop specialised roles within global value chains, and how innovation policies interact with market forces to shape transitional outcomes. Their detailed empirical research has substantially advanced our understanding of the technological and marketised dimensions of energy transitions beyond simplistic accounts of technology transfer or cost advantages.

However, despite their contributions, innovation studies approaches share significant limitations that constrain their explanatory power regarding the Green Divergence. First, they often treat innovation processes as relatively autonomous from broader political-economic structures rather

than systematically conditioned by them. By privileging technological change, firm strategy, and innovation systems as primary explanatory variables while treating structural economic factors as contextual rather than determinative, these approaches inadequately explain why similar innovation capabilities produce dramatically different transitional outcomes in the US and China. Nahm comes closest to overcoming this issue, hence his work being the primary discussion point. However, Nahm's firm-level analysis fails to fully integrate the divergent levels of state support and ownership into its analysis, deciding instead to flatten the difference.

Second, when innovation studies acknowledge political factors, they typically focus on policy design and implementation without adequately theorising how underlying economic structures influence policy possibilities. This limitation is particularly evident in Meckling and Nahm's (2021) account of strategic state capacity, which emphasises policy entrepreneurs' agency without sufficiently addressing how systematic structural advantages enable certain actors to repeatedly circumvent and exploit policy initiatives. Furthermore, it does not address the class character of policy entrepreneurs and the bases and networks of support they rely upon, which limits the range of policy approaches they are interested in and willing to implement. The result is an overly optimistic assessment of reform possibilities that inadequately accounts for the consistent obstacles to transformative change.

Third, innovation studies approaches often conceptualise power primarily in terms of information asymmetries, market positionality, or governance arrangements rather than as a fundamental feature of capitalist political economy. This analytical choice obscures how class interests systematically shape innovation trajectories, not merely as one factor among many but

as a fundamental condition determining which innovations receive support, how they are implemented, and who benefits from their deployment. This theoretical blind spot severely constrains innovation studies' ability to explain crucial aspects of the Green Divergence. For instance, why did American renewable energy policies focus primarily on R&D while neglecting manufacturing despite clear evidence of manufacturing's importance? How did different class compositions in China and the US influence policy priorities and implementation effectiveness? By treating innovation as relatively autonomous from underlying power structures rather than systematically conditioned by them, these approaches cannot adequately account for how different configurations of class power shaped renewable energy development in the two contexts.

Together, these innovation studies approaches make significant contributions to understanding the technological and industrial dynamics driving the Green Divergence, particularly through their analysis of innovation systems, firm-level specialisation patterns, and global value chain positioning. However, their predominant focus on technological change and market-driven innovation processes comes at the expense of critical engagement with the structural political-economic conditions that systematically shape innovation processes and the developmental role of the state. By privileging firm strategies and innovation capabilities as primary explanatory factors while treating political-economic structures as a contextual backdrop rather than constitutive determinants, these approaches inadequately account for how divergent configurations of national economies, state power, and class relations fundamentally condition renewable energy transition outcomes. Rather than dismissing these approaches' valuable contributions, this dissertation seeks to integrate their insights within a framework that can better

account for the deeper structural transformations shaping the contexts within which institutions, technologies, cultures, ideologies, and innovation systems develop. The goal is synthesis rather than replacement - building upon existing knowledge while addressing analytical gaps.

[1.2] Constructing a Critical Theoretical Approach to Energy Transitions Studies

This chapter has thus far developed a critical overview of the predominant methodological frameworks in transitions research, namely institutionalism, STS and innovation studies. What has been shown is that each suffers individual and common limitations, particularly around three interrelated issues.⁸ First, they do not place sufficient attention on the dynamics of capitalist accumulation and how its abstract logic is central to the production of transitional inertia globally. In turn, they conceptualise power, both economic and political, without critically engaging with how capitalist social relations act as the central structuring force in reproducing the present and evolving balance of power in the struggles over the energy transition. Finally, they do not comprehensively engage with the differing capitalist economic compositions between states, driven by the developmental tendencies of the capitalist system, often treating these compositions as one contextual factor amongst many and failing to address the multifaceted and deep effects these divergent compositions have on the developmental trajectories of national energy transitions. The combination of these limitations means that the dominant approaches naturalise capitalism. Presently, they obscure its central role in reproducing the dominance of fossil fuels and preventing the accelerated production of a sustainable alternative. Without a critical political economy of energy transitions, the various dynamics

⁸ Importantly, these limitations do not negate their insights. The analysis of this dissertation seeks to build upon their findings, whilst bringing forward the primary causal role of economic composition. It does not seek to dismiss the role of the factors they discuss, holding that they are important mediating forces that create room for contingent historical outcomes.

currently driving the Green Divergence appear to be natural, transhistoric, and inevitable, rather than the result of a historically specific social and economic system.

The section of the chapter undertakes the theoretical development necessary to address the limitations identified in the existing literature on the Green Divergence between the US and China. To provide a comprehensive understanding of how capitalist economic structures shape energy transition governance, this section reviews key works in the critical political economy of energy transitions (Malm, 2016; Haas, 2019; Newell and Simms, 2021; Pearse, 2021; Paterson, 2021; Christophers, 2024). These works offer key insights into the role of capitalism in creating transitional inertia, the development of ecological crises, and the process of policy formulation through social contestation and mediation. Additionally, this section explores metabolic rift theory, as developed by Foster (1999, 2000) and Saito (2023), which highlights the ecological contradictions inherent in capitalist development. Finally, it examines historical-materialist policy analysis, as outlined by Brand et al (2021), which provides a framework for understanding how policies are formulated against the backdrop of competing social forces and contradictory interests. By synthesising these theoretical perspectives, this dissertation develops a novel analytic framework that integrates critical political economy, metabolic rift theory and adapts historical-materialist policy analysis to effectively integrate the role of economic structure, the spatial and temporal shifts in ecological burdens, and the social contestation over state policy-making, into one comprehensive analysis.

[1.2.1] A Critical Political Economy of Energy Transitions

Critical political economy offers a distinct perspective on economic systems by diverging from liberal political economy, neoclassical economics, and institutional economics on several key points. As outlined by Scherrer, Garcia, and Wullweber (2023) in their introduction to *The Handbook of Critical Political Economy and Public Policy*, this approach views humans as fundamentally social beings, whose actions are shaped by their social context. This perspective rejects methodological individualism and the concept of *homo economicus*, whilst emphasising the interconnectedness of state and economy through the lens of class domination and capitalist accumulation.⁹ Rooted in the Marxist framework of historical materialism, critical political economy analyses economic dynamics through the prism of social power, structures of domination, class formations, and historical development paths.¹⁰

Critical political economy offers a complementary analytical lens for examining state policies, particularly in understanding how economic structures interact with political processes while remaining attentive to the role of agency, contingency, and institutional mediation in shaping outcomes. Unlike orthodox economics, which often views economic decision-making as a straightforward pursuit of national wealth or efficiency, critical political economy argues that these decisions are driven by specific class interests. However, it does not portray the state as a monolithic tool of class rule. Instead, it sees the state as a complex entity where different social forces, often representing various class fractions, engage in struggle and mediation to assert their interests through state institutions (Poulantzas, 2000).

⁹ Whilst all economics argues that the functions of state and economy are intertwined, critical political economy holds that the concepts of class and capitalist accumulation are central to understanding the dynamics of their relationship.

¹⁰ It is worth noting that here that critical political economy is used synonymously with the Marxist critique of political economy. Not all critical political economies are explicitly Marxist and may only share a limited amount of common assumptions. However, the critical political economic work engaged with in this dissertation emerges from the broad Marxist tradition, hence the synonymous usage throughout.

Methodologically, critical political economy employs a wide range of research approaches, including regression analysis, triangulation, comparative approaches, retrodution, and ethnographic methods (Scherrer, Garcia, and Wullweber, 2023). This dissertation utilises a comparative analysis drawing on critical political economy. To illustrate this approach, Haas' (2019) critical political-economic comparison of energy transitions provides an important methodological model. His framework focuses on comparing political-economic contexts that shape transitional trajectories, emphasising the dominant regime of accumulation in national economies, as well as the structures of civil society and state institutions.

Critical political economy differs significantly from institutionalism, STS, and innovation studies approaches to energy transitions studies by placing capitalist accumulation at the heart of understanding energy governance. It examines how class interests and social formations emerge from fossil fuel-based capitalist production. Pearse (2020) provides an overview of the theoretical differences between the usage of critical political economy and other approaches. In her work, she highlights that there are four key themes that are central to the approach. First, there is a specific historicity to current forms of energy usage that must be emphasised. Second, just as with all other forms of capital, there are distinct crisis tendencies of energy capital which shape its development and governance. Third, energy capital is spatially and physically embodied, meaning that any energy transition entails a massive spatial reconfiguration of the material basis of society. Finally, the processes of energy governance are driven by political contestation, which is filled with generative and contradictory dynamics which radically shape the policy process.

Malm's *Fossil Capital* (2016) is a foundational work within the critical political economy of energy transitions. His analysis derives the central link between fossil fuels and capitalist development, providing crucial insight into China's developmental trajectory in the aftermath of the Reform and Opening Up period. Malm provides a historical account of the energy transition in early nineteenth-century Britain, when the textile industry transitioned from the use of water power to coal. Through this historical analysis, he develops a framework for understanding the relations between capital, energy sources and labour. According to Malm, the transition primarily took place because it was able to provide capital with access to an expansive and easily disciplined labour force, challenging traditional views that coal replaced water because it was more economically efficient.

In constructing his framework, Malm (2016) categorises energy into three types: flow energy (like water and wind), animate energy (from humans and animals), and stock energy (stored in materials like coal). Flow energy is free but geographically limited, while animate energy comes from living creatures - and must be paid for. Pre-industrial and early industrial economies combined these two types, as seen in Britain's water-powered textile mills. However, flow energy's geographical constraints limited availability, giving workers in water mills leverage over factory owners. This created a contradiction in capital's drive for accumulation: flow energy could not be increased to boost output, and the costs of animate energy - human labour-power - drove upwards, creating a cyclical crisis of profitability and severe industrial downturn.

Malm (2016) argues that this contradiction prompted capital to shift to stock energy, embodied in coal. Although stock energy costs more than flow energy because it requires continuous purchasing and transportation, it can be used anywhere. This allowed capital to relocate to densely populated areas, weaken labour's bargaining power, and increase production through greater energetic inputs.

Malm's analysis shows how capitalist accumulation and class domination drove fossil fuel adoption, making it central to industrial development. Building upon this conceptual framework and historical account, Malm derives his central hypothesis, which posits that capitalism relies on increasing fossil fuel use to recover from its endemic crises of profitability and overproduction by expanding into new labour markets, facilitated by rapid fossil energy infrastructure development.

Using this framework, Malm (2016) explains fossil fuels' role in China's capitalist development. In the late twentieth century, manufacturing sectors in advanced industrial nations faced falling profit rates due to rising capital costs, labour militancy, and stagnating productivity. Similar to how textile capitalists abandoned water mills for urban steam engines to exploit concentrated urban workers, capital relocated to China to restore profitability through access to its vast labour force. This workforce, comprising hundreds of millions of rural migrants displaced during China's reforms, offered capitalists extremely low wages enforced by state repression of labour organising, limited industrial regulation, localised supply chains and cheap energy. This cheap energy was provided by China's state-led infrastructure investments, which facilitated a massive expansion of coal-fired power in coastal industrial cities.

From this analysis, Malm (2016) formulates the “Law of Rising Atmospheric Concentration of CO₂,” arguing that rising emissions follow capital wherever it goes. Importantly, Malm sees this as a cyclical development that would not end with China's industrialisation. The logic of capitalist accumulation would reproduce profitability crises in Chinese manufacturing, leading to industrial relocation to new regions with exploitable labour, enabled by rapid coal power infrastructure development - a spatial fix to the crisis of profitability. This creates a self-reinforcing cycle where capital's pursuit of profitability through relocation worsens climate breakdown while strengthening dependence on fossil fuels.

Malm's (2016) contribution to the critical political economy of energy transitions is essential to this dissertation. However, his account of China focuses specifically on drawing out his “Law of Rising Atmospheric Concentration of CO₂” and the contradictions in China's development in the 2000s and early 2010s, without addressing China's world-leading renewable energy development during the same period. While he correctly identifies that Chinese growth depended on fossil capitalist development, he does not explain how this same development simultaneously created the foundation for a global green transition that could potentially end fossil capitalist cycles. This one-sidedness does not undermine Malm's framework but indicates where it can be expanded to understand the contradictory emergence of a green developmental state from China's fossil capitalist growth. Malm also points to limitations in China's labour reserves, competing developing markets, and rising Chinese labour costs, which this dissertation argues contributed to the rise of the green developmental state.

Haas (2019) provides an excellent model of comparative critical political-economic analysis of energy transitions in his comparison of Germany and Spain from 2000 to the mid-2010s. His analysis draws upon Gramsci's critique of hegemony and regulation theory's analysis of economic development patterns. The most important aspect of Haas' work for building a comparative methodology is his use of the “regime of accumulation” concept, derived from Lipietz (1988) and elaborated by Becker (2002). A regime of accumulation is a “mode of systematic distribution and reallocation of the social product which, over a prolonged period, is able to coordinate transformations in the conditions of production... with transformations in the conditions of final consumption” (Lipietz, 1988: 25; Haas, 2019). This concept refers to the social relations and conditions that make capitalist production and accumulation possible, which vary across different national and regional contexts. Haas uses Becker's (2002: 67) distinction of three axes that differentiate capitalist accumulation processes: “first, productive vs. financialised accumulation, second, extensive vs. intensive accumulation and third, introverted vs. extraverted accumulation.”

These three axes allow for creating national profiles of economic development patterns, which Haas (2019) uses to compare Germany and Spain's energy transitions. This approach reveals two important insights. First, different economic patterns produce different social forces/actors with different interests regarding energy production and consumption, who then attempt to shape the dominant conception of energy transition. Second, they create different economic contexts for the energy transition, with some patterns being more prone to crises and systemic risks that can undermine national transition efforts.

In comparing Germany and Spain's energy transitions, Haas (2019) characterises their regimes of accumulation. Germany's regime is described as productive and actively oriented toward exports, while Spain's is financialised and passively integrated with global markets. Germany's large industrial base, focused on producing technical and specialised goods, constantly seeks new export markets. Haas notes the beneficial connections between Germany's industry and renewable energy development, with renewables being a highly technical industry with substantial export potential. Germany's economic structure provides two advantages: a stable economic context with relatively consistent growth, and an industrial base seeking to capitalise on electrification and renewable development. In contrast, Spain is characterised as financialised due to its deindustrialisation, reliance on tourism, and high levels of foreign investment (and debt) in construction and real estate. This creates a greater tendency toward cyclical debt crises and inconsistent growth, making Spain's economic context less stable than Germany's and weakening the investment pool for its energy transition.

Despite Germany having a large industrial base, Haas (2019) highlights that through continuous efficiency gains, economic growth is enabled without requiring an expanding energy supply. By comparison, energy demand in Spain was growing rapidly during boom periods in the construction sector, which was able to be met by the development of renewables. He explains that growth in electrical consumption was a benefit to Spain in terms of building the share of renewables, as it did not create direct conflict through the necessity of a fossil fuel phase-out to achieve an increased renewable share. However, he argues that Germany's wider economic advantages, which are paired with actively engaged civil society organisations, corporatist political tradition and deliberative democratic functions, allowed Germany to navigate this disadvantage. As such, Haas integrates his analysis of the national regimes of accumulation with

an analysis of civil society and state actors, examining them through the lens of hegemony building and modes of regulation.

Haas' (2019) analysis of how these civil and political factors enabled Germany to partially deal with the stable energy consumption issue is an important model for this dissertation because a similar dynamic occurred in the US and China in the selected period of study. Chinese energy consumption grew explosively throughout the 2000s and 2010s, whilst the US' remained practically unchanging, replicating the same advantage/disadvantage factor seen between Spain and Germany. However, the US lacked the civil society and political factors to overcome this disadvantage, alongside those found within its unstable, financialised, passive extraverted regime of accumulation.

While Haas' (2019) framework provides a solid foundation for analysing energy transitions through the lens of regimes of accumulation, this dissertation adopts “economic composition” and “structure” as a more accessible analytical framework for engaging with the mainstream transitions studies literature. By substituting “regime of accumulation” with “economic composition,” the analysis retains Haas' emphasis on how different modes of capitalist accumulation shape energy development dynamics and social actors' interests while aligning more closely with mainstream debates about economic dynamics in the institutionalist, STS and innovation studies literature - without sacrificing critical political economy's interrogation of power relations and hegemonic contestation. The “economic structure” dimension of this framework similarly captures Haas' focus on systemic stability and crisis tendencies. This reframing maintains Haas' comparative methodology but positions the analysis within discourses about economic development pathways, sectoral specialisations and industrial policy. By operationalising these structural dynamics through mainstream economic concepts rather than

regulation theory's specialised terminology, the analysis becomes more accessible to interdisciplinary audiences without losing the criticality of Haas' original framework.

[1.2.2] Metabolic Rift Theory

Critical political economy provides the analytical framework necessary to understand the multifaceted role of capitalism in preventing the rapid acceleration of the global green transition, providing a comprehensive theory that centres capitalist accumulation, whilst integrating and deepening discussions of other causal factors such as technological development and innovation, ideology, culture, finance, policy-making, and institutions. It demonstrates the inherent linkage between capitalist development and the expanded usage of fossil fuels, articulating clearly the necessity to adopt transformative action that does not simply incentivise the expansion of renewable energy but also challenges the dominance of fossil capitalism. However, when it comes to analysing the Green Divergence, there is an apparent issue here. As mentioned in the discussion of Malm (2016), China's rapid development of its renewable energy sector is inherently bound up within its fossil capitalist development. Whilst this work holds that critical political economy is an essential framework that enables the analysis of this contradiction, there is a necessity for further theoretical expansion to fully comprehend it. Here, this chapter argues for the integration of the metabolic rift framework, developed primarily by Foster (1999, 2000).

This theory provides a critical framework for analysing capitalism's systemic disruption of ecological systems through its structural imperative for endless accumulation. Foster develops the theory through a close reading of Marx's analysis of capitalist agriculture in Britain, wherein

he observes the opening of a rift in the social metabolism - the material exchange between humans and nature mediated through labour. Marx identified that capitalist development had led to a disruption of the nutrient cycle, as urbanisation led to the concentration of waste in cities whilst depleting the soil through intensified production, preventing the prior regenerative ecological process. Foster expands this analysis and formalises it into the theory of metabolic rift, arguing that capitalist development, driven by the structural necessity for profit, inevitably leads to the further disruption of natural cycles and the subsequent generation of ecological crises. Applied to the energy system, we see the opening of the deepest metabolic rift, wherein capitalism's reliance on fossil fuel development accelerates the withdrawal of carbon from its natural storage - coal, oil, gas stores beneath the ground - overwhelming atmospheric and oceanic carbon absorption capacities, leading to a rupture in the natural carbon cycle, with a series of deep cascading effects that erode the possibilities of ecological reproduction.

In response to the opening of metabolic rifts, Foster (1999) argues that capitalism undertakes a series of spatial and temporal shifts in order to prevent ecological crises from preventing the continued accumulation of capital. In the case of Marx's analyses of the metabolic rift occurring in the soil's nutrient cycle, Saito (2023) explains how the mass extraction of bat guano in Latin America, which was used as a nitrogen-rich fertiliser, served as a spatial shift of the rift. Instead of reorienting social reproduction to rebalance human and ecological reproduction into a more sustainable configuration, capitalism shifted the ecological consequences of its industrial development, restoring the health of British soil, to continue accumulation of agrarian capital, at the expense of the degradation of the ecological conditions in Latin America - wherein the extraction and eventual depletion of guano led to the collapse of local ecosystems which were

dependent on it. This is the nature of shifts in the metabolic rift: they do not serve to close the rift, which would act as a permanent solution; instead, they seek merely to relocate the ecological consequences, either to faraway localities or into the future.

Metabolic rift theory provides an essential bridge between critical political economy and environmental science, offering a systematic account of capitalism's role in the ongoing breakdown of the planet's ecological reproduction. It clearly frames ecological crises not as the failures of political will to regulate or establish technocratic management, but as the inevitable consequences of orienting social reproduction around the accumulation of capital. Additionally, the concepts of the social metabolism and spatial and temporal shifts are invaluable in understanding the last thirty years of development in global environmental politics and the opening up of the Green Divergence. It is through their application that we can come to understand the Green Divergence as a unified process, emergent out of the spatial shift of the ecological consequences of the US' capitalist consumerism to China, through the relocation and concentration of manufacturing into its coastal cities. Through an analysis of the spatial shift and its consequences, the weakness of the American environmentalist effort to accelerate a green transition and the contradictory development of a booming renewable sector out of China's fossil-fuel-driven industrialisation become clearly understood not as two distinct and separate phenomena but as a unified process.

[1.2.3] Historical Materialist Policy Analysis

While critical political economy provides the analytical framework to understand capitalism's role in hindering renewable energy transitions, and metabolic rift theory explains the ecological contradictions of capitalist development, we require an additional framework to analyse how specific policies emerge from these contradictory relations. Historical-materialist policy analysis (HMPA) offers this framework, bridging the structural analysis of critical political economy with the concrete examination of policy formation processes. The addition of this framework is essential because the Green Divergence is a story about the failure of comprehensive and effective policy-making to take place in the US, whilst occurring consistently in China.

The critical political economy approach, as outlined above, differs methodologically from the dominant approaches of the transitions literature by placing capitalist accumulation at the centre of understanding the energy transition, particularly emphasising the emergent class interests and social formations arising from fossilised capitalist production. However, this approach risks sliding toward economism, wherein everything appears as the inevitable result of economic conditions and processes, leaving no room for political contestation over the shape and pace of energy transitions. To avoid this critique of reductionism, it must be recognised that while critical political economy provides crucial insights into the underlying social processes that structure political contestation - by shaping the economic context and giving rise to various class fractions with divergent interests - these factors alone cannot fully explain political outcomes. The realm of active political contestation, where various interests are mediated through civil society and state organisations, remains a critical determinant of transitional trajectories, where effective mobilisation and manoeuvring of particular interests can dramatically shape outcomes.

Even with favourable economic conditions and social forces supporting a transition, inertia can take hold within state apparatuses. To more precisely understand the political dimensions that mediate the antagonistic interests within capitalist society, the HMPA framework has been developed. HMPA aims “at analysing how specific policies are formulated against the background of essentially competing and contradictory interests of different social forces and how, if at all, they contribute to societal reproduction and the regulation of contradictory social relations and crisis tendencies” (Brand et al., 2022). The framework takes a historical approach to policy formation, informed by Marxist critical political economy, while emphasising the role of contingency and contestation, directly challenging critiques that characterise Marxist politics as economistic, teleological, or class reductionist. HMPA's methodological assumptions derive from Marxist state theory, especially Poulantzas' articulation of the state as the material condensation of social relations and Gramsci's theory of hegemony (Gramsci, 1999; Poulantzas, 2000; Brand et al., 2022). Three core points characterise HMPA's conceptualisation of the state, its institutions, and the actors involved.

First, the primary purpose of the state in a capitalist society is not to maximise transaction efficiency, resolve collective action problems, or pursue an abstract public good. Rather, the state functions as a means of “anticipating, expressing and processing” the contradictions and crisis tendencies emerging from the antagonistic social and natural forces reproduced by the capitalist mode of production (Lipietz, 1988 in Brand et al., 2022). As a regulatory agent, the state mediates social antagonism, manages ongoing crises, and works to establish stable conditions for continued social reproduction organised through capitalist accumulation. In this capacity, the state maintains relative autonomy - its essential role allows it to deviate from specific

class-fractional interests to negotiate compromises between different social forces to effectively regulate antagonisms. Within these compromises, state actors exercise autonomy, developing their own political visions for mediating latent interests and demands from the wider social body. This autonomy remains relative, as the state cannot completely ignore dominant social forces' interests, but it retains significant discretion in how it satisfies or compromises with those interests.

Second, while the state is not an instrument of direct class rule, it constitutes an asymmetric terrain where particular class factions gain political advantages in realising their interests through specific policies (Brand et al., 2022). This results from the state being the “material condensation” of social relations - more organised and powerful social forces have shaped the state's formation, transformation, and reproduction throughout its historical evolution. These forces have altered the “material structure of the state” to create asymmetric selectivities favouring their interests, providing them with a greater capacity to have their desires realised through state policies. In practice, this material structure encompasses institutional arrangements, laws, dominant political orientations, governance modes, bureaucratic training and regulation, and power devolution (e.g., to independent regulatory bodies, commissions, ministries, central banks, state-owned enterprises). HMPA holds that while diverse class and social interests compete within the state, attempting to influence policy formulation, the resulting compromises will, under normal circumstances, favour particularly organised and influential fractions of capital because the state structure amplifies their capacity while minimising other groups' influence.

Third, complementing the material condensation framework is the concept of hegemony (Brand et al., 2022). While material condensation describes structural effects on social groupings, hegemony explains how dominant social forces' particular interests become universalised (Gramsci, 1999). This universalisation transforms material interests through inter- and intra-class compromises into normative frameworks regarding moral, political, and epistemic practices. This hegemonic normativity establishes order rules justifying and reinforcing the continued reproduction of existing class structures through prescriptions about mediating social conflict and managing crises. Hegemony production occurs both within and external to the state through class-structured knowledge production in state commissions, party research bodies, think tanks, and universities. For HMPA, policy struggles are simultaneously struggles for reproduction of class hegemony, with challenges to existing policy paradigms threatening dominant hegemony and becoming sites of fierce contestation over both material interests and competing normative claims (Brand et al., 2022). Like the state apparatus, hegemony represents a contested field, but its normal operation advantages dominant social forces by dampening challenges against it.

In methodological terms, HMPA requires continuous movement between theoretical reconstruction of structural conditions and contradictions within human-nature social relations and empirical research (Brand et al., 2022). This approach necessitates simultaneous engagement with highly abstracted social forces and concrete material developments. In practice, this means gathering empirical data regarding specific policies - their formulation and impacts - and reviewing relevant theoretical concepts, iteratively moving between the two to refine conceptual interpretations. Through continuous engagement with empirical data, theoretical explanations are modified and reconstructed, developing more rigorous historical interpretations without resorting

to predetermined theoretical explanations. Brand et al. (2022) operationalise this method through a three-step analysis process: context analysis, actor analysis, and process analysis.

Context analysis within HMPA situates conflicts over specific policies within the broader historical context of oppositional social and political forces originating in contradictions of the capitalist mode of production. This approach aims to reveal how particular policies are shaped by capitalist society's antagonisms and crisis tendencies, which in turn illuminates these antagonistic social forces, their alignments, and how they attempt to mediate contradictions (Brand et al., 2022). Haas' (2019) comparative analysis of energy transitions in Germany and Spain, discussed earlier, provides comprehensive insight into developing contextual analysis for energy transitions. This approach demonstrates how abstract contradictions become concretised within national economies through the historical formation of different accumulation regimes (economic compositions), creating distinct economic contexts. A comparative analysis is particularly effective in demonstrating how different economic compositions respond to various global developments.

While context analysis situates policy developments within broader political-economic trajectories, actor analysis identifies, analyses, and understands key political actors in policy development (Brand et al., 2022). This begins by identifying key actors, examining why they mobilised toward policy development, and how they articulated problems and framed desired solutions. Importantly, key actors exist not only within the state but also in economic and civil society spheres, where they seek to influence state policy adoption. Actor analysis then situates key actors within wider actor constellations, identifying informal groupings, coalitions, and

oppositions, understanding how different actors relate organisationally and strategically - for instance, analysing when groups with differing policy proposals might compromise to advance a united front. Analysing and comparing actors requires examining their resources and relative power, especially relating to HMPA's conceptualisation of the state as an asymmetric terrain. The analysis then connects back to the abstract, seeking to understand how underlying interests shape key actors' positionality, tracing the nature of class and social groupings while recognising that many actors themselves represent compromises between differing interests.

With an understanding of context and key actors established, HMPA proceeds to process analysis, tracing policy formulation and implementation processes. This requires identifying key events in policy contestation, enabling a periodisation of the compromises and conflicts involving actors. Through these events and periodisation, shifting power balances and political advantages are examined, relating these to different strategic selectivity factors (Sum and Jessop, 2013 in Brand et al., 2022). Process analysis should investigate the extent to which policy developments occurred within the formal state apparatus versus the wider public sphere. After analysing policy formulation trajectory, implementation must be studied, as this involves reinterpretation and rearticulation by new state actors, creating opportunities for additional interests to influence policy outcomes. Process analysis remains the least methodologically developed aspect of HMPA due to the vast array of states and policies with differing contestatory processes, requiring researchers to make adjustments based on their specific research subjects.

Importantly, while results presentation may be linear, the HMPA research process entails continuously moving between context, actor, and process analysis, using new information to

restructure interpretation and build a coherent, unified analysis of political struggles. Analysis ordering may be adjusted depending on the research subject or the researcher's preferences. This dissertation follows the context, actor, then process ordering, creating a coherent, informative structure enabling readers to comprehend political struggles - establishing the setting, introducing the characters, then elaborating on the action in narrative terms. As a comparative analysis, this dissertation places special emphasis on context analysis of Chinese and American transitions, as their distinctly different contexts create dramatic divergences in transition pathways.

By integrating critical political economy, metabolic rift theory, and historical-materialist policy analysis, this dissertation develops a theoretical framework that examines how economic compositions and their transformations interact with political agency, institutional arrangements, contingent events, and other factors to explain the Green Divergence while avoiding both overly deterministic and voluntarist explanations. This integrated approach allows it to analyse how different political-economic compositions shaped the formation, implementation, and effectiveness of energy transition policies in both countries, while avoiding reductionist explanations that attribute divergent outcomes solely to institutional arrangements, socio-technical systems, or innovation capabilities.

Section 1: Fractured Promises: The Transitional Failure of the Obama Era

Chapter 2: The American Context Analysis

This section of the dissertation examines the structural and political-economic forces that undermined America's capacity to implement a comprehensive energy transition during the Obama presidency (2009-2016), despite the overwhelming scientific consensus on climate change and initial public support for decarbonisation. This section is organised around three chapters, each organised around a different level of analysis. Through this dissertation's tripartite analytical framework - context, actor, and process - the section's analysis reveals how deindustrialisation reconfigured the dynamics of American energy governance, amplifying fossil capital's dominance while eroding the social foundations necessary for transformative climate action. By applying metabolic rift theory (Foster, 1999; Saito, 2023) to post-industrial America, this chapter demonstrates how the spatial displacement of industrial production to China created a political-economic environment where climate denialism flourished, fossil fuel interests consolidated power, and renewable energy development became trapped in a stifling substitution dynamic.

This context analysis chapter establishes three pivotal arguments about the Obama-era energy transition. First, deindustrialisation severed the most obvious material connection between American consumers and the ecological consequences of fossil-fuel capitalism, enabling fossil interests to rebrand environmental regulation as economically harmful rather than ecologically

necessary. As manufacturing jobs migrated overseas, fossil capital weaponised economic anxieties to frame climate action as a threat to the remaining industrial employment - a strategy exemplified by the Romney campaign's attacks on Obama's "imaginary energy policies" (Romney, 2012). Second, the fracking revolution emerged as a politically expedient solution to the dual crises of economic recovery and energy security, creating path dependencies that further locked fossil fuels into America's energy system despite their incompatibility with long-term decarbonisation goals. Third, stagnant energy demand in the post-industrial economy forced renewable energy into a substitution dynamic, where every megawatt of clean energy directly threatened fossil fuel incumbents - a structural barrier absent in industrialising economies like China, where renewables could expand through addition rather than displacement.

The actor analysis chapter articulates why pro-transition forces failed to coalesce at the most optimal time when a pathway to renewable energy policy-making was available. It reveals how deindustrialisation fractured potential alliances between organised labour and environmentalists, leaving unions trapped in defensive postures that prioritised protecting dwindling fossil fuel jobs over advocating green industrial policy. Simultaneously, the environmental movement's shift toward NGO professionals and coastal elites alienated working-class communities devastated by plant closures, creating political openings for fossil interests to position fracking as an economic lifeline and depriving them of an organisational base in the key battleground states. Finally, it is argued that President Obama's transitional imaginary - prioritising market-driven innovation over state-led industrial planning - proved fatally misaligned with these structural realities. His administration's "all-of-the-above" energy strategy functionally preserved fossil capital's

hegemony by avoiding confrontations with incumbent industries and relying on unfulfilled promises of green job creation.

The process analysis chapter demonstrates how these contextual and actor-level failures crystallised in the defeat of the Waxman-Markey climate bill. Contrary to Skocpol's (2013) emphasis on tactical errors, this chapter argues the bill's collapse stemmed from deeper structural imbalances: a corporate-captured policy-making process dominated by the United States Climate Action Partnership (USCAP), which prioritised market mechanisms over popular mobilisation, in alignment with its own class interests. This left them unable to effectively counter fossil fuel interests, who spent over \$700 million lobbying against the bill, exploiting post-industrial economic anxieties to frame carbon pricing as a job-killing tax - a narrative amplified by the absence of strong labour-environmental alliances. Additionally, Obama missed a crucial opportunity to use his political momentum after the election to build a grassroots movement that could have reshaped his party's stance on climate policy and other issues, similar to how the Tea Party mobilised to drag the Republican party in a national-populist direction. This squandered opportunity highlights the limitations of Obama's and the Democratic Party's leadership's overreliance on technocratic solutions to address climate change, which proved drastically unpopular in the context of deindustrialisation.

By synthesising these dimensions, this section of the dissertation advances a novel explanation for America's transitional failure: deindustrialisation did not merely weaken pro-climate forces - it reconfigured the political economy of energy in ways that made fossil capital's continued dominance structurally advantageous. The spatial displacement of industrial emissions to China

obscured the metabolic rift's global dimensions, allowing domestic air quality improvements to demobilise environmental constituencies while fossil interests blamed offshore production for climate harms. This analysis provides critical grounding for the subsequent chapter's examination of China's contrasting pathway, where industrialisation's additive energy dynamics and visible ecological crises enabled a more decisive state-led transition. Together, these cases illuminate how divergent positions within global capitalism shape national capacities for climate action - a framework essential for understanding the emerging era of Green Divergence.

[2.0] Chapter Outline

This context analysis chapter examines how the US' economic transformation from the 1970s to the 2000s, marked by the decline of manufacturing and the rise of service, financial, and knowledge sectors, created structural barriers to a successful energy transition. It begins by providing a clear background regarding the political-economic context in which Obama's presidency and the struggle over energy policy occurred. It expands on this by outlining the causes and consequences of deindustrialisation, which this dissertation argues is central to understanding the failure of the US energy transition. It thus highlights how the offshoring of manufacturing reshaped the US economy and displaced key industries, giving a clear depiction of the US' post-industrial economic composition. With this context explained, the chapter identifies three central ways in which the US' economic composition inhibited progress toward renewable energy, addressing them in turn. First, it explores how the spatial shift in industrial activity relocated environmental harm overseas, weakening domestic environmentalist momentum and fostering climate scepticism in regions devastated by industrial decline. Second,

it discusses how the 2008 financial crisis and related political-economic pressures incentivised political elites to embrace fossil fuel extractivism, particularly through fracking, as a short-term fix for economic recovery and to achieve energy security goals. Finally, it considers how the shift to low-energy service, financial, and knowledge sectors reduced overall energy demand, creating a dynamic where renewable energy had to compete directly with entrenched fossil fuel interests rather than complementing growing consumption.

[2.1] The Background

Obama's election sparked widespread optimism about accelerating the energy transition after eight years of Republican governance, with expectations for increased federal renewable energy support, renewable portfolio standards, carbon markets, and fossil fuel subsidy elimination (Vidal, 2008; Burkhalter, 2008a, 2008b; Barnes, 2008). Unfortunately, most of these anticipated policies never materialised. Instead, the transition that occurred was largely the substitution of imported fossil fuels with domestically extracted ones, accompanied by only marginal growth in renewable energy capacity (EIA, 2024d, 2024e, 2024f). The US remained constrained by inertia, locked into an expanding fossil economy, later forcing the Biden administration to desperately attempt to catch up - an effort that would prove a failure, leading to the return of Trump's fossil nationalism. Obama's first term represented America's prime opportunity to accelerate the renewable energy transition and prevent falling dramatically behind China - an opportunity that was ultimately squandered.

With hopes raised by the election of the US' first "climate president", how did it go so wrong (Vidal, 2008)? There was some initial limited success within the American Recovery and

Reinvestment Act of 2009 (ARRA), providing record levels of federal funding for renewable energy development.¹¹ However, ARRA simultaneously allocated substantial support to the domestic fossil fuel industry, reflecting the “all-of-the-above” approach that dominated US energy policy-making, which essentially reinforced the status quo (Office of the Press Secretary, 2016). Following ARRA, Democrats needed to pass comprehensive transitional legislation to expand federal support for renewable energy while imposing limitations on fossil fuels. Their attempt, the Waxman-Markey energy bill, narrowly passed the House only to falter in the Senate. The bill faced determined opposition not just from Republicans but also from a group of Democratic senators - dubbed the Technology-15 (T15s) - who aligned with fossil fuel interests, fearing electoral consequences from their fossil fuel industry-dependent constituents (Jenkins, 2009). As the bill stalled in the Senate, Obama failed to mobilise political capital to secure its passage, believing another opportunity would arise the following year (Bravender, Cama and Bogardus, 2024). His Energy Secretary, Steven Chu, an academic with limited political experience, was left isolated in pushing for the bill's passage - an effort that predictably proved unsuccessful.

What the Democrats did not anticipate was that the Waxman-Markey bill would represent their last opportunity to pass comprehensive transitional legislation for more than a decade. The 2010 midterm elections shifted control of the House to Republicans, who also gained enough Senate seats to effectively block legislation. The Republican Party, increasingly influenced by the Tea Party movement's national-populism, deepened its embrace of climate change denialism. With legislative pathways closed, Obama retreated to executive policy-making, attempting to leverage

¹¹ The full text of the American Recovery and Reinvestment Act of 2009 is available at: <https://www.govinfo.gov/content/pkg/PLAW-111publ5/pdf/PLAW-111publ5.pdf>

existing legislation and executive orders to achieve limited environmental progress. While his focus on executive actions intensified during his second term, these measures never approached the potential impact of the Waxman-Markey bill or similar legislation (Reilly and Bogardus, 2016).

The failure to accelerate renewable energy transition did not prevent an energy transition of a different kind: the fracking revolution - namely, the widespread implementation of horizontal drilling and hydraulic fracturing to extract shale gas and other fossil fuels from previously inaccessible formations. As initially hoped, US carbon emissions did decline under Obama's presidency, but not because of a shift toward renewable energy (EIA, 2024g). Instead, these reductions came from displacing coal in electricity generation with increasingly abundant natural gas (EIA, 2024c, 2024e, 2024f).

Beyond emissions reduction, the US also overcame its dependence on fuel imports. Just ten years after Obama's election, America had become a net exporter of oil and gas for the first time in over seventy years (EIA, 2024d, 2024e). American concerns about “peak oil” vanished as the country gained access to oil and gas supplies potentially sufficient for the remainder of the century. The energy legacy of Obama’s presidency thus became the enablement of the fracking revolution, which reinvigorated extractivist-driven economic growth and deepened America's commitment to the fossil economy. The contradiction between Obama's climate change concerns and his embrace of fossil fuels was obscured by promoting natural gas as a “bridge fuel” that would provide time to develop renewable capacity. Proponents emphasised that shale gas primarily emits methane rather than carbon dioxide, offering immediate reductions in greenhouse

gases when replacing coal. However, the fracking revolution created lock-in effects that undermined incentives to transition from fossil fuels, as massive fixed investments in shale gas infrastructure (pipelines, storage facilities, LNG terminals, gas-fired generators) created powerful path dependencies. Even more concerning, the expansion of the domestic fossil economy formed the economic foundation that would later drive Trump's carbon nationalism and pipeline populism. During his second term, Obama attempted to establish environmental policies through executive actions to limit the excesses of domestic extractivism, but the fossil fuel industry and its supporters rejected these limitations, becoming a core base of Trump's support and enabling him to systematically dismantle Obama's environmental policies (Baker, 2020; Popovich, Albeck-Ripka and Pierre-Louis, 2021).

Obama claimed that securing shale gas supplies represented one of his greatest achievements (Richardson, 2018). This assessment is fundamentally flawed. The fracking revolution was not a temporary measure facilitating ecological modernisation but rather demonstrated America's inability to break free from fossil fuel dependency, revealing capitalism's continued reliance on extractivist accumulation and environmental degradation. This represents Obama's most significant failure, not his greatest achievement. The critical question becomes: why did Obama's presidency, despite the considerable hopes invested in it, fail to produce substantial progress in energy transition? This question can be broken down into three components. First, what structural conditions and imperatives discouraged renewable energy policy while encouraging the fracking revolution? Second, why were advocates for transitional policies so severely limited in their ability to influence key senators to support the Waxman-Markey bill? Finally, how did

forces opposing the transition manoeuvre against the bill, and what consequences followed their victory?

To explain why Obama's presidency failed to transcend fossil fuel dependency despite its aspirations for decisive climate action, this analysis turns to the structural reconfiguration of America's economic composition through deindustrialisation. The dissertation contends that the post-1970s shift from manufacturing dominance to a service-knowledge economy created three interlocking barriers to renewable energy transition: the spatial displacement of ecological costs through industrial offshoring, the post-2008 embrace of fracking as a crisis management tool, and stagnant energy demand in low-consumption service sectors. In order to lay the foundations for these arguments, the remainder of this background section develops a brief account of America's process of deindustrialisation, outlining the core developments that were central to producing the transitional inertia that gripped the US federal state.

Since the mid-1970s, American society has undergone a drastic political-economic transformation following what is known as the Golden Age of American Capitalism, a period characterised by rapid and stable economic growth achieved through standardised production methods, high profitability, and global demand for American goods and capital after the Second World War (Lipietz, 1987). This prosperity, which delivered widespread improvements in living standards through expanded welfare, electrification, consumer access, education, and stable unionised employment, was fueled by a dramatic doubling in energy consumption between 1950 and 1972 (EIA, 2024b). However, this Golden Age inevitably unravelled due to converging structural pressures that exposed fundamental contradictions in America's industrial capitalism.

The 1973 OPEC embargo and subsequent oil shocks coincided with the stagnation in domestic production, leading to the US suffering an increasing reliance on costly fuel imports, with over 40% of America's fuel consumption coming from abroad by the late 1970s (EIA, 2024d). These energy challenges collided with declining productivity growth, eroding profit margins already strained by rising wages and regulatory costs (Cobet and Wilson, 2002). Simultaneously, US industry was facing intensifying competition from Japanese and West German manufacturers with newer infrastructure and lower labour costs (Howes, 1993). The combination of these structural pressures, amongst others, led to a decline in profit rates in manufacturing across the 1970s, triggering a systemic crisis of accumulation that demanded radical restructuring to reinvigorate profitability.

This profitability collapse manifested spatially through the rapid deindustrialisation of traditional manufacturing regions. Manufacturing employment reached its peak in the US in 1979, reaching over 19 million employees, which represented 22% of total employment (Harris, 2020). Whilst the decline began in the 1980s and continued towards the end of the 1990s, manufacturing employment dropped most intensely across the 2000s, falling from 17.2 million by the end of 1999 to 11.4 million by the end of 2009, a historical low that had not been reached since 1941 (Harris, 2020).¹²

By the mid-2000s, American capitalism had been drastically restructured through the dual processes of deindustrialisation, industrial consolidation and offshoring. Manufacturing was no

¹² Between 1979 and 1999, industrial capital sought to resolve its profitability problem, in part, through the pursuit of a spatial shift, fleeing the Midwest and Appalachia for the Sun Belt, where the exploitation of disorganised immigrant labour, weaker labour protection laws, and a comparative absence of regulatory compliances provided a temporary relief. Whilst deindustrialisation of the Midwest and Appalachia led to a spatial shift in the location of production, predominantly relocating across state lines within the US, this shift would not hold permanently. Stagnation and crises of profitability also came to increasingly plague the manufacturing industries in the Sun Belt.

longer the central driver of the US' economic growth or a key provider of employment. In its place was a fundamentally restructured economy dominated by tech (research and development), finance and services. This transformation represents not merely a sectoral shift but a comprehensive transformation of the economic composition of the US. By the late 1990s, American economic strategy had pivoted decisively from producing manufactured goods toward developing intellectual property monopolies, particularly in information technologies, pharmaceuticals, and other technologies - including energetic ones (Nahm, 2021). The vision was to generate economic growth not through production-based profits employing labour to create tangible goods, but through monopoly rents derived from knowledge production and design expertise. Firms, once directly engaged in manufacturing, invested in increased research and development capacities, whilst outsourcing manufacturing and fulfilment to firms predominantly in China and Southeast Asia.

The expansion of the service sector in the US has been the other central transformation occurring in the economic composition in the face of deindustrialisation. With rising unemployment, due to the collapse in manufacturing employment via consolidation and offshoring, the service sector has swelled to become the dominant avenue of employment and economic output. This shift, however, has been characterised by low rates of productivity growth, proving to be a core difference from the manufacturing sector. The shift from manufacturing to services as the central driver of the US economy has led to several developments that are crucial to this dissertation's argument and are elaborated upon throughout this chapter. However, to note them here, there are three central developments. First, the collapse of the trade union movement is directly tied to the collapse of manufacturing and the growth of the service economy. The old bastions of organised

labour - the industrial cities and townships of Appalachia and the Midwest - have long entered a terminal decline, whilst the heterogeneous and transient nature of the service economy has proved incredibly difficult for unions to effectively organise within. Second, it has driven the concentration of economic activity and the working population into coastal metropolitan cities. Although this has long been a developmental trend, it has accelerated under deindustrialisation, as rural and semi-rural areas, previously host to manufacturing sectors, do not have the population density to sustain a robust service sector, leading to high levels of youth unemployment and migration to major cities (Green, 2020). Finally, the growth of the service sector has led to stagnation in energy demand growth and its eventual flatlining. Where the old industrialising economy was characterised by ever-increasing energy demand, the service economy - predominantly based on human labour - has low requirements for energetic inputs.

[2.2] American Deindustrialisation as Metabolic Shift

The collapse of American manufacturing and the rise of post-industrial capitalism in the late 20th century did not merely reconfigure economic relations - it fundamentally altered the spatial and ecological dynamics of capitalist accumulation. This section argues that America's deindustrialisation constituted a metabolic shift in the relationship between the US economy and the natural world, redistributing the environmental costs of consumption across geopolitical boundaries while eroding the material basis for transformative climate action. Drawing on Foster's (2000) metabolic rift theory, this analysis demonstrates how the offshoring of industrial production to China and other developing economies severed the visible link between American consumption patterns and their planetary consequences. It argues that deindustrialisation created

an illusion of ecological progress within US borders by spatially displacing pollution, carbon emissions, and resource extraction. It then proceeds to demonstrate how deindustrialisation and associated metabolic shift created a political-economic context which fostered the weakening of the labour-environmentalist coalition, core to the passage of any renewable energy legislation, whilst empowering fossil capital. This analysis is essential to explaining why Waxman-Markey failed despite Democratic control of both Congress and the White House - a failure largely attributable to the defection of approximately fifteen Democratic senators from Rust Belt and Coal Belt states whose constituencies had been fundamentally transformed by this metabolic shift. It argues that this is a central way in which deindustrialisation facilitated the failure of federal climate legislation during the critical opening of the early Obama era.¹³

The deindustrialisation of the American Midwest and Appalachia represents one of the most drastic metabolic shifts in human history. American capital abandoned domestic manufacturing in favour of offshore production sites, in the pursuit of cheaper labour, lax environmental regulations, and closer proximity to supply chains. The offshoring of a third of manufacturing jobs from the US to China and other industrialising countries effectively sent over a billion metric tons of annual CO₂ emissions from US production sites overseas (Yunfeng and Laike,

¹³ Importantly, the underlying insight of this section's analysis, regarding the growing disconnect between American consumers and the energetic and ecological demands of their lifestyles, is not unique to the metabolic rift framework utilised here. The insight is shared with existing analyses within the STS literature. For example, Sovacool's (2009a, 2009b) comprehensive mapping of socio-technical impediments to renewable energy adoption has demonstrated how cultural disconnection from energy systems and the prevalence of consumerist abundance mindsets obstructed clean energy diffusion in the US. Whilst Smith and Tidwell (2016) have shown how, even within the US, geographical proximity to energy production leads to the development of local imaginaries of energy production that clash with the dominant national consumption-oriented imaginaries. The strength of the metabolic rift analysis is in providing a systematic and materialist foundation for understanding the mechanisms behind why America's national consumerist mindset has become increasingly dominant over time. Sovacool's identification of Americans' apathy regarding energy systems and Smith and Tidwell's identification of America's consumption-oriented energy imaginary become more clearly understood when situated within the systematic obscuring of ecological destruction through offshoring and the shift to a post-industrial economic composition. Through utilising the metabolic rift framework, these phenomena become historicised, being understood as emergent outcomes of capitalism's spatial reorganisation in the face of its own crisis tendencies.

2010; Guo, Zou, and Wei, 2010; Harris, 2020; Lin, Pan, and Davis, 2014). Whilst production was offshored, consumption of imported goods increased in turn. This spatial reorganisation of production severed the visceral connection between American consumers and the ecological devastation wrought by their patterns of consumption and the associated system of production enabling it. As factories shuttered in Detroit closed and the thick smog dissipated, they reappeared in Shanghai, Guangzhou, Shenzhen, powered by cheap coal power, bringing the choking smog with them. The emissions necessary to reproduce the American economy were transferred to China, physically but also statistically, as the dominant methods of accounting for emissions were production-based (Davis and Caldeira, 2010).

To the average American citizen, they were no longer able to directly see the most dire consequences of fossil capitalism, whilst the most widespread data points concerning emissions obscured the reality further. The decarbonisation of the US, driven by deindustrialisation, was largely a mirage wrought by the metabolic shift. Due to the metabolic shift, alongside the growth of the environmental regulatory regime, there have been significant improvements in the US' environmental conditions since the 1970s.¹⁴ Air and water quality have visibly improved across the country, particularly in its former industrial bastions. Beyond any aesthetic concerns, the most important benefits of these improvements regard health outcomes, seeing drastic declines in chronic bronchitis, asthma exacerbation, heart disease and other chronic illnesses caused by local pollution (EPA, 2011). The mortality rate attributed to environmental pollution was four times higher in China than in the US in 2008 (WHO, 2022). This is a clear example of a spatial fix to

¹⁴ Naturally, not all reductions in emissions and improvements to air and water quality can be attributed to the offshoring of emitting activity to the developing world. The picture is complicated by the real successes of regulation, such as the Clean Air Act of 1970, which brought under control the worst excesses of industrial production. However, it is not simple to disentangle these two causes, as offshoring and the associated metabolic shift has been driven, in part, by the increased costs of industry brought about through environmental regulation.

the metabolic rift. American fossil capitalism was gripped by its own ecological destruction, forging domestic opposition and a systemic crisis of profitability. In order to escape these stifling conditions, it transferred production and its worst consequences elsewhere, freeing itself of the chains of US organised labour and a growing environmentalist opposition. Its escape was enabled by the willingness of China to absorb the flood of manufacturing investment in order to undergo rapid economic development, accepting the consequences of ecological destruction necessary to fuel global and, particularly, American consumption.

The improvements to US environmental conditions, delivered by the transfer of emissions to China and other developing countries, had major political consequences, transforming not only the environment but also the context in which struggles for climate action occurred. The most significant consequence was the creation of conditions that facilitated the fracturing of the coalition between labour and environmentalists. American environmentalism's major political successes, such as the Clean Air Act of 1970, Earth Day Demonstrations, and a wide array of state and federal environmental protections, were made possible through the historic coalition between organised labour and environmentalists (Dewey, 1998). This unity was not merely rhetorical - it manifested in concrete political actions and victories. The United Auto Workers (UAW), for instance, provided critical funding and organising support for the first Earth Day in 1970, while the United Steelworkers and other major industrial unions joined environmental organisations in pushing for the passage of the Clean Air Act, Clean Water Act, and the creation of the Environmental Protection Agency (Obach, 2002).

The core binding point of this coalition was a shared concern with two major issues: the negative health impacts caused by American industry and the degradation of the local environment. It has been demonstrated that cooperation between American unions and environmentalists has been most effective and consistent when working on these specific issues (Obach, 2002). However, deindustrialisation and the associated metabolic shift undermined the conditions that fostered this overlap. As local air and water quality visibly improved in the bastions of union membership, the urgency of pursuing climate action became abstracted into debates over distant melting ice caps, rising sea levels and altered weather patterns, rather than immediate threats to community health and the local visible environment. This transformation was particularly consequential in those Rust Belt and Coal Belt states whose Democratic senators - the so-called “T15” targeted by fossil fuel industry campaigns - would eventually prove decisive in the failure of the Waxman-Markey bill (Skocpol, 2013). The unravelling of this once-powerful coalition became increasingly evident through the 1990s and 2000s, as unions like the United Mine Workers of America shifted from environmental allies to vocal opponents of environmental legislation.

This change in context altered the social and economic calculus undertaken by labour when contemplating the pursuit of climate action. While unions had previously accepted industrial slowdowns to secure immediate worker health and safety, they proved far more reluctant to support additional regulatory burdens on already-struggling industries to address the abstract, future-oriented threat of climate change rather than tangible workplace hazards with direct cause-and-effect relationships. The shift in the spatial and temporal logic of the ecological rift

between humanity and nature has thus weakened the linkages between the American labour and environmental movements.¹⁵

Beyond creating a context which led to growing tensions between organised labour and the environmentalist movement, the metabolic shift provided advantageous conditions to fossil capitalists within the US, who were able to exploit the historic weakness of their opposition. Fossil capitalists astutely exploited the growing divide between environmentalists and labour by framing climate policies as elitist projects that sacrificed blue-collar jobs for abstract environmental goals - which they consistently claimed would not be achieved via the proposed policies. The American Petroleum Institute launched a multimillion-dollar campaign targeting swing states, emphasising how emissions regulations would cost consumers billions of dollars, kill millions of American jobs, and send production overseas (API, 2009a, 2009b, 2009c; Goldenberg, 2009a). This narrative proved highly effective, and the result of fossil capital's efforts was the achievement of a perverse alignment between unions in carbon-intensive sectors and fossil capital against Waxman-Markey. This alignment would prove decisive in the bill's ultimate failure, as Democratic senators from states with significant fossil fuel employment - particularly those from the Rust and Coal Belts like West Virginia, Pennsylvania, Ohio, and Indiana - became increasingly concerned about constituent job losses rather than environmental gains.

¹⁵ Notably, this shift cannot be overblown into a full rupture between environmentalists and labour organisations. The labour-environmentalist coalition is still alive, but it has clearly undergone clear fractures. Furthermore, the tension between economic self-interest of union members and the pursuit of environmental protections was not generated by the shift, it was significantly deepened. How these fractures specifically played out in the period of Obama's first term and the struggle over Waxman-Markey is discussed in the following chapter.

The effectiveness of fossil capital's narrative in dividing organised labour and the environmentalist movement was primarily shaped by deindustrialisation and the metabolic shift. It was able to gain traction precisely because the metabolic shift had already actualised the spatial separation between American workers and the most intense environmental consequences of industrial production. As domestic manufacturing dwindled and environmental conditions improved, fossil fuel interests were able to successfully rebrand remaining energy-intensive and polluting industries - from petrochemical plants to emerging fracking operations - as bastions of working-class employment deserving special protection from green policy-making. This rebranding was made possible through two interrelated dynamics. First, deindustrialisation created a deepening structural dependency of local economies on fossil capitalist employment. Second, the widespread overestimation of the US' environmentalist successes, which enabled fossil capital to lay the majority of the blame for climate change at the feet of China and the developing world, arguing that further action would deepen the comparative disadvantages facing remaining US industries.

The first dynamic - the deepening structural dependency on fossil capitalist employment - manifested most dramatically in regions already devastated by the process of deindustrialisation. As manufacturing jobs disappeared from the Midwest and Appalachia at unprecedented rates, fossil fuel industries often remained as the sole significant employers in many communities. This economic vacuum created geographical areas where the decimation of diverse industrial employment left fossil capital as the predominant source of well-paying, stable employment. In West Virginia, coal mining employment fell from 125,000 jobs in the 1950s to just 20,000 by 2010, yet these jobs became increasingly crucial as manufacturing disappeared from the state. By

2008, coal directly provided 10% of state tax revenue and \$1.6 billion in wages, creating a deep structural dependency on fossil fuel extraction (O'Leary and Boettner, 2011).¹⁶

This dependency created fertile ground for fossil capital's narrative framing of climate policies as existential threats to working-class livelihoods rather than necessary environmental protections. The United Mine Workers of America (UMWA), once part of the labour-environmental coalition of the 1970s, came to vigorously oppose climate legislation by the early 2000s, siding with fossil capital against Waxman-Markey, exemplifying how the deepening structural dependency transformed political alignments (Trisko, 2009). UMWA leadership repeatedly characterised the Waxman-Markey bill as harmful to coal communities, despite the bill's attempts to limit these harms (Roberts, 2009; Curwood, 2009). This political realignment reflected the material reality that remaining fossil fuel jobs had become increasingly precious amid the broader economic devastation of deindustrialisation, with limited alternative employment options available to those remaining in those territories. Deindustrialisation and the metabolic shift thus created a perverse lock-in effect: regions experiencing the steepest deindustrialisation became most dependent on precisely the industries driving global emissions, their economic survival tethered to continued fossil fuel extraction.

The second dynamic enabling fossil capital's successful rebranding stemmed from widespread misconceptions about American environmental progress, which were caused by the metabolic shift. The visible improvements in domestic air and water quality, coupled with declining

¹⁶ Beyond direct employment, this structural dependency extended to encompass entire regional economic systems, as auxiliary businesses, housing markets, and social services all became increasingly tethered to the continued profitability of fossil fuel extraction and processing, unable to find alternative income through the vanishing manufacturing sector.

production-based emissions statistics, created a persistent illusion that the US had substantially addressed its environmental impacts, while developing economies were the primary drivers of ecological degradation. This spatial sleight of hand - facilitated by production-based emissions accounting - obscured the reality that American consumption patterns remained fundamentally environmentally destructive, with their worst and immediate consequences displaced overseas. By 2004, the US was the world's largest net importer of emissions, importing 699 megatonnes of CO₂ a year, which under the production-based accounting system was attributed to China and other net exporters (Davis and Caldeira, 2010). For context, in 2004, US CO₂ emissions were recorded by the EPA (2006) at 5,988 megatonnes, meaning that if imported emissions were counted, the figure would have grown by over 10%.

This statistical distortion provided fossil capital with a powerful rhetorical weapon in opposing climate legislation. Industry representatives routinely cited China's rapidly growing emissions as evidence that American climate policy would amount to economic self-sabotage with minimal environmental benefit. The American Petroleum Institute's lobbying campaign against Waxman-Markey specifically emphasised that unilateral US climate action would simply accelerate the leakage of both jobs and emissions to countries with fewer environmental restrictions (API, 2009a, 2009c). This narrative proved particularly effective in communities already traumatised by manufacturing job losses, where arguments against sending more jobs to China reflected their lived experience. The metabolic shift thus enabled the carbon-intensive industry to free itself of its complicity in climate change by arguing that the US had already taken sufficient action. Instead of accepting limitations aimed at the buildout of a green energy sector, the real responsibility for action lay with China and the rest of the developing world,

where industry had been offshored, to take comprehensive climate action. Only when that had been achieved could the US take further climate action, without it being economic self-sabotage. Of course, this naturally ignores that China was the largest net exporter of emissions (primarily to the US and Western Europe) and that it had far lower emissions per capita and per GDP (Davis and Caldeira, 2010).

Importantly, US policy elites across the political spectrum - from the fiercest climate denier to the progressive environmentalists - were all too happy to accept the offshoring of blame for emissions and the associated statistical distortions. Naturally, for those on the climate denialist right, it provided cover for the continued status quo, painting the US as already having made sufficient sacrifices, whilst enabling them to place the majority of blame - if they even acknowledged emissions as a problem - on China. Meanwhile, for environmentally-conscious democrats, it enabled them to build their green credentials by overselling the success of prior legislation and their ability to address the climate crisis, without having to discuss the more politically difficult question of making drastic transformations to American consumption patterns.

The intersection of regional economic dependency and overestimated environmental progress thus created a self-reinforcing cycle that fostered the deepening of the divide between organised labour and environmentalists, whilst further empowering fossil capital. The environmentalist movement, increasingly concentrated in post-industrial coastal cities, framed climate action as a moral imperative with manageable economic costs - a perspective made possible by their physical and statistical distance from both the environmental harms of offshored production and

the economic precarity of fossil-dependent regions. Meanwhile, communities in deindustrialised heartlands perceived climate policies as demands for further sacrifice from populations already dealing with the fallout of economic abandonment, interpreting coastal environmentalism as threats to their last remaining economic pillars. Simultaneously, the statistical illusion of domestic environmental progress enabled coastal environmentalists to overlook how their consumption patterns continued driving emissions abroad, fostering a blind spot which led them to fixate primarily on the extractive industries in the rural states. This toxic combination of coastal environmentalists perceiving sacrifice as an abstract moral duty and rural communities experiencing it as an existential threat fractured the material basis for solidarity, allowing fossil fuel interests to sustain their operations through what amounted to a pincer movement against effective climate policy-making.

Together, these dual dynamics - structural dependency and overestimated environmental progress - created conditions where fossil capital could effectively position itself as the defender of working-class interests against elite environmentalist agendas. This positioning proved decisive in defeating comprehensive climate legislation during the crucial opening provided by the Obama administration's early years. The failure of the Waxman-Markey bill in 2009-2010 represented not merely a tactical defeat for climate advocates but revealed the profound ways in which deindustrialisation had transformed the political landscape for environmental action in the US. By spatially reorganising both production and environmental harm, the metabolic shift of deindustrialisation fundamentally altered the political terrain within which coalition-building for ambitious climate policy had to be taken.

[2.3] Fracking Revolution as Saviour

This section argues that the fracking revolution undermined the impetus for the federal government to pursue comprehensive energy transition legislation. While strong presidential leadership, as Romm argues (2010), or effective environmental mobilisation might have overcome this obstacle, as Skocpol argues (2013), the structural advantages of fracking made this politically difficult. It emerged as a politically and economically convenient response to three intersecting crises of deindustrialisation, climate policy paralysis, and the meltdown of the financial system. First, it offered an economic lifeline for deindustrialised regions gutted by manufacturing decline, particularly by creating unionised employment opportunities largely absent in the renewable sector. Second, it provided a market-driven pathway to reduce emissions by displacing coal without requiring new regulatory frameworks. And third, fracking promised to mitigate systemic economic risks by reducing import dependency and providing immediate investment opportunities in the post-crisis economy. This section proceeds by examining each of the three crises in turn, tracing their origins within the changing economic composition of the US, before revealing how hydraulic fracturing emerged as the path of least resistance by leveraging existing market, infrastructure, and regulatory advantages unavailable to renewable alternatives. It demonstrates how deindustrialisation's hollowing out of state capacity and industrial policy created structural barriers to renewable energy deployment while simultaneously favouring market-driven solutions like fracking. In conclusion, the section reveals how these dynamics empowered fossil capital to position itself as essential to economic and working-class revitalisation, climate progress, and national economic security - deepening the US' dependencies on the fossil economy and delaying the pursuit of energy transition.

As discussed in the prior section, the collapse of American manufacturing left behind a stark economic landscape, particularly in the Midwest and Appalachia, where fossil fuel extraction emerged as one of the few remaining pillars of stable employment. However, the oil and coal industries were hardly ideal pillars of employment. In the 1970s, oil extraction in the US stagnated as the economically viable wells were almost all exploited. In the mid-1980s, US oil extraction began to decline as these wells turned dry. By the 2000s, domestic oil production had almost halved from its peak of 10,000 barrels a day in 1970, with production oscillating between 5,000 and 6,000 barrels a day across the first half of the decade (EIA, 2024h). In turn, employment had collapsed in the oil and gas extractive industries, averaging just over 120,000 employees in the industry in the early 2000s, compared to a peak of over 260,000 in the early 1980s (BLS, 2024a). Unlike oil, the coal industry's output had only continued to rise since the 1970s, reaching its historic peak in 2008 (EIA, 2024c). However, employment was an entirely different picture due to the increasing mechanisation and automation of the mining process. Coal mining employment was already undergoing decline when the Bureau of Labor Statistics' records began in the 1950s, falling from over 500,000 down to 150,000 by the 1960s, where it remained for a decade (BLS, 2024b). It then saw a brief resurgence, after the 1973 oil crisis, peaking again at just over 175,000 jobs in 1985, before entering a final terminal decline, with an average of only 70,000 jobs remaining by the early 2000s.

Despite this decline, these jobs became increasingly important to local economies, particularly in rural Appalachia. As manufacturing jobs disappeared, these communities developed an intensified dependence on fossil fuel extraction. By the early 2000s, many Appalachian counties had effectively become mono-economies, where coal not only provided the majority of well-paid

employment opportunities but also funded local services through tax revenue and royalty payments. This dependency created a precarious situation where communities became increasingly vulnerable to industry fluctuations while simultaneously developing stronger political and cultural attachments to fossil fuel extraction as central to regional identity (Lewin, 2019). The economic vulnerability of these regions was then amplified further by two additional pressures: the mounting demand to reduce carbon emissions from coal-fired power plants and the devastating effects of the Great Recession.

It was within this context that hydraulic fracturing emerged as an apparent economic lifeline. The technological breakthroughs in horizontal drilling and fracking techniques around 2008 suddenly made vast reserves of previously inaccessible natural gas economically viable to extract. For policymakers facing the dual challenges of climate change and economic revitalisation in deindustrialised regions, fracking presented a seemingly elegant solution: it promised to create extraction jobs in economically depressed areas while producing a fuel that, when burned, generated approximately half the carbon emissions of coal. This positioning of natural gas as both an economic development strategy and a “bridge fuel” in the transition away from coal made fracking politically attractive across the ideological spectrum, particularly as the country faced the immediate pressures of the 2008 financial crisis and subsequent recession.

The boom in shale gas extraction spurred job growth across various sectors, including drilling, equipment manufacturing and transportation. For instance, in states like Pennsylvania, Texas and North Dakota, which were hit hard by the recession, the shale gas industry provided a lifeline, generating thousands of jobs and injecting billions of dollars into local economies (Mayfield et

al., 2019; Belton and Rupp, 2010; Brown and Yücel, 2013). This influx of employment opportunities helped alleviate unemployment rates and stimulate economic activity in regions grappling with economic downturns. Importantly, fracking enabled states without a particularly strong history with extractive industries, such as North Dakota, to be catapulted into becoming leading producers of oil and gas because the contents of their shale gas formations suddenly became accessible (Brown and Yücel, 2013).

The extractive industries' strong history of unionisation represented a second crucial factor in fracking's political appeal for state actors. Fossil fuel sectors had long maintained high union density compared to other industries, providing workers with stable wages, comprehensive benefits, and collective bargaining power. As Lozano and DiGiuseppe (2023) of the United Autoworkers union note, “organised labour grew up with fossil fuel industries.” This symbiotic relationship stemmed from energy extraction's central role in 20th-century industrialisation, where unions leveraged the strategic importance of coal and oil to secure landmark labour protections. Mitchell's *Carbon Democracy* (2011) documents how fossil fuel workers' ability to disrupt energy flows through strikes gave unions unprecedented political leverage, enabling breakthroughs like the eight-hour workday and workplace safety standards. For policymakers promoting shale gas development, this legacy offered dual advantages: expanding unionised extraction jobs helped secure labour movement support, while existing union structures provided established channels for implementing safety protocols and environmental guidelines. The latter point proved particularly valuable, as union involvement in fracking operations allowed regulators to mitigate public concerns about fracking's risks while preserving the industry's growth trajectory.

In contrast, the promise of green jobs associated with renewable energy sources faced scepticism, despite their potential for long-term sustainability and reduced environmental impact. This scepticism largely arose from the perceived absence of stable employment opportunities and low rates of unionisation within the renewable energy sector (Lozano and DiGiuseppe, 2023). Unlike traditional energy industries, such as fossil fuels, which have historically boasted strong union representation, the renewable sector lacked comparable labour organisation. This presented a challenge for state actors aiming to garner support from labour groups, as concerns about pay, job security and adequate worker protections had already been raised. Whilst progressives promised that new renewable energy jobs could be made into union jobs, with comparable pay, security, safety, and benefits, there were reasonable grounds for doubting this claim. The reality at the time and still today is that employment in the fossil industry is far more attractive than in renewable energy, in terms of job security, wages, unionisation rates and benefits (Huber, 2022).

Importantly, these differences between the two energy sectors are the direct result of the deindustrialisation of the American economy. As the US developed its renewable economy, investment flowed overwhelmingly into research and development and then installation, with the extraction of key materials and manufacture of components being outsourced to China and other developing countries. The result was that the creation of new green jobs fell overwhelmingly into two sectors that were unsuited to the core traditional working class base, whose support was necessary to pass energy transition legislation through the Senate. On one hand, jobs in research and development were firmly in the knowledge and tech sectors, requiring high levels of education and expertise - alongside a willingness to relocate to geographic hubs of innovation,

like Silicon Valley. On the other hand, installation jobs were largely within the service sector, requiring only low-skilled labour - primarily filled by immigrants and other precarious workers. These jobs tended to require frequent travel and offered unreliable quantities of work to those unable to travel large distances. The types of green energy transition jobs that would have been attractive to the losers of deindustrialisation, such as component manufacturers and miners, were all overwhelmingly being created in China, not the Rust Belt and Appalachia.

The second argument of this section posits that deindustrialisation reconfigured the US' political economy in three mutually reinforcing ways that enabled fracking to appear as a rational market-driven emissions-reduction strategy: the erosion of industrial policy and state capacity for coordinated economic planning, the rise of innovation-orientated economic governance that favoured technological fixes over long-term infrastructural development, and the cementing of path-dependent advantages conferred by decades of fossil fuel infrastructure investment. Crucially, these factors operated as distinct but interconnected mechanisms that enabled fracking's ascent while systematically disadvantaging renewable energy deployment.

The transformation of America's industrial base through offshoring fundamentally altered the state's relationship with economic planning. Deindustrialisation represented more than just job losses - it signalled the dismantling of an entire institutional contestation that had previously enabled coordinated industrial development in the post-war era. As globalisation deepened and America continued to offshore significant chunks of its industrial activity, the state's role in the economy underwent a profound transformation. The old Fordist-era institutions of industrial planning, infrastructural development, directed investment, and strict regulation gave way to a

far less involved industrial policy which was chiefly concerned with maintaining the nation's competitive edge in the sciences and technological development, maximising the innovation produced by market actors (Block, 2008; Block and Keller, 2011; Weiss, 2012; Andreoni, Chang, and Scazzieri, 2019).

This hollowing out of state capacity was not merely a material shift in the state's economic function but also represented an ideological transformation. As Weiss (2012) particularly draws out, the primacy of market forces in delivering ideal outcomes through innovation became an important cornerstone of both American liberal and conservative thinking. The institutional architecture that had previously enabled large-scale coordination of industrial development - from the Department of Defense's strategic investments to the regional planning authorities established during the New Deal era - either atrophied or was deliberately dismantled. By the early 2000s, the federal government had largely abandoned its role in directing industrial development, leaving a vacuum in planning capacity precisely when climate change demanded coordinated action to revolutionise the country's energy infrastructure.¹⁷

As traditional industrial policy collapsed, it was replaced by a narrower focus on innovation policy that prioritised research and development, whilst largely abandoning the infrastructural

¹⁷ Proponents of the hidden developmental state thesis would likely challenge this strong characterisation of American state capacity decline, pointing to continued federal involvement in strategic sectors through less apparent mechanisms than the old Fordist state model (Block, 2008; Weiss, 2012; Macneil and Patterson, 2012). Their work documents extensive government support for innovation through research funding, public-private partnerships, and targeted subsidies, suggesting that state capacity was restructured rather than eliminated. These alternative interpretations merit serious engagement, as they correctly identify continued federal involvement in economic development. However, they conflate the persistence of discrete policy instruments with the capacity for comprehensive industrial planning that energy transitions require. The hidden developmental state operates through fragmented agencies, temporary programmes, and market-oriented mechanisms that cannot substitute for the coordinated industrial policy necessary to challenge fossil fuel dominance and rapidly develop new energy systems. Their analysis documents innovation support but not the ability to direct investment, coordinate supply chains, or discipline capital - capacities essential for comprehensive energy transitions.

developmentalism that had characterised the post-war era. While both fracking and renewables benefited from federal and state-level R&D support, the structural realities of America's existing infrastructure heavily favoured fracking over renewable energy deployment (Golden and Wiseman, 2015; Kushi, 2015).¹⁸ Fracking emerged as a politically expedient solution precisely because it aligned with the regulatory and infrastructural legacy of the fossil fuel economy. Unlike an accelerated renewable energy transition, which would have required new legal frameworks and state-led coordination, shale gas extraction leveraged existing pipelines, refining networks, and permitting processes designed for conventional oil and gas production (Holahan & Arnold, 2013). By relying on price competition between natural gas and coal, the strategy sidestepped the need for legislative battles over carbon pricing or renewable portfolio standards, enabling Democrats to avoid the political quagmire that had opened up over energy policy.

Renewable technology's sufficient maturity arrived too late to benefit from the robust industrial state capacity of the Fordist state. The structural advantages conferred by decades of fossil fuel infrastructure investment created insurmountable barriers for renewable energy deployment in the post-industrial policy environment. Shale gas extraction could leverage over 250,000 miles of intra- and interstate pipelines, with existing domestic manufacturing capacity ready to expand this infrastructure (API, 2016). In contrast, renewable projects were forced to deal with a grid system which was overwhelmingly built prior to 1990, unsuited to handling intermittent generation or long-distance transmission without significant losses. The result was the

¹⁸ Notably, whilst Republican administrations, at the state and federal level, were historically more likely to lower funding to renewable energy research, this normally followed on from Democratic increases in funding - typically returning to pre-increased levels of support (Baccini and Urpelainen, 2012).

emergence of years-long bottlenecks for renewable deployment as projects waited for connection to the grid (Gorman et al., 2025).¹⁹

Rebuilding the required capacities to rectify these structural disadvantages would have required New Deal-style coordination between federal agencies, manufacturers, and labour unions - precisely the institutional framework dismantled during manufacturing offshoring and the associated collapse of state capacity. The final result was that, when the Obama administration came to power with a mandate to reduce US emissions, deindustrialisation had ensured that the fracking revolution was perfectly situated as an immediate means of achieving that goal. In turn, it had undermined the US' capacity to rapidly develop and integrate renewable energy into the energy mix, severely dampening its ability to offer a viable alternative to the fracking revolution, with no clear way to undertake immediate reductions. This dynamic entrenched a path dependency in which fracking was not only tolerated but actively promoted as the optimal compromise between economic revitalisation and emissions reduction. The political and economic power of fossil capital was thus reinforced, as state and local governments became increasingly reliant on the tax revenues, employment, and investment generated by the shale boom.

The third way in which deindustrialisation and its associated crises empowered fossil capital was through the financial crisis and an associated impetus to limit the US' exposure to systemic risk. Mattick (2011) demonstrates that the financial crisis was fundamentally rooted in the long-term process of deindustrialisation, which saw a steady shift from productive investment in

¹⁹ On top of this, there was very little domestic manufacturing capacity in a position to undertake the provisioning of the required materials, meaning an increased reliance on imports from China, particularly for batteries and solar panels.

manufacturing to speculative activity in finance and asset markets from the mid-1970s onward. As profitability in productive sectors declined, capital increasingly flowed into financial speculation and debt creation, postponing the crisis that these underlying economic weaknesses would otherwise have triggered. For Mattick, the 2008 financial crisis was not simply a failure of regulation or a singular event, but the inevitable result of this decades-long turn away from production towards financialisation - a process that hollowed out the real economy and increased the US' exposure to systemic risk by making it increasingly reliant on speculative activity.

The financial crisis was a stark wake-up call about the reality of systemic risks and the dangers of inaction and weak oversight. As the impacts of the crisis rippled outward across society, concern over systemic risk and effective risk governance increasingly became central political concerns. Systemic risks were no longer just the subject of academic papers or a supposed looming threat wielded by doom mongers and cynics; they had become the practical issue of the day. In the minds of policymakers, the worst-case scenario loomed: what if the hoped-for recovery were to be taken out by the realisation of another systemic risk? Evidence of this increased concern can be seen in the swift passage of the Dodd-Frank Act, which created the Financial Stability Oversight Council, whose primary responsibility was to “identify risks to the financial stability of the United States.”²⁰ The heightened concern with risk exposure and the necessity of securitisation incentivised the embrace of the fracking revolution along two lines.

First, the fracking revolution promised to reduce the US' exposure to the risks of international fuel shocks by decreasing the US' dependency on fuel imports. Beyond the lingering memory of

²⁰ The full text of the Dodd-Frank Act is available at:
<https://www.congress.gov/bill/111th-congress/house-bill/4173/text>

the 1973 OPEC oil embargo, the main perceived risk emerging from the US' dependency on fuel imports was situated in the context of the War on Terror. American policymakers widely understood that anti-American terror groups, particularly in Africa and the Middle East, could sabotage key sites of extraction, refineries, and transport hubs, to cut off supplies to the US and induce economic fallout. The US' approach to risk mitigation and securitisation was the militarisation of resource supply chains across the world and the engagement in anti-terror campaigns (Moran, 2009). However, by the time of the financial crisis, the War on Terror and its association with the hunt for foreign oil were becoming increasingly unpopular. Fossil fuel companies promised that in a single decade, the fracking revolution could transform the US from a net importer to a net exporter of oil and gas. Indeed, a mere ten years after Obama's election, the US had become a net exporter of oil and gas, for the first time in over seventy years, leading to massive reductions in the quantities of fuel imports (EIA, 2024d, 2024e). In this context, the fracking revolution was an immediate solution to a major systemic risk facing the US. Renewable energy was unable to fulfil this same role. There was no plausible path to rapid development that would enable the US to drastically reduce its import dependency.

Second, in the aftermath of the 2008 financial crisis, the US economy faced severe constraints on productive investment opportunities. Traditional manufacturing had been hollowed out by decades of deindustrialisation, and the service economy, despite its growth, was structurally ill-suited to absorb large-scale capital investments through conventional Keynesian-style stimulus measures. This economic context created an urgent need for areas of investment that could facilitate capital accumulation and the revitalisation of economic growth. In this context, the fracking revolution provided an immediate and scalable investment opportunity, which would

revitalise the real economy and serve as a key stabilising force in the US' post-crisis recovery. The capital-intensive nature of shale extraction attracted significant financial investment, offering comparatively stable returns on investment in a period where other sectors were stagnating.

The immediate marketability of shale gas products was a central factor driving the embrace of the fracking revolution in the aftermath of the recession. This advantage over renewable energy was particularly pronounced in the years following the crisis, as the need for rapid economic recovery and job creation became leading imperatives behind policy-making. Unlike renewable energy projects, which often require extensive infrastructure development and the passage of new legislative support schemes, the extraction and monetisation of shale gas could be swiftly executed within the existing energy market and regulatory framework. This expedited process was a far more attractive proposition for investors and industry players seeking quick returns on investment during a period of economic uncertainty, boosting shale above renewables. In regions like the Marcellus Shale formation in Pennsylvania, the development of shale gas resources saw a rapid surge in drilling activity and production immediately after the crisis. As the rest of Pennsylvania's economy contracted across 2009, the shale gas boom brought over 23,000 jobs and \$3 billion into the state economy (Kelsey et al., 2011).

Fracking also benefited from clear projections of a growing global market for natural gas. With technological breakthroughs in liquified natural gas (LNG) across the late 1990s and 2000s, the global transport of natural gas was already becoming economically viable. The development of LNG technology was accelerated, in part, by the spiking oil prices across the early 2000s. In an

ironic twist, prior to the fracking revolution, the US was building LNG import terminals, expecting to meet growing natural gas demand through LNG imports from North Africa and the Middle East (Parfomak, 2006). Whilst in 2008, there was not yet the global infrastructure in place for global LNG trade, it was beginning to form. If the US could become a global leader in natural gas production and LNG exports, it could produce a long-term stable site of investment, with natural gas being projected to continually grow in its centrality to the energy mix over the following decades (Parfomak, 2006).

The convergence of manufacturing decline, climate policy gridlock, and financial instability created a tripartite crisis that shale gas extraction appeared uniquely positioned to resolve through its capacity to generate unionised jobs in depressed regions, leverage existing regulatory frameworks to achieve emissions reductions without legislative battles, and reduce systemic risks via energy independence. This solution was made more attractive by the hollowing out of state capacity to direct industrial policy, which left policymakers reliant on market-driven approaches that fossil fuel incumbents could exploit through their infrastructural and institutional advantages. Where renewable energy required coordinated public investment in grid modernisation, domestic manufacturing resurgence, and worker retraining programmes, fracking thrived precisely because it demanded neither new regulatory architectures nor confrontations with entrenched power structures - a dynamic that fossil capital strategically framed as pragmatic climate action. The resultant path dependency locked in carbon-intensive development trajectories while reinforcing the political narrative that environmental progress is best delivered by market forces, thereby ensuring that subsequent climate policy initiatives prioritised market mechanisms over state-led decarbonisation. Ultimately, the fracking revolution's success in

addressing immediate crises through fossil fuel expansion reveals how deindustrialisation's erosion of the state's industrial planning capacities created a structural barrier to sustainable energy transitions, cementing a political economy where fossil capital maintains dominance over the plausibility of the energy transition.

[2.4] Stagnant Energy Demand and Renewable Development

This section argues that America's post-industrial economic composition created a third critical structural barrier to energy transition during the Obama presidency. Unlike industrialising economies where renewable energy could expand by capturing growing demand, America's post-industrial economy was characterised by stagnant energy consumption, forcing renewables into direct zero-sum competition with entrenched fossil fuel interests. This “substitution dynamic” heightened political resistance to clean energy policies, as every megawatt of renewable capacity directly threatened existing fossil fuel generation rather than simply adding to a growing energy mix - as was the case in China. Furthermore, it argues that the financial crisis of 2008 dramatically intensified these challenges precisely when federal climate legislation was being debated, creating a political-economic context where even modest renewable energy mandates faced insurmountable opposition at the federal level.

US energy demand stagnated by 2000, remaining below 100 quadrillion British Thermal Units throughout the 2000s (EIA, 2024b). This stagnation resulted from three interrelated developments emerging from deindustrialisation. First, the shift from energy-intensive manufacturing toward a heterogeneous service sector dramatically reduced the economy's energy

intensity. Service industries - particularly in finance, retail, recreation, and business services - require substantially lower energy inputs than manufacturing processes, operating primarily through human labour rather than energy-intensive machinery and industrial processes. As service sector employment grew from approximately 50% in the post-war period to around 80% by 2010 (BLS, 2024), the economy's overall energy requirements plateaued despite continued GDP growth.

Second, the remaining domestic manufacturing sector underwent significant consolidation and efficiency improvements. Facing global competition and declining profit margins, US heavy industries strongly invested in energy efficiency measures to reduce operational costs. The EIA (2018) found that a majority of US manufacturing firms were actively working to improve their energy consumption through various investment strategies: researching and deploying energy-efficient machinery, fuel switching, on-site generation, energy reclamation, and advanced monitoring systems. These efficiency gains were most pronounced in heavy industries (metals, chemicals, machinery) where energy costs represented a significant determinant of profitability (National Association of Manufacturers, 2005). The result was a manufacturing sector that continued to increase gross output while simultaneously reducing its energy intensity.

Third, the offshoring of light manufacturing to China and Southeast Asia effectively exported US energy demand abroad. Labour-intensive industries like textiles, electronics, and household goods production migrated overseas in search of lower wages, taking their energy consumption with them. Unlike heavy manufacturing, which could offset rising labour costs through automation and consolidation, light manufacturing remained labour-intensive with

interchangeable, unskilled positions. Facing declining profitability, companies found it more expedient to relocate production than to invest in automation. In the prior section, this was discussed in terms of a metabolic shift in emissions; the underlying dimension of this shift was the transfer of energy demand from American shores to developing economies (Melton, 2014). Whilst US consumption patterns remained largely unchanged, the domestic energy inputs required were drastically lessened, removing one of the core drivers of growing energy demand.

The distinction between addition and substitution dynamics is crucial for understanding the political economy of energy transitions. When renewable energy can expand by capturing new demand (addition), it faces significantly less resistance than when it must directly replace existing generation (substitution). The addition dynamic merely denies fossil fuel industries the opportunity to expand, while substitution requires their active contraction - a far more threatening proposition that provokes intense opposition (Haas 2019). Brown (2001) and Press and Arnould (2009) identify several barriers to renewable substitution: higher capital intensity, infrastructure compatibility challenges, intermittency risks, land-use conflicts, and community opposition. These barriers create significant market disadvantages for renewables when forced to compete directly with entrenched fossil fuel generation in a zero-sum environment. America's stagnant energy demand thus trapped renewable energy development in a substitution dynamic, creating adversarial conditions for the passage of clean energy policy. This created conditions where fossil fuel interests perceived renewable policies not as complementary to their business models but as existential threats, intensifying their opposition to even modest climate legislation.

The primary policy mechanism utilised to overcome the issue of stagnant energy demand was the implementation of Renewable Portfolio Standards (RPS), which mandated utilities to derive a specified percentage of their electricity from renewable sources. By the time of Obama's inauguration, over half of the US states had enacted some form of RPS (NCSL, 2021). These policies effectively partitioned a segment of the energy market for renewable development, creating protected space for clean energy to grow despite its market disadvantages relative to incumbent fossil sources. Numerous studies have demonstrated the effectiveness of these standards in boosting renewable capacity at relatively modest cost (Eastin, 2014; Barbose et al., 2015, 2016; Wiser et al., 2017). However, the ambition and effectiveness of state-level RPS policies varied dramatically across regions, largely along partisan lines. Berry, Laird, and Stefes (2015) identified this variation as primarily a partisan issue, with more progressive, Democrat-controlled states implementing more ambitious renewable targets even when controlling for resource availability and existing capacity. This created a patchwork regulatory landscape where some states actively pursued renewable development while others - particularly those with stronger fossil fuel industries - maintained minimal or nonexistent standards. The Waxman-Markey bill attempted to address this disparity by establishing a federal RPS requiring utilities nationwide to source 20% of their electricity from renewable sources by 2020. This provision would have significantly accelerated renewable deployment in conservative states that had resisted clean energy mandates, effectively federalising the transition policies already moderately succeeding in progressive states. However, the proposition of federal RPS provoked the formation of a unified and fierce opposition from fossil fuel interests and regional dependents, which proved decisive in the prevention of Waxman-Markey's passage.

Regional energy demand divergences contributed to the material drivers of the split within the Democratic Party on supporting Waxman-Markey. The majority of the 44 House Democrats who voted against the bill were from the Midwest and Appalachia, regions where energy demand had either stagnated or declined, and were thus locked most intensely into a renewable dynamic of substitution. At the same time, many of the bill's strongest Democratic supporters came from the Western states, where energy demand was still growing - albeit unevenly. This was built on the existing geographic and historic fault lines in the party, with Midwestern and Appalachian Democrats facing constituencies dealing with the harshest impacts of deindustrialisation, whilst the Western states had never experienced the same levels of economic dependency on manufacturing and coal-extractivism.

The 2008 financial crisis - which originated in the post-industrial shift of the US - dramatically intensified these trends. BP (2010) reported that global primary energy consumption dropped by 1.1% in 2009 - the first decline since 1982. In the US, the impact was even more pronounced, with a decline of 5 quadrillion British Thermal Units between 2008 and 2009, representing one of the steepest single-year drops in the post-war period. This collapse in energy demand occurred at the precise moment when the Obama administration and Democratic-controlled Congress were attempting to advance comprehensive climate legislation.

The crisis-induced energy demand decline exacerbated the already challenging landscape for renewable energy development in two critical ways. First, it eliminated any near-term prospects for demand growth that might have created space for renewable additions without directly threatening existing fossil fuel generation. With total electricity demand actually shrinking rather

than growing, the zero-sum nature of competition between energy sources was intensified. Second, the economic uncertainty and job losses accompanying the recession heightened public sensitivity to the potential economic impacts of climate legislation, making cost arguments against renewable mandates more politically potent. This timing proved especially damning for champions of renewable legislation, as it coincided with the narrow window of opportunity presented by unified Democratic control of government, providing a confluence of structural economic shifts and cyclical crisis that fossil interests exploited to block the passage of Waxman-Markey.

The stagnation of US energy demand thus represents a third critical way in which deindustrialisation undermined America's capacity for energy transition during the Obama era. Beyond displacing emissions through offshoring and creating regional economic dependencies on fossil extraction, deindustrialisation fundamentally altered the dynamics of energy development by eliminating the growth context that might have enabled a less confrontational transition. This contraction would last until the opportunity to pass legislation had passed, with the loss of the necessary Democratic majority in the Senate and control of the House.

[2.5.] Conclusion

This context analysis has established the structural foundations upon which America's transitional failure during the Obama era was built. Through metabolic rift theory and critical political economy, this chapter has demonstrated how deindustrialisation operated as a comprehensive reconfiguration of the political terrain upon which energy transitions are contested. The three mechanisms examined - spatial displacement of ecological consequences,

the fracking revolution's political expediency, and the renewable substitution dynamic - reveal how America's post-industrial economic composition systematically privileged fossil capital whilst eroding the conditions necessary for transformative climate action.

The metabolic shift accompanying deindustrialisation created profound spatial and temporal disconnection between American consumption patterns and their ecological consequences. This displacement severed the material basis for labour-environmentalist coalitions whilst enabling fossil capital to exploit regional anxieties and frame climate policies as threats to working-class livelihoods. The fracking revolution emerged not as a technological inevitability but as the path of least resistance within a post-industrial landscape where state capacity for coordinated planning had been systematically hollowed out. Finally, stagnant energy demand forced renewable development into adversarial zero-sum competition with fossil incumbents, heightening resistance precisely when federal legislation was being debated.

Crucially, these dynamics cannot be understood as separate impediments but as interconnected manifestations of deindustrialisation's broader transformation of American capitalism. The same spatial reorganisation that obscured ecological harm also concentrated remaining industrial employment in fossil-dependent regions. The same erosion of state capacity that enabled fracking's ascendancy also prevented coordinated industrial policy necessary for renewable deployment at scale.

America's transitional failure was built upon the structural conditions produced by post-industrial capitalism's contradictions. This analysis establishes the contextual foundation for subsequent

actor and process analyses whilst providing the comparative baseline for understanding China's divergent trajectory, where industrialisation's opposite dynamics - visible ecological crises, additive energy demand, and enhanced state capacity - enabled the world's most ambitious renewable energy programme.

Chapter 3: The American Actor Analysis

[3.0] Chapter Outline

Building on Chapter 2's analysis of how deindustrialisation created structural barriers to renewable energy legislation, this chapter examines three key actors in the contestation over Waxman-Markey: the trade union movement, the environmentalist movement, and the US President, Barack Obama.²¹ The analysis addresses each actor's capacity to influence federal energy policy, their driving interests, and their guiding frameworks. In doing so, this enables us to understand these actors' relations with each other, their contribution to the failure of Waxman-Markey, and their subsequent role in the Green Divergence.

Situating this actor-level analysis within the context of the structural factors analysed in the previous chapter, this chapter argues that deindustrialisation systematically undermined the potential for an effective pro-transition coalition by weakening organised labour, transforming the class composition of the environmental movement, and constraining the policy imagination

²¹ This chapter analyses the potential coalition of forces that could have pushed for transitional legislation, rather than providing an in-depth analysis of the antagonistic social forces, such as the fossil majors, conservative media and climate denialist Republicans. This decision is taken for several reasons. First, the motivations and tactics of fossil capital in delaying energy transition have been extensively analysed through critical political economy frameworks (Carrk, 2011; Malm, 2016; Newell and Simms, 2020; Paterson, 2021; Pearse, 2021; Hanieh, 2024; Christophers, 2024). This work's context analysis already expands upon these studies by exploring how fossil capital's power was amplified during this specific period. Second, there is limited research on why pro-transition forces failed to coalesce effectively during the period (Skocpol, 2014; Hess, 2014, 2018; Stevis and Felli, 2015; Glynn, Cadman and Maraseni, 2017; Kalt, 2022). Importantly, this dissertation uniquely examines how the shift to a post-industrial economy undermined the formation of an effective pro-transition coalition in this period. Finally, each chosen actor has clear significance to the transitional struggle. Labour unions represented the working-class base crucial for socially-oriented and broadly popular policies to be formulated and effectively implemented. The environmentalist movement, despite its limitations, serves as the primary political driver for climate legislation in the US, especially prior to the rise of China. Finally, Obama, with his significant mass support embodied in the grassroots campaign that brought him to the presidency, had unique potential to mobilise new political forces for transformative change.

of political leadership. First, the trade union movement's division over the question of climate action was a major enabler of the Technology-15 (T15) Democrats' refusal to back climate action, particularly with key unions, including the United Mine Workers of America (UMWA), International Brotherhood of Electrical Workers (IBEW), and Utility Workers Union of America (UWUA), each opposing Waxman-Markey. This chapter provides a historical account of this division within the union movement, with particular focus on explaining why these unions turned decisively against Waxman-Markey. Centrally, it argues that these unions were driven into an oppositional posture by their narrow sectoral interests. These interests dominated their decision-making due to the economic hardships facing their base, the decline in the wider power of the union movement, and the absence of alternative employment options for their membership. But not all unions were opposed to the bill. The chapter argues that the reason the majority of the trade union movement and its leadership in the AFL-CIO supported Waxman-Markey was the absence of clashing sectoral interests, a commitment to environmentalism by the leadership, and a loose belief in a green industrial revival. However, the section concludes by providing an explanation for why the minority of the movement's opposition proved to be more decisive than the majority in support. It is argued that this is the result of the geographic concentration of the UMWA in the regions of the T15, in contrast with the weakening relevance of the trade union movement in the wider Democratic coalition. Additionally, there were differing levels of commitment by the unions. The UMWA were heavily involved in campaigning and lobbying because Waxman-Markey was felt to be a direct threat to their industry, while the other unions lacked comparable incentives to act and preserved their resources for more immediate struggles.

Looking to the other half of the labour-environmentalist coalition, this chapter turns to analysing the American environmental movement. The central argument is that deindustrialisation transformed the environmentalist movement in a way which significantly weakened their effectiveness in the struggle for comprehensive federal climate legislation. This occurred through the decline of the trade union movement and the associated weakening of the linkages between environmental concerns and working-class interests. This decline led to a shift in the composition of the green coalition toward one composed predominantly of activists, academics, scientists, NGO professionals, and corporate elites. This reconfigured movement, despite finding some success in advancing transitional policies at local levels in Democratic states without significant extractive industries, systematically faltered when confronting federal energy policy. It is argued that this failure at the federal level was the result of the movement's disconnection from the constituents of deindustrialised communities. Unable to articulate a compelling vision of green energy transition that addressed the immediate economic anxieties of those most affected by job losses and social service cuts, the movement ceded ground to the fossil fuel industry's narrative of economic revitalisation through expanded drilling. This disconnect stemmed directly from the movement's loss of strong ties to organised labour and working-class communities. Without these connections, environmentalists struggled to counter the fossil fuel industry's promises of job creation and increased funding for essential services, allowing it to position itself as the champion of economic revival in struggling areas. By failing to adapt to the changing economic realities of post-industrial America, the movement inadvertently strengthened the position of fossil fuel interests and complicated the path to comprehensive climate action.

Next, the chapter turns to the analysis of political leadership, where Obama and his administration were one of the few remaining actors with the capacity and self-professed interest to push for federal climate legislation. In analysing Obama's role, it is argued that his political ideology, approach to the policy-making process, and his transitional imaginary limited his desire to involve himself in the struggle for Waxman-Markey or pursue a more transformative climate policy. The argument builds upon the analysis of Chapter 2 by situating Obama's positions within the post-industrial economic composition of the US. In doing so, it is argued that his ideology, policy-making approach, and transitional imaginary were far from exceptional, but rather reflective of the dominant positions of the time, which had emerged precisely with the rollback of the state's capacity and the increased political-economic power of the fossil industry.

First, Obama's ideology is argued to be fundamentally a form of market liberalism, which led to his belief that private-sector innovation and competitive markets - with appropriate regulation - were best situated to solve the climate crisis and that there was no need for the state to take a leading role in organising renewable development or enforcing fossil fuel phase-out. This ideology, shaped by his formative experiences in Chicago's neoliberal policy-making circles, reflected the structural transformation in the economy toward innovation-oriented knowledge economies. Second, Obama's policy-making approach is argued to have prioritised the pursuit of bipartisan support through elite-level insider negotiations, driven by his experiences working with more moderate Illinois State Republicans and the belief that oppositional buy-in delivered more durable legislation. It is argued that this approach reflects the wider post-industrial retreat from redistributive and confrontational politics, prioritising consensus and stakeholder buy-in

over mass mobilisations and the application of popular pressures. Finally, Obama's transitional imaginary is argued to be a core reason for his inaction. Obama's conceptualisation of energy transition prioritised energy security, specifically breaking American dependence on fuel imports, over the immediate necessity for deep decarbonisation. His transitional imaginary was also heavily influenced by fossil capital's narratives regarding bridge fuels and carbon capture technologies, leading him to adopt a vision of incremental eco-modernisation, where market-driven innovation would deliver energy transition through the diffusion of less carbon-intensive technologies.

The chapter concludes by synthesising how these three actors' limitations collectively contributed to the failure of transitional governance during the Obama era. Situating this actor-level analysis within the context of the structural factors analysed in the previous chapter, it argues that deindustrialisation systematically undermined the potential for an effective pro-transition coalition by weakening organised labour, transforming the class composition of the environmental movement, and constraining the policy imagination of political leadership. The fractured nature of this potential coalition left a political vacuum that fossil interests readily exploited, positioning themselves as champions of economic revitalisation in struggling regions while effectively blocking meaningful climate legislation. This analysis reinforces the dissertation's central argument that the US failure to implement comprehensive climate policy was not primarily a result of institutional design, policy choices, or leadership failures in isolation, but rather stemmed from deeper structural economic changes that fundamentally altered the landscape of political possibility. By examining these actors through the lens of critical political economy, the chapter reveals how America's shift to a post-industrial economy

systematically weakened and broke apart the coalition capable of challenging fossil capital's dominance.

[3.1] The Split of the Labour Movement

This section analyses the fracturing of organised labour over climate legislation as both a symptom and accelerator of the Green Divergence. It reveals how deindustrialisation's dual erosion of union power and industrial employment transformed sectoral interests into existential imperatives that overrode collective climate action. It argues that the AFL-CIO's support for Waxman-Markey and the opposition from fossil-fuel unions like the UMWA and IBEW were not due to differing views on climate science, but because of sectoral vulnerabilities caused by forty years of deindustrialisation. While most unions embraced ecological modernisation as a potential pathway for industrial revival - framing the bill's renewable investments and job guarantees as mechanisms to reverse industrial decline - fossil-sector unions faced immediate threats to their members' livelihoods from decarbonisation pressures compounded by the 2008 financial crisis. This divergence crystallised through competing interpretations of the "just transition" frameworks: the AFL-CIO coalition emphasised green job creation and energy diversity provisions, while opposition unions demanded prolonged delays via the pursuit of carbon capture subsidies and allowance allocations that protected coal-reliant utilities. Crucially, the opposition's disproportionate influence stemmed from deindustrialisation's geographic legacy - their concentrated membership in swing states with T15 Democrats made sector-specific lobbying more strategically potent than the diffuse support of supportive unions. This fracture exposed how economic precarity had narrowed unions' political horizons, leaving organised

labour incapable of presenting a unified challenge to fossil capital's obstructionism despite a growing majority in support of climate action.

Union divisions over Waxman-Markey stemmed from the long-term effects of deindustrialisation. As capitalism's profitability crisis drove spatial relocation and automation, industrial employment declined, shrinking traditional union strongholds in factories, mines, and utilities. Prior to Obama's election, the Bureau of Labour Statistics (Mayer, 2004) reported that union membership declined from just over 30% in 1960 to 15% in 1990. By 2009, it had declined even further, hitting 12.2% (BLS, 2019). As union jobs dissipated, workers moved increasingly into the heterogeneous service sector, where conditions for industrial organising were far more difficult than the traditional sectors (Benanav, 2019). The assault on organised labour was not thought only via economic means, but also legally, as the Reagan and subsequent administrations - alongside state governments - rolled back the rights and protections won by unions.

American unions had long been forced into a defensive posture. By 2000, unions faced declining membership, strained finances, restrictive laws, weakened bargaining power, and ageing demographics focused on pension protection rather than workplace mobilisation (Clawson and Clawson, 1999). American unions' political activity had become centrally oriented around maintaining their few remaining legal protections and seeking state support for their industries in hopes of maintaining employment levels (Milkman, 2020). The old era of unions pushing for transformative economic and social legislation was far gone.

Historically, trade unions in the US have been central to many of the major pushes for environmental awareness and green legislation. Their importance within this coalition emerged from their organisational capacity, as other key actors - such as progressive and environmentalist organisations, green-tech companies, academics and scientists - lack a support base and institutional roots in traditional working-class constituencies and geographies. This meant that whilst coastal and metropolitan representatives were responsive to the influence of these other groupings, when it came to representatives from the industrial heartland, the alignment of unions in favour of climate and transitional advance was essential. Without the pressure from unions, conservative Democratic legislators, like the T15s, could adopt the default position of supporting the status quo.

In previous disputes, unions have sought to defend both the job security of their members and the health and environmental conditions of their communities. When these two commitments appeared to clash, US labour organisers developed the concept of a “just transitions” as a means to resolve it (Stavis and Felli, 2015; Eisenberg, 2019; Pinker, 2020; Henry, Bazilian and Markuson, 2020; Wang and Lo, 2021). The original conceptualisation of a just transition argued that the energy transition must be undertaken without placing the costs disproportionately onto workers. What a just transition would look like, in practice, remained undetermined, although common policy proposals include: funding for skills and jobs retraining, early retirement and expanded pensions, guaranteed jobs programmes, and compensated wages whilst their industries minimise their operations (Eisenberg, 2019). Just transitions do not refer to a unified idea for how the energy transition should be undertaken; rather, they are a collection of normative frameworks, operating from the standpoint of labour, that seeks to critique anti-worker

approaches to green policy-making and anti-environmental forces hiding behind a veneer of pro-worker discourse (Stavis and Felli, 2015). Wang and Lo (2021) note that just transition discourse has become increasingly ambiguous and divided, as it has developed, undergoing cooptation and deployment in defence of the fossil fuel industry. This was a central theme in the union split over Waxman-Markey, with both sides maintaining a commitment to the necessity of a just transition, but disagreeing over whether the bill met the necessary conditions.

In the struggle over Waxman-Markey, the major union which was strongest in its opposition to the bill was the United Mine Workers of America (UMWA). They adopted a reactive strategy, seeking to delay the transition without denying its necessity, driven to this position through their sectoral interest and the socio-economic context. The coal industry, wherein the vast majority of UMWA members worked, had been undergoing decline in the US for several decades before Obama's election (EIA, 2024c). Employment had already fallen drastically, as had active union membership due to the decline in jobs and an ageing membership entering into retirement. With the wider economic pressures placed on membership by the financial crisis and the threat of replacement via natural gas and renewable technology, the union was forced into a more defensive position than the rest of the movement. The process of deindustrialisation and its impact on energy consumption, creating a dynamic of substitution, pressured the UMWA membership into closely aligning with their fossil capitalist employers, facing an existential threat.

The UMWA refused to support the Waxman-Markey bill, saying the targets were too strict, it unfairly favoured other energy sources, and that without global cooperation, it could simply push

more American jobs overseas (Roberts, 2009). However, the UMWA President Cecil Roberts was careful in his discussion of transitional policy-making, refusing to adopt climate denialist rhetoric. He acknowledged the necessity of a green transition and argued that the central debate was how it should be organised (Curwood, 2009). When asked about the possibility of coal workers being indemnified to enable the closing of coal mines in a just manner, Roberts agreed in principle but showed scepticism about the reality of suitable indemnification occurring. He highlighted the high wages and lucrative benefits that would need matching for the current miners and 100,000-plus retirees. Furthermore, he noted that there was a 4:1 ratio of support jobs to mining jobs in the coal economy that would also require governmental support (Curwood, 2009). Roberts noted his scepticism that the federal government would take on the expense of sufficiently supporting the miners and their communities. In the absence of satisfactory state support and in the face of dire economic conditions, the UMWA shared a strategic demand typical of oppositional forces seeking to delay transition, pushing for legislation to prioritise funding for carbon-capture and storage, rather than building out green technologies (Trisko, 2009).

The UMWA was the main union resisting change, but it was not alone. Harsh economic conditions during the financial crisis pushed other unions to adopt a defensive stance. In 2009, the presidents of the International Brotherhood of Electrical Workers (IBEW) and Utility Workers Union of America (UWUA) wrote to Congress and President Obama, asking for changes to the proposed cap and trade programme (Hill and Langford, 2009). They wanted emission allowances to be given out for free rather than auctioned, and they refused to support the bill unless it was significantly weakened. Their goal was to protect coal-based utilities, where

many of their members worked, by keeping coal financially competitive and delaying its decline. They justified this position by claiming that reducing coal's role in electricity generation would threaten system stability (Hill and Langford, 2009). In the end, the two unions split: the UAW offered limited, conditional support for the bill, while the IBEW withheld support (Markey, 2009).

These unions effectively manoeuvred against the bill because they faced direct economic consequences of the proposed cap and trade measures, renewable portfolio standards and increased renewable market viability, due to the majority of their membership being employed by fossil capital. This meant they committed a greater proportion of their time, effort and resources to mobilising against Waxman-Markey. More than this, their efforts were amplified due to the geographic features of the fossil fuel industry. With coal mining and oil drilling being heavily concentrated in a limited number of states, the fossil-fuel unions could exert concentrated pressure on key Democratic senators whose state economies were particularly beholden to the sectoral interests of fossil capital.

Despite this opposition, the majority of the union movement, including its largest national federation, supported the bill. The AFL-CIO's leadership adopted a vision of ecological modernisation, embracing the Obama administration's call for green jobs and green growth. John Sweeney, the president of the AFL-CIO from 1995 to 2009, placed the federation in support of the Waxman-Markey bill. In Sweeney's statement, he provided three points in favour of support: the necessity of maintaining a "diverse energy portfolio" with the bill protecting "individual industries and geographical regions from being adversely affected", the bill's provision of "job

creating investments” and the bill’s attempts to prevent “foreign companies from getting advantages over American companies” (Romm, 2009). The AFL-CIO leadership was joined by many of the major unions in supporting the bill, including the United Steelworkers, United Auto Workers, Communications Workers of America, Laborers’ International Union of North America, Service Employees International Union and, eventually, the Utility Workers Union of America (Markey, 2009).

The AFL-CIO’s support was also characterised by its participation in coalitional groups which sought to maintain unity between the environmentalist movement and the trade union movement. Two key coalitional groups were the BlueGreen Alliance and the Labor Network for Sustainability, both of which had former high-level officials of the AFL-CIO taking leading roles within them. These organisations worked to maintain the labour-environmentalist coalition through campaigns that raised awareness about the mutual interests of environmentalists and union activists and how transitional policy-making could simultaneously meet their concerns. Through their campaigns, they sought to ensure the environmentalist heart of the union movement would win over the narrowly self-interested one (Uehlein, 2010). They also sought to maintain positive relations with environmentalist activists and NGOs by educating them on the important role unions could play in advancing transitional policy-making, warning them not to alienate workers in key industries. Unfortunately, the AFL-CIO’s political power had declined alongside the rest of the union movement. As membership declined, the federation was unable to mobilise the same number of members for campaigns or electoral coalitions. Nevertheless, Obama still wanted the AFL-CIO within his coalition and made several efforts, prior to and during his presidency, to win the AFL-CIO’s continued support. Likewise, the AFL-CIO

continuously mobilised to support his electoral and legislative campaigns (Obama, 2005b, Bull, 2010, Lee, 2010, Condon, 2012).

In reviewing the role of unions in the contestation over transitional policy-making under Obama, a rather depressing picture appears. Decades of industrial decline and economic hardship had sent the union movement into a permanent defensive retreat that was increasingly defined by unions fighting for their sectoral interests rather than the collective advance of the movement. This was punctuated by the financial crisis, unleashing a fresh wave of economic squeezing and desperation amongst union membership. Just as the opportunity for the green coalition opened to make a significant legislative advance, in the form of Waxman-Markey, the union movement was unable to effectively mobilise. Even worse, the terminal decline of the conditions of workers in the fossil fuel industry led to their unions aligning with fossil capital, with sectoral interest decidedly winning out over any notions of solidarity or environmental concern. This crisis effectively divided the main social forces capable of pushing for the advance of renewables.

[3.2] The Fracturing of the Labour-Environmentalism Coalition

In the prior section, the decline of organised labour and its split over Waxman-Markey was analysed and situated in the processes of deindustrialisation. This section turns toward the wider labour-environmentalist coalition to provide a more comprehensive account. It argues that the fracturing and weakening of the coalition was equally driven by the transformation of the environmentalist movement through the period of deindustrialisation. Building upon the account of union decline in the last section, it is argued that, in the absence of a powerful labour

movement to serve as the basis of a labour-environmentalist coalition, environmentalist organisations also underwent a shift in their composition, leading to their failure to maintain the connection. This shift was characterised by three core trends. First, the geographic concentration of the environmentalist movement in affluent coastal metropolitan cities. Second, the professionalisation of the environmentalist movement, as it became increasingly composed of a core of NGOs, academic and scientific associations, and professional activists. Finally, there has been a rise in collaborative, rather than confrontational, approaches amongst environmentalist organisations and corporations. Together, these lead to a distancing of the environmentalist movement from the working-class constituencies, which were central to the passage of Waxman-Markey. With their disconnect from these core constituencies, environmentalists became unable to articulate a compelling vision that addressed their interests, whilst losing their organisational basis in those geographies. Failing in this regard, they essentially ceded the central ground of contestation to fossil capital, which had already been handed an extremely advantageous position.

The modern environmental movement emerged in the 1960s-70s, shifting from upper-class conservation concerns to focus on pollution, energy consumption, and the ecosystem, informed by the natural and health sciences. As has been discussed in prior sections, the modern environmentalist movement's early success is partially attributable to its early coalition with the robust trade union movement of the period. However, in turn, through the processes of deindustrialisation, we have seen how the labour component of the coalition entered into decline and suffered major splits on the question of climate. With this, there was an inevitable accompanying shift in the environmentalist movement, as the role of organised labour in

maintaining the movement was decreased. As American industry and the labour movement declined, the geographic centres of organisation within the environmentalist movement shifted.

The environmental movement has always had strong representation in the more affluent regions of the US. The West Coast has been a bastion of environmentalist organisations since the movement's beginnings, with California and Washington state governments being the leading states in passing green legislation. Likewise, the North-East coast has long been a stronghold of environmentalism. The District of Columbia, Vermont, Connecticut, Maine, and New Hampshire constituted five of the top six states for environmental organisation membership density prior to the turn of the century (Wikle, 1995). By contrast, the movement has always been weakest in the South, where the dominant conservatism of the region has made it largely resistant to the spread of most social movements - particularly outside of urban areas.

These geographic divides have only grown through the processes of deindustrialisation. Key battlegrounds like West Virginia and other fossil-dependent states have fallen further behind in terms of environmental organisation growth. In particular, there has been an increasing centralisation of environmental organisations into DC, seeking access to the federal government. However, beyond the overwhelming concentration of organisations in DC, this has also been accompanied by the outsized growth of organisations in coastal states with major metropolitan areas, with California, New York, and Washington state being epicentres of growth (Straughan and Pollak, 2008). This is no coincidence. In the post-industrial economic composition of the US, oriented around services, information, and the innovation economy, these coastal metropolises are the centres of economic and population growth. These cities (and states) have fostered robust

liberal political cultures and concentrations of wealth, making them strategic for the development of environmental organisations which seek to rely on a large cohort of morally-motivated volunteers and are the beneficiaries of economic elites' desires to support moral causes. Indeed, the concentration of the environmental movement into affluent metropolitan cities can also be seen in the distribution of environmental grant funding, which has continued to flow overwhelmingly toward DC and affluent coastal states with major metropolitan cities (Environmental Grantmakers Association, 2024).

One of the key results of this trend has been the intensification of the rural-urban divide regarding environmental and energy politics. Environmentalist organisations were geographically distanced from rural populations, such as the coal mining communities of Appalachia, and their connection to them via the labour movement was weakened. The tragedy here is that, despite common conceptions about these communities, they are not automatically opposed to environmentalist policy-making. Instead, they have different understandings, priorities, and preferences about environmental policy-making. For instance, they are widely sceptical about policy mechanisms being controlled by the federal government, fearing a lack of control over its formulation and being disproportionately targeted (Bonnie, Diamond, and Rowe, 2020). If environmentalist organisations had a clear presence and link in these core battleground constituencies, they would have been more aware of this divide. Moreover, they would have had the capacity to design legislation proposals which spoke to the concerns of these communities and alleviated opposition. Waxman-Markey, largely designed by the DC-based United States Climate Action Partnership, contained proposals for federal control and enforcement of renewable portfolio standards. This made it an easy target for fossil capital, playing into

community concerns about losing political control and receiving disproportionate economic burdens.

The growing divide between the environmentalist movement and these working-class communities was not driven solely by the geographical disconnect. Another key contributor was the growing professionalisation of the environmentalist movement. The modern environmentalist movement emerged from the explosion of social activism in the 1960s and early 1970s, composed of large contingents of activists with connections to the labour, anti-war, anti-nuclear, and other movements. In contrast to the prior environmentalist movement, with its top-down organisational structure, it was largely bottom-up. The overwhelming basis of the movement was a sudden growth in citizen groups that were based across both urban and rural communities, reacting to the consequences of industrial expansion (Silveira, 2001). The height of this movement was the first Earth Day Protest in 1970, where over 20 million people took to the streets.

As social mobilisation waned in the mid-1970s amidst economic stagnation, environmentalism shifted from grassroots activism to major NGOs like the Sierra Club, Environmental Defense Fund, and Natural Resources Defense Council. There was diversity beyond these organisations, with a far less influential grassroots movement which mobilised on local issues and undertook direct action. However, these major DC-centred and corporate adjacent organisations came to be dominant due to their funding, capacity for national messaging, and influential connections in government (Silveria, 2001).

With the growth of the major environmental NGOs, the movement became increasingly professionalised, as its core actors were full-time workers within the major organisations, aided by a far less active group of volunteers, who were not given organisational decision-making power (Towery, 2003). These networks of professional organisers' primary activities shifted increasingly towards securing funding from state, corporate, and philanthropic backers, organising public campaigns, undertaking research and developing policy proposals, and lobbying state and, particularly, federal government to take environmental action. The movement was no longer made up of activist citizens but by professionals who lived in affluent metropolitan cities and were usually hired due to their connections, credentials, and academic and policy expertise. The environmentalist movement became subject to a compositional elitism, wherein the leading figures and core organisers were all from similar elite circles (Arnold, 1999). Moreover, they were not only composed of elites, but they were increasingly made to rely upon other elite groups in society. Professionalisation and reliance upon public campaigning and insider politics were resource-intensive. The major environmental NGOs thus became increasingly oriented toward securing continued financial backing from their patrons. The result was that they became increasingly attentive and oriented toward the interests, viewpoints, and demands of their elite supporters (Delfin and Tang, 2005).

Composed by elites and oriented towards them, the major environmental NGOs were motivated to continually deepen their collaborative partnerships with major corporations and the liberal elites. The formation of the United States Climate Action Partnership (USCAP) in 2007 exemplified this trend, uniting environmental NGOs with fossil fuel corporations like BP and ConocoPhillips while excluding organised labour. This corporate-collaborative model prioritised

emissions trading mechanisms and state support for renewable research and development in Waxman-Markey but failed to address the economic vulnerabilities of coal-dependent regions, leaving working-class communities alienated from the policy process.

While existing scholarship has documented the environmental movement's geographic recentering, professionalisation, and corporate alignment as important institutional developments, this analysis argues these shifts were primarily caused by - though not entirely determined by - deindustrialisation's broader political-economic recomposition (Towery, 2003; Delfin and Tang, 2005; Straughan and Pollak, 2008). Just as deindustrialisation stripped unions of their manufacturing base and forced them into a permanent defensive posture, it simultaneously reconfigured environmentalism into a movement reflecting the spatial and class dynamics of the emerging post-industrial economy. The concentration of environmental organisations to coastal metros like San Francisco and New York mirrored the spatial polarisation of capital itself, as deindustrialisation concentrated high-value services in major cities while leaving former manufacturing regions stranded with depleted tax bases and limited political influence. This geographic sorting created feedback loops: NGOs' dependence on coastal philanthropic networks deepened their isolation from deindustrialised heartlands, while unions' residual strength in those regions withered alongside factory and mine closures. The result was a dual alienation - environmentalists lost organic ties to working-class communities just as those communities lost institutional vehicles to articulate alternative, transformative visions of climate policy.

Professionalisation operated as the organisational counterpart to this spatial stratification. As deindustrialisation elevated the economic status of credentialed professionals in tech, finance, and academia, environmental NGOs increasingly recruited from these cohorts, replicating their worldview. By the Obama-era, the vast majority of national environmental groups' budgets derived from foundations and corporations rather than grassroots donations, incentivising policy frameworks palatable to elite donors - carbon trading over worker retraining, research and development subsidies over public works programmes. This mirrored unions' own professionalisation crisis, as organised labour shifted from shop-floor mobilisation to DC lobbying, but with a critical divergence: environmentalists' elite integration expanded their political access while labour's continually contracted. The growing divergence created irreconcilable tensions in climate politics as environmentalists demanded market-based solutions favouring their corporate partners, while unions sought job guarantees incompatible with neoliberal climate governance. Deindustrialisation thus did not merely weaken labour; it reconstituted environmentalism as a movement structurally incapable of addressing labour's diminished but still crucial concerns.

The transition to a post-industrial economy, thrusting the environmentalist movement into the arms of corporate elites, led to the perspective of the major environmentalist organisations being overwhelmingly dominated by an elitist market liberalism. As seen in Waxman-Markey's formulation, they believed strongly that the best way to accelerate the green transition was to give corporate stakeholders a major say in the formation of federal regulation. With the creation of the right incentives, the market would undertake an accelerated transition. The transition was thus treated entirely as a market-technical affair, one which would be led by technocratic elite

experts and market innovators, not driven through popular participation. There was no necessity to complicate legislation with the inclusion of major social reform, wealth redistribution, or state disciplining of capital. The fracturing of the labour-environmentalist coalition must be understood not just as the result of struggling post-industrial unions becoming narrowly concerned with their sectoral interests. It was equally due to the environmentalist movement shifting away from a popular citizen-driven movement to one dominated by corporate liberal elitism. Finally, these two transformations must be understood as constitutive of the wider political-economic transformations wrought by deindustrialisation, not due to tactical or strategic failures on the part of leadership.

[3.3] Obama's Weakness

What has been developed across the two prior sections is a clear account of why the two halves of the labour-environmentalist coalition were left weakened, fractured, and unable to successfully push for the passage of federal energy transition legislation. This account was fully situated within the processes of America's deindustrialisation. Therefore, the account developed has looked to the coalition of social forces which could have pressured and convinced federal legislators to change the trajectory of energy policy-making. However, the responsibility for failure does not lie only with these social movements. In the absence of a robust popular coalition capable of pushing forward energy reform, the other direction we must look toward is that of political leadership.

One of the few remaining actors that could have drastically altered the trajectory of energy policy-making during this period was the Obama administration. Obama was elected with a mandate for significant reform during the most intense political-economic crisis since the Great Depression. At the start of his presidency, he had unprecedented popularity with the party base, with a 89% approval rating, the highest on record - beating out even Kennedy at 87% (Jones, 2017). His support was not limited to the party base, with 61% approval with independent voters in his first month, the highest figure since the time of Carter. Obama had the opportunity and support to substantially alter the basis of the Democratic Party and to set out in a new political direction. Regarding energy policy, there were substantial hopes that Obama would be the first “climate president” and undertake transformational measures (Vidal, 2008). Infamously, Obama did not deliver transformational changes in terms of energy policy, other policy domains, or in terms of the orientation/composition of the Democratic Party. This section produces an explanation for why the Obama administration was so hands-off regarding the legislative process, one which situates Obama’s orientation within the dominant political tendencies that had come to dominate in the post-industrial period. This analysis is organised along three relevant areas of Obama’s orientation: his ideology, his policy-making approach, and his socio-technical imagination - each of which turned Obama away from embracing a more active, populist, and transformative approach to leading the struggle over energy policy.

What was Obama’s ideological framework? How did Obama understand the world, what were his driving values, how did he conceptualise ethical and effective political action, and how did he situate himself within the existing political, economic and social reality? The existing literature provides an expansive range of interpretations for Obama’s ideological framework, with

characterisations placing him in the full range of the political spectrum. Contemporary conservative commentators often claimed Obama was a socialist, communist, and a Marxist (Greggory, 2012; Hendrickson, 2012). However, it is obvious these claims have no substantial basis in reality, fueled by the rising conspiracism of the emergent national-populist right. Most serious analyses place Obama in a variety of overlapping ideological positions, including neoliberalism, technocracy, centrism, Third Way, left-liberalism, progressivism, pragmatism, and liberal-realism (Peck, 2010; Mora and Christianakis, 2011; Smith, 2012; Lyles, 2013; Pedwell, 2014; Khan, 2014; Atkins, 2015; Kloppenberg, 2016; Rigueur, 2017; O'Connor and Cooper, 2021).

Obama avoided political labels, cultivating a pragmatic image. His inaugural declaration that the question is not “whether our government is too big or too small, but whether it works” exemplified his pursuit of broad coalition-building through apparent ideological flexibility (Obama, 2009a). However, Obama’s refusal to explicitly embrace an ideology does not mean he was without one; rather, it just went without a coherent expression or clear self-identification. Obama’s steadfast commitment to liberalism is abundantly clear in his inaugural address, stating that “the question before us [is not] whether the market is a force for good or ill. Its power to generate wealth and expand freedom is unmatched” (Obama, 2009a). The market, as the most efficient form of economic organisation and guarantor of freedom, was unquestionable to Obama.

In the face of market failure, Obama was distinct from progressives, such as Bernie Sanders and Elizabeth Warren, in his clear reluctance to tap into populist rage about Wall Street’s role in the

recession (Sanders, 2009; Warren, 2009). However, he still held that the market required a watchful eye from the state to prevent it from spinning out of control as it had in the months before his inauguration. Obama understood the recession as a collective failure, partially created by Wall Street's greed, but also from American society's inability to make tough decisions and prepare for the future. This preparation did not entail a deep reforming of liberal-capitalist organisational forms or uprooting of entrenched powers; instead, they were to be core components and participants of the generational struggle to improve America. This improvement was to be understood as a programme of economic modernisation, precise state intervention and investment, reintroducing regulatory competency and fostering political unity and transparency in decision-making (Obama, 2008, 2009a).

Obama was not an external challenger to the neoliberal economic orthodoxy, which extended between "New Democrats" and "Wall Street Republicans" that dominated the political establishment (Miller and Schofield, 2008). He was an internal critic who sought to reform it in the face of crisis.²² Kloppenberg (2016) attempts to place Obama within the tradition of post-war progressivism. As the US parallel to European Social Democracy, progressivism sought incremental change through political and economic reform, whilst aiming towards a common good and grand societal vision. Progressivism challenged the contemporary political-economic order by advocating for anti-trust reforms, land reform, transformational work programmes, welfare expansion, and social provisioning. However, as Birnbaum (2010) highlights, Obama's programme was articulated as a matter of crisis response rather than as social reconstruction. He

²² While Obama's positioning within the neoliberal consensus reflected the constraints of post-industrial Democratic politics, his specific approach also represented deliberate strategic choices. He consciously positioned himself as an internal reformer rather than external challenger to the prevailing economic orthodoxy, believing this would prove more politically viable - a calculation that, while influenced by structural conditions, must be understood as the result of his own agency.

did not articulate a grand societal vision but sought to resolve the ongoing crises plaguing the existing system and future-proof it. The difference here lies in the scope of reform and the relationship between Obama and the neoliberal establishment. Obama was far too austere in what he proposed to be a progressive. He was fundamentally aligned with the existing order and primarily sought to bring modernisation, transparency, and inclusion to it. Despite the hopes of the progressive wing of the Democratic Party, a core component of his support base, Obama was in the business of technical crisis management, not grand reform.

Obama's ideology, whatever label we would assign to him, placed him on the left wing of the neoliberal establishment. Shortly after his election, Obama announced that he was "a New Democrat" and a "Pro-Growth Democrat", cementing his placement within the neoliberal wing of the party (Lee and Martin, 2009). In forming his administration, Obama recruited widely from the New Democratic caucus for positions within his cabinet and for his team of advisors. His economic team, as several authors have highlighted, was composed predominantly of figures with close ties to Wall Street and the former Bush and Clinton administrations (Peck, 2010; Lyles, 2013; Curtis, 2015; Tooze, 2018). Where Obama differed from the prior administration was not in fundamental ideological framework, but on particular issues, such as the environment and international affairs. Obama, unlike Bush, was firmly committed to ensuring the US federal government recognised the reality and dangers of climate change and began to take action against it. However, the actions pursued would still be formulated within the policy paradigm of market liberalism, as with prior administrations.

Turning from ideology to policy-making approach, Obama stated that the best way to enact an energy transition was to harness “the ingenuity of the free market” (Little, 2007). In line with his market liberalism, Obama’s energy policy-making was always going to be market-regulatory, seeking to incentivise market actors into building renewable capacity and infrastructure, rather than disciplining capital or even going as far as to seek control or ownership over it.

Subsidisation, feed-in tariffs, renewable portfolio standards, and carbon markets were the preferred methods utilised by state-level neoliberal administrations. These measures had even seen some limited application in prior federal legislation, such as the Clean Air Act of 1990, which introduced cap and trade to combat acid rain (Conniff, 2009). The dynamic of incentivisation, rather than discipline, control or seizure, often relied upon corporate self-governance and participation in the formulation of regulation. This approach was favoured on the basis that active participation from stakeholders would lead to more cost-effective policy implementation by limiting the expenditure of state resources on oversight.

Whilst Obama argued in favour of a consensus-based, corporate-inclusive, policy-making approach, he did acknowledge that any transitional policy-making would face “resistance from certain parts of the energy sector, and... ideological resistance within the Republican party” (Little, 2007). In practice, Obama understood “consensus” needed to be a workable majority that could adequately address regional differences and aid those who would lose out. Obama’s compromising policy-making approach must be understood as emerging from his political origins in the Illinois State Senate, where he experienced multiple early successes working to develop bipartisan state legislation, including regarding energy efficiency and other environmental initiatives. This also extended to his brief period in the federal Senate, wherein he

had more limited successes working on energy efficiency initiatives with moderate Republicans. What is characteristic here is that Obama's experiences with Illinois Republicans would prove radically different to those of Republicans in the House and Senate once he was elected President. Illinois Republicans, operating in a state whose government was dominated by Democrats, historically tended more liberal than their national counterparts. Furthermore, the national Republican Party would swing further to the right after losing the 2008 election, embracing a policy of total opposition and legislative sabotage, as they were consumed by an insurgent populism from within.

Turning from Obama's ideology and policy-making approach toward his transitional imaginary, we must begin from when he arrived in the US Senate to analyse it. Once in the US Senate, Obama became more vocal about foreign policy and concerns about national security. Here, we begin to see Obama's first articulations on energy policy aimed at a national audience. In 2005, discussing the aftermath of Hurricane Katrina, Obama made the case for a renewable future for America's energy supply (Obama, 2005a). He focused on durable energy supplies as a matter of national security, criticising the Bush administration for continuing to make the US reliant on foreign fuels that were at risk of attack. This was an argument Obama repeatedly made over the next two years before his campaign announcement. The case for fuel efficiency and renewable development was made in terms of economic efficiency and domestic security, rather than in terms of environmental sustainability or justice (Obama, 2006a, 2006b and 2006c).

Obama's references to global warming were often tangential. Undoubtedly, though, Obama was a climate realist. He clearly accepted the necessity of a transition to prevent climate change.

However, in articulating his case for transition, it was the frameworks of security and economic prosperity that Obama predominantly utilised. This aligns with what we have seen in Obama's ideology and approach to policy-making. In the Bush era, the reality of climate change was a divisive political issue, with climate denialism being dominant in the Republican party and even infecting the conservative fringes of the Democratic party. However, in the post 9/11 era, concerns over national security were a unifying aspect across the political spectrum (Pew Research Center, 2004). Of course, each political faction held different understandings of how to achieve national security, but the basic logic of securitisation, especially of energy supplies, went unquestioned. Obama was - as always - an internal critic of the dominant national security framework. He sought to reform it into a more socially conscious paradigm without challenging the role of securitisation in dictating energy policy.

Obama was not making a radical break with Bush's conceptualisation of energy security as central to national security. There was a great deal of continuity. Bush himself had argued for and pursued fuel efficiency and alternative energy development (Monsiavais, 2007). The central difference was that Obama positioned himself as critical of foreign interventionism as a means of achieving national security objectives. He was here tapping into the popular fatigue building over the ongoing wars in the Middle East (Pew Research Center, 2008). In the years leading up to Obama's election, there was an increasing demand for a return to domestic, rather than international affairs. Obama's criticism of dependency on foreign oil was arguably an effective means of depoliticising renewable development. However, making the case for transition as a matter of national security was not just a rhetorical move on Obama's part. It was indicative of his priorities and gave key insight into his socio-technical imagination. For Obama, the highest

priority within energy policy was to break the US' reliance on foreign oil and secure national energy supplies through domestic production. Decarbonisation was not an immediate priority; rather, it was a long-term goal that would only become primary after breaking the national “addiction” to foreign oil (Obama, 2006a).

Though secondary to energy independence, Obama's commitment to decarbonisation was genuine. He framed domestic fossil fuel production as contributing to long-term decarbonisation through 'bridge fuels' - temporary alternatives while renewable solutions were being developed (Obama, 2006c and 2006d). The task was to find a technical substitute for carbon-intensive fossil fuels in transport, industrial and power generation that would lower emissions and allow time for renewable development and electrification to be undertaken. As Obama's presidential campaign started and he developed a more robust energy policy, it became apparent that natural gas was going to be that bridge fuel, a possibility unlocked by the beginning of the fracking revolution (Obama 2008). Natural gas could be extracted economically at scale, and it could be applied almost immediately to substitute more carbon-intensive fuels in electrical generation and heating. Most importantly, to make it a bridge fuel, natural gas primarily emits methane, which contributes significantly less to the greenhouse effect when compared with carbon dioxide emissions from oil and coal.

The centrality of natural gas as a bridge fuel to Obama's energy transition policy is reflective of his broader transitional imaginary. Obama's imaginary was fundamentally one of incremental modernisation, wherein transition is understood as the steady adoption of new technologies to supplant old ones, without requiring fundamental changes in the wider social organisation.

Transition was a process that would take over a half-century, wherein market-actors would develop and implement new technical processes to enable the steady reduction in fossil-fuel usage. The state's role would be to incentivise market actors to develop and implement the necessary technologies. Time for this steady market-based development would be brought through the adoption of temporary measures, such as the utilisation of natural-gas power generation to replace coal usage. This conception of transition is one from fossil-powered consumer capitalism to a renewable-powered consumer capitalism. The challenges of transition, in Obama's framework, were limited to finding energy sources and productive processes which are suitable for fueling the present economy. This imaginary embodied the emphasis of the technical over the social. This is not surprising. As we saw with Obama's ideology and policy-making approach, he was committed to preserving the market's centrality and approached reforms as a matter of technical fixes to manage crises. His conception of transition is exactly aligned with this, seeking incremental, market-oriented, technical fixes as a means to manage the crises of US dependency on foreign oil and climate change.

What we see then is that Obama's ideology, policy-making approach and socio-technical imaginary made him predisposed to embracing the fracking revolution. The fossil fuel majors promised that with fracking, they could break the US' dependence on imports in less than two decades. Its adoption would also provide American capitalism with a steady means of productive growth, desperately needed in the wake of the financial crisis. It fulfilled the role of the bridge fuel, which Obama had previously sought in biofuels. As such, he could embrace the fracking revolution on economic, security and transitional grounds. Obama's embrace of fossil capital and domestic extraction was not a betrayal of progressive-environmentalist loyalties that he held;

rather, it was the natural result of his ideology, policy-making approach and understanding of transition. Furthermore, Obama's hands-off approach and favouring of Waxman-Markey's technocratic and market-centric policy mechanisms were clearly in line with his ideological aversion to confrontational politics and his conviction that "consensus-based" solutions would emerge organically from stakeholder negotiations. Far from a strategic miscalculation, this approach reflected his belief in market liberalism's capacity to reconcile competing interests through technocratic mediation. By outsourcing policy design to USCAP's corporate-NGO coalition, Obama avoided direct confrontation with fossil capital while maintaining his self-image as a bipartisan reconciler. This alignment was not incidental but constitutive of his political identity: the same market-friendly incrementalism that guided his handling of the financial crisis structured his climate policy-making. To expect Obama to have forcefully intervened in Waxman-Markey's legislative process would require imagining a leader fundamentally at odds with his own ideological foundation.

Finally, Obama's ideology, policy-making approach, and transitional imaginary cannot be disentangled from the political-economic transformations wrought by deindustrialisation. The same processes that reconfigured the environmental movement into a professional-managerial class institution - geographic polarisation, the rise of finance-driven growth models, and the erosion of industrial labour's political power - produced the conditions for Obama's neoliberal positions. His administration's technocratic orientation mirrored the environmental NGOs' shift toward elite consensus-building, reflecting deindustrialisation's dual marginalisation of both labour and transformative politics. The Democratic Party's post-1990s base in coastal metros and affluent suburbs incentivised leadership styles prioritising representation over material

redistribution, a pattern exemplified by Obama's emphasis on "green growth" rhetoric that promised climate action without unsettling corporate profitability. This geographic and class realignment left the administration incapable of addressing the contradictions between decarbonisation and America's deindustrialised regions' economic survival.

Obama's transitional imaginary, with its faith in market-driven technical fixes and decades-long timelines, epitomised the post-industrial political imagination. The fracking revolution's embrace as a "bridge fuel" reflected deindustrialisation's corrosive effect on industrial policy ambition. Whilst leaders in the industrial era might have nationalised energy systems or launched expansive public works programmes, Obama's team defaulted to public-private partnerships and R&D subsidies - as seen in the American Recovery and Reinvestment Act. This retreat from state planning mirrored the environmental movement's own reliance on corporate collaborations, demonstrating how deindustrialisation had narrowed the horizon of political possibility for both state and civil society actors. The result was a self-reinforcing dynamic: market-centric climate solutions deepened geographic inequalities by favouring coastal tech hubs over Rust Belt manufacturing and mining regions. This further entrenched the spatial fractures that made ambitious federal legislation implausible. In this light, Obama's hands-off approach to Waxman-Markey appears not as a personal failing but as the logical endpoint of post-industrial politics - a system where presidents mediate between elite interests rather than mobilising mass constituencies, and where crises of survival are reframed as technical challenges for expert management.

[3.4] Conclusion

This chapter has traced how deindustrialisation systematically disarmed the three actors essential to challenging fossil capital's dominance over federal energy governance. The trade union movement's fragmentation into defensive sectoral positions, the environmental movement's transformation into a coastal elite project, and Obama's market-centric transitional imaginary represent interconnected adaptations to America's post-industrial recomposition rather than independent political failures. Each actor's limitations reinforced the others: unions' geographic concentration in fossil-dependent regions made their opposition to climate legislation strategically decisive, whilst environmentalists' corporate partnerships and professional-managerial composition severed their capacity to counter this resistance through popular mobilisation in battleground states.

Crucially, these actor-level dynamics cannot be understood separately from the structural transformations analysed in Chapter 2. The metabolic shift that displaced ecological consequences overseas weakened the material basis for labour-environmental solidarity, whilst stagnant energy demand forced renewable development into substitution dynamics that heightened fossil-sector unions' existential anxieties. Obama's embrace of the fracking revolution as a bridge fuel reflected both his ideological commitment to market-driven solutions and the post-industrial state's retreat from comprehensive industrial planning. Together, these limitations created a political vacuum that fossil interests systematically exploited, positioning themselves as champions of economic revitalisation whilst blocking transformative climate action.

However, demonstrating these structural and actor-level barriers alone cannot fully explain Waxman-Markey's defeat. The concrete mechanisms through which deindustrialisation's contradictions crystallised in legislative failure require examination of the policy-making processes themselves. The following chapter thus turns to process analysis, tracing how the fragmented pro-transition coalition's weaknesses manifested in the bill's corporate-dominated design and elite-negotiated political strategy, revealing why America's most significant opportunity for comprehensive climate legislation lead to failure.

Chapter 4: The American Process Analysis

[4.0] Chapter Outline

In utilising the prior chapter's findings, this chapter traces the concrete mechanisms through which the structural conditions and social recompositions of deindustrialisation crystallised in legislative failure. Rather than treating Waxman-Markey's defeat as primarily the result of tactical errors, conservative obstruction, or institutional gridlock, this analysis demonstrates how the bill's policy design, implementation strategy, and ultimate failure were primarily caused by the contradictions of America's particular post-industrial composition.

The chapter is organised around two substantive sections that reveal how deindustrialisation's effects manifested in concrete policy-making processes. The first examines how the bill's market-centric policy framework emerged from the fractured coalition dynamics analysed in Chapter 3, specifically focusing on the USCAP's dominance over producing the key climate bill of the Obama era. This section argues that USCAP's corporate composition and exclusion of labour organisations reflected deindustrialisation's wider transformation of American political coalitions, where the environmental movement's geographic concentration in coastal metropolitan areas and professionalisation around NGO structures systematically privileged corporate partnerships over working-class mobilisation. The analysis traces how this corporate-dominated coalition produced policy mechanisms - carbon trading, technology subsidies, and the extensive availability of emission offsets - that prioritised the profitability of market actors and thus created a bill structurally incapable of addressing the economic anxieties

of deindustrialised communities. By examining USCAP's internal composition and policy preferences, this section reveals how the environmental movement's post-industrial transformation predetermined Waxman-Markey's unpopular design, making it vulnerable to fossil capital's counter-mobilisation in key battleground states.

The section further argues that USCAP's approach reflected the broader changes in post-industrial governance that emerged from deindustrialisation's hollowing-out of state capacity for direct economic intervention. Where New Deal-era climate policy might have emphasised public works programmes, industrial planning, and worker retraining - approaches that could have aligned environmental goals with economic revitalisation in Rust Belt communities - USCAP's marketised orientation produced policies that appeared to threaten remaining industrial employment without offering meaningful alternatives. This policy design flaw cannot simply be attributed to poor policy design but rather reflects the environmental movement's structural transformation through deindustrialisation, which severely weakened its organic connections to working-class constituencies while embedding it within professional-managerial networks that naturally gravitated toward technocratic solutions. The section concludes by examining how this elite policy process created political vulnerabilities that fossil capital would systematically exploit through targeted campaigns in states with significant fossil fuel employment.

The second section shifts focus from policy design to political strategy, arguing that Obama's hands-off approach to Waxman-Markey - and failure to put forward an alternative climate bill - was a major contributor to the era's failure to deliver comprehensive transitional legislation. In

contrast to Skocpol's (2013) claim that Obama had little ability to intervene in the struggle, this chapter contends that the president possessed a unique opportunity to make a decisive intervention in the contest over federal energy policy. It puts forward that Obama entered office at a moment of acute economic and political crisis, enjoying unprecedented popularity and a sweeping mandate for meaningful change. The convergence of the financial crisis, the near collapse of the old economic order, and the rising demand for both substantial political changes and climate action created a rare opening for presidential leadership to reshape the Democratic Party's orientation and the national approach to energy and climate policy. Rather than seizing this moment to mobilise mass support and reorient the party's climate strategy in a popular direction, Obama defaulted to a hands-off, consensus-driven, and elite-negotiated approach that prioritised technocratic solutions and market mechanisms over grassroots mobilisation. Building upon the findings of the prior chapter, the analysis demonstrates that Obama's reluctance to leverage his political capital and popular mandate to build a broad-based coalition for transformative climate action was not simply a matter of personal disposition but reflected the dominant tendencies of post-industrial governance. The hollowing out of the party's working-class base, the professionalisation of the environmental movement, and the dominance of market-liberal ideology within the Democratic leadership all contributed to a political environment in which mass mobilisation was not seen as a pathway to sustainable policy-making.

The second section thus argues that the pathway available to Obama was not foreclosed by senatorial obstruction and institutional gridlock alone, but by a failure to break with the ideological consensus. The chapter traces how, had Obama chosen to break with the prevailing

consensus and actively mobilise the party's base - drawing on the energy of the 2008 campaign and the widespread demand for economic and environmental reform - he could have fundamentally altered the balance of forces surrounding Waxman-Markey. By building a popular coalition that linked climate action to economic revitalisation, job creation, and social justice, Obama could have pressured wavering legislators, countered fossil capital's narrative of economic sacrifice, and redefined the terms of the national debate. Instead, the administration's reliance on elite brokerage and incrementalism left the field open for fossil capital to exploit regional anxieties and fracture the Democratic coalition, dooming the bill to defeat.

The chapter concludes by combining these process-level findings, demonstrating that the failure of Waxman-Markey was not just a contingent political defeat, but the logical outcome of deindustrialisation's systematic transformation of American energy governance. The bill's corporate-dominated policy design and elite-negotiated political strategy reflected the broader post-industrial dynamics that privileged market mechanisms over popular-oriented state intervention, creating structural vulnerabilities that fossil capital systematically exploited. By tracing the concrete mechanisms through which contextual barriers and actor limitations manifested in the legislative process, this chapter demonstrates that Waxman-Markey's defeat emerged out of the contradictions of America's post-industrial composition.

[4.1] The Origins of Waxman-Markey's Unpopularity

This section examines how the structural contradictions of America's post-industrial economic composition shaped the design and ultimate failure of the Waxman-Markey climate bill. It begins

by providing a concise overview of the bill itself, including its legislative origins, the coalition that produced it, and the process by which it advanced through Congress before ultimately dying in the Senate. The section then surveys the major post-mortem debates that have emerged around Waxman-Markey's defeat, discussing the competing explanations offered by experts and policymakers - before highlighting Skocpol's (2013) process analysis as the most sophisticated, albeit still limited, diagnosis. Building upon parts of Skocpol's diagnosis, this section argues that Waxman-Markey's market-centric policy design and elite-dominated formulation were not contingent flaws but products of deindustrialisation's structural transformation of the pro-transition coalition. The bill's reliance on carbon trading reflected the environmental movement's post-industrial transformation into a professional-managerial coalition, structurally disconnected from working-class constituencies and incapable of countering fossil capital's narrative hegemony. It is argued that by prioritising corporate profitability over popular economic revitalisation, the legislation's design was a crystallisation of the very contradictions - rooted in deindustrialisation - that doomed its passage.

The American Clean Energy and Security Act of 2009, commonly known as the Waxman-Markey bill, was introduced in the House of Representatives on May 15, 2009, by Representatives Henry Waxman of California and Edward Markey of Massachusetts.²³ The extensive 1,427-page bill aimed to establish the US' first economy-wide cap and trade system for greenhouse gas emissions. Markey described the aims of the bill as oriented around three goals: promoting American energy security, accelerating the economic recovery whilst promoting long-term growth, and taking climate action by cutting emissions (Markey, 2009b). The legislation set multi-phase emissions reduction targets, requiring covered entities to reduce

²³ The full text of the Waxman-Markey Bill (American Clean Energy and Security Act 2009) is available here: <https://www.congress.gov/111/bills/hr2454/BILLS-111hr2454pcs.pdf>

aggregate greenhouse gas emissions to 17% below 2005 levels by 2020, 42% below by 2030, and 83% below by 2050.²⁴²⁵ To achieve these goals, the bill proposed a multifaceted approach utilising a variety of market-oriented policy instruments to encourage renewable development. The main mechanism was the proposed cap and trade program, which would have applied to any stationary emitters of greenhouse gases producing more than 25,000 tons per year - including petroleum fuel producers and importers, natural gas distributors, gas and coal utilities, and a variety of other sources (Centre for Climate and Energy Solutions, 2009). Beyond emissions trading, the bill included various provisions for renewable energy development. It established a federal-level renewable portfolio standard requiring suppliers to meet 20% of their electricity demand through renewable sources and energy efficiency by 2020. The legislation also included substantial funding for carbon capture and storage technology, smart grid development, electric vehicle research and development, and expanded energy efficiency compliance for buildings and appliances.

Despite being the authors of the bill, Representatives Waxman and Markey were not the origin point of the bill's principles, mechanisms, targets, or allowances. Waxman-Markey's framework was lifted largely from the legislative blueprint provided by the United States Climate Action Partnership (USCAP), a coalition of major corporations and DC-based environmental organisations formed in 2007 (USCAP, 2009). As discussed in the prior chapter, USCAP's membership included prominent polluting companies such as Shell, BP, ConocoPhillips, General

²⁴ For reference, without the passage of Waxman-Markey emissions were still cut by 12.1% by 2019 compared to 2005 levels (United States Environmental Protection Agency, 2024). These reductions came from the reductions caused by the shale gas revolution, which were not factored into the creation of the 17% target. It is highly likely if Waxman-Markey had passed that emission reductions would have exceeded the 17% target.

²⁵ It is noteworthy that the cap on emissions was more accurately characterised as a non-binding cap because the bill included generous free emissions allowances, offset purchasing above the cap, and the auctioning of strategic reserves to limit the price of carbon (Norris, 2009; Shellenberger, 2009).

Electric, and General Motors, alongside elite environmental groups including the Environmental Defense Fund, Natural Resources Defense Council, and the Nature Conservancy (USCAP, 2007). The bill did not include every aspect of USCAP's proposal, but "broadly embrace[d] the USCAP *Blueprint for Legislative Action*" as USCAP itself acknowledged (Altman, 2009). This included the 17% emissions reduction target by 2020, the free allocation of emissions allowances, the definition and applicability of offsets, and even the continued authorisation for the construction of conventional coal power plants, so long as they would be, theoretically, capable of installing carbon-capture and sequestration technology by 2025 (Borofsky, 2009).

The coalition's approach emphasised market-based mechanisms and industry participation in policy design. The logic is that involving major corporations in the legislative process would ensure economically viable climate policies while maintaining industrial competitiveness. However, the partnership faced internal tensions, particularly as the legislative process advanced and some fossil fuel companies began actively opposing the bill despite their USCAP membership. In practice, this came through their dual membership and contributions to organisations like the Chamber of Commerce, which were fierce critics of the bill and sought, at a minimum, to further water down its measures in the name of economic efficiency (US Chamber of Commerce, 2009; Burnham, 2009).

Despite being designed via corporate input to limit economic costs, Waxman-Markey failed in the Senate when Democrats from fossil fuel-dependent states joined Republicans in opposition, citing concerns about job losses in regions already devastated by deindustrialisation. Without the support of the T15, the bill was unable to advance. Unsurprisingly, the legislative battle over Waxman-Markey was characterised by unprecedented lobbying expenditures. Companies spent more than \$700 million lobbying on the bill, representing approximately 14% of all lobbying

expenditures between 2009 and 2010 (Meng and Rode, 2019). Predictably, fossil capital significantly outspent environmental groups in their lobbying efforts. All combined, environmental organisations spent \$22.5 million on federal lobbying in 2009, while oil and gas interests alone spent \$175 million, with ExxonMobil's individual lobbying expenditure of \$27.4 million exceeding the total spending of all environmental groups combined (Sheppard, 2010).

As time passed, inertia gripped the Senate, as initial meetings, hearings, and backroom discussions showed little sign of overcoming the raw numerics of the filibuster. Heading into the fall, alternative climate legislation, such as the Kerry-Boxer Clean Energy Jobs and American Power Act, was proposed instead.²⁶ However, despite trying to address the concerns raised by conservative Democrats, nothing came to fruition. As the passage of Waxman-Markey in the House drew further away, what little momentum there had waned away. By early 2010, the raw numbers had only gotten worse, with special elections narrowing the Democrats' majority and showing that there was a growing electoral pressure from the insurgent Tea Party, which professed a radical climate denialism. Finally, in July 2010, Harry Reid, the Senate Majority Leader, officially announced that comprehensive climate legislation was no longer on the agenda, due to the lack of support (Black, 2010). Whilst already dead at this point, the loss of the House majority in the November 2010 elections and the further shrinkage of the Democratic majority in the Senate was the final nail in the coffin.

Before Reid's pronouncement of the abandonment of the effort to pass the climate bill, policymakers, experts, activists, journalists, and academics began to debate why Waxman-Markey had been left to die on the Senate floor, across 2010 there was a flurry of

²⁶ The full text of the Clean Energy Jobs and American Power Act is available at: <https://www.govinfo.gov/content/pkg/CRPT-111srpt121/html/CRPT-111srpt121.htm>

participants involved in the autopsy, generating competing diagnoses - with each faction of the defeated coalition gravitating toward explanations that absolved their preferred strategies while condemning alternative approaches. These diagnoses ranged widely. Many environmentalists blamed the overwhelming power of the Koch brothers and other fossil capitalists funding the Tea Party and the wider ecosystem of climate denial (Greenpeace, 2010; Merchant, 2010; Mayer, 2010; Roberts, 2010; and Carrk, 2011). Others blamed Obama for weak and ineffectual leadership, particularly in failing to utilise the 2010 BP Oil Spill as a last-minute attempt to revive the legislative effort, failing to utilise the bully pulpit, and failing to counter the anti-renewable narratives of the fossil industry (Rieland, 2010, Harkinson, 2010, Revkin, 2010, Dickinson, 2010, Romm, 2010 and New York Times Editorial, 2010). Others simply blamed the weak economy, making the bill unpalatable during a period in which people were struggling with rising prices (Broder, 2010).

The Koch brothers narrative, while accurately documenting the unprecedented scale of fossil capital's mobilisation against the bill, offered little insight into why such opposition proved so politically effective in mobilising grassroots resistance across key battleground states. Similarly, the critiques of Obama's leadership, though highlighting genuine tactical failures, were unable to comprehensively explain why he took the pathway he did. The economic recession explanation, while acknowledging the material context that amplified public concerns about regulatory costs, failed to explain why climate legislation had struggled to gain traction even before the financial crisis intensified. Each diagnosis captured important elements of the bill's defeat, yet none provided a comprehensive account of how these various factors interacted with the deeper

political-economic transformations that had systematically weakened the coalition necessary for transformative climate action.²⁷

Among these competing explanations, Theda Skocpol's (2013) process analysis emerged as the most sophisticated and comprehensive diagnosis of Waxman-Markey's failure, particularly in its systematic examination of how USCAP's corporate-dominated approach fundamentally undermined the bill's design and campaigning abilities. Controversially, she placed the majority of the blame on the environmentalist movement itself, whilst practically clearing Obama of any responsibility. Skocpol's analysis was distinctive in its focus on the organisational and strategic dimensions of coalition-building, revealing how the environmental movement's reliance on insider negotiations and corporate partnerships meant they neglected working on fostering the grassroots mobilisation that would have been essential to counter fossil capital's opposition in key states. Her detailed comparison with the more successful healthcare reform campaign illuminated how USCAP's elite-dominated structure prevented the kind of broad-based popular engagement that could have pressured wavering Democratic senators, particularly those from fossil fuel-dependent regions.

However, while Skocpol's diagnosis of USCAP's limitations provides crucial insights that this analysis builds upon and extend, her exoneration of Obama from significant responsibility represents a critical blind spot that obscures the president's unique capacity to have altered the trajectory of climate politics during this pivotal moment, which is discussed in the next section.

Whilst this section argues that Skocpol's focus on USCAP's corporate orientation and

²⁷ Whilst arguing that the US' transitional failure was primarily caused by the structural conditions imposed by deindustrialisation, this chapter necessarily builds upon these analyses for their diagnoses regarding other factors, which operated as essential mediating factors. For instance, if the federal policy-making operated under different institutional arrangements - such as popular representation or the abolishment of the filibuster in the Senate - the result of the contestation could have been very different (Roberts, 2010).

elite-dominated strategy correctly identifies the key point of failure in the struggle over Waxman-Markey. However, it argues that USCAP's orientation and the lack of a clear alternative organisational structure must be understood as the direct result of deindustrialisation and the post-industrial economic composition of the US. This provides a level of structural analysis that clarifies and deepens the critique, demonstrating that the bill's unpopular market-oriented design and the lack of focus on grassroots mobilisation were not contingent errors but inevitable products of deindustrialisation's systematic transformation of the pro-transition coalition.

The environmental movement's overreliance on the corporate-centred approach through USCAP, which Skocpol (2013) correctly identifies as central to the bill's failure, was not the result of strategic miscalculation on the part of environmentalists but rather the emergent product of deindustrialisation's systematic transformation of American environmental politics. The geographic recentering of environmental organisations into affluent coastal metropolitan areas, analysed in Chapter 3, created structural conditions that made corporate partnerships appear both necessary and natural while severing the movement's organic connections to working-class constituencies in the very regions where Waxman-Markey would ultimately fail. As manufacturing declined and unions weakened, environmental NGOs found themselves increasingly dependent on foundation funding and corporate philanthropy concentrated in post-industrial urban centres, creating an arrangement where policy design reflected the preferences of elite donors rather than the material needs of deindustrialised communities. USCAP's exclusion of organised labour and failure to develop grassroots connections outside of urban metropolises was not an oversight but a logical outcome of environmentalism's post-industrial recomposition. The movement had already significantly lost its institutional ties to industrial workers through decades of spatial and sectoral displacement, making labour's absence

from climate policy formulation seem unremarkable to NGO professionals whose networks were embedded in financial institutions, tech firms, and corporate consulting.

The bill's market-centric mechanisms - cap and trade, technology subsidies, inclusion of carbon capture and storage, and extensive offset provisions - further reflected this elite coalition's class position and ideological orientation within America's post-industrial economy. Where New Deal-era environmental policy might have emphasised public works programmes, industrial planning, and worker retraining that could align environmental goals with economic revitalisation in Rust Belt communities, USCAP's approach prioritised market mechanisms that preserved corporate autonomy while avoiding direct confrontation with existing power structures. This design preference emerged from the mainstream environmental movement's transformation into a series of professionalised urban-elitist institutions, as documented in Chapter 3, where organisational leaders shared educational backgrounds, career trajectories, and worldviews with the corporate executives they sought to influence. The resulting policy framework appeared technically sufficient in balancing economic priorities and ecological concerns to coastal elites while remaining fundamentally alien to the economic realities facing deindustrialised regions, where the abstract promise of carbon markets offered no tangible alternative to the immediate threat of further job losses and economic insecurity plaguing their communities.

The geographic concentration of environmental organisations into post-industrial metropolitan areas, combined with their increasing reliance on corporate partnerships, created a policy imagination that was systematically disconnected from the economic anxieties driving opposition in key battleground states. Chapter 3's analysis of the environmental movement's transformation revealed how professionalisation and coastal clustering had created an organisational culture that

viewed policy success primarily through the lens of elite consensus-building rather than mass mobilisation. This orientation made USCAP's corporate-collaborative approach appear strategically rational to environmental leaders, who believed that securing business buy-in would guarantee legislative passage while avoiding the messy work of coalition-building across class and regional divides. However, this elite-focused strategy proved catastrophically misaligned with the political realities of a local deindustrialised democracy, where the absence of robust working-class organisations meant that fossil capital could exploit regional economic vulnerabilities without facing organised countermobilisation.

Furthermore, the absence of effective grassroots mobilisation that Skocpol identifies as one of USCAP's fatal weaknesses was not simply a tactical failure but the structural consequence of deindustrialisation's destruction of the material basis for labour-environmental solidarity. Chapter 2's analysis of the metabolic shift revealed how the spatial displacement of industrial production to China had severed the most visceral connection between American environmental conditions and economic activity, transforming environmentalism from an immediate health and safety concern toward an abstract global issue. This spatial reorganisation systematically undermined the foundation upon which the historic labour-environmental coalition had been built - the shared experience of workplace and community health threats from industrial pollution. With this weakened material basis for solidarity, environmental organisations found themselves unable to articulate compelling narratives that could mobilise working-class support in fossil fuel-dependent regions, leaving them structurally dependent on elite networks that prioritised market mechanisms over redistributive policies.

The bill's ultimate vulnerability to fossil capital's counter-campaign thus stemmed directly from USCAP's structural composition and strategic orientation, which were themselves products of

deindustrialisation's broader reconfiguration of American political coalitions. Fossil capital and its allies' \$700 million lobbying campaign succeeded not merely because of its scale but because it targeted a political landscape already fractured by the economic dynamics of deindustrialisation - regions where manufacturing decline had intensified dependence on extractive industries, communities where the metabolic shift had obscured the connection between local environmental conditions and global emissions, and constituencies where the environmental movement's elite orientation had created a political vacuum that fossil capital readily exploited - presenting themselves as the protectors of the last bastion of regional economic vitality. The effectiveness of industry arguments about job losses and economic sacrifice reflected deindustrialisation's systematic erosion of alternative economic visions, leaving fossil extraction as one of the few remaining sources of high-wage employment in devastated regions, while environmental organisations lacked the institutional capacity to articulate credible alternatives rooted in industrial planning or public investment.

USCAP's unpopular market-centric policy design thus crystallised the fundamental contradiction of the US' post-industrial environmental politics: a movement that had gained elite access and corporate partnerships, even entering into coalition with fossil capitalists, attempted to advance climate legislation that was fundamentally incapable of addressing the concerns and needs of core working-class constituencies needed to advance climate legislation. This disconnect was not just due to strategic oversight but clearly emerged from the structural economic transformations and the recomposition of the environmental movement, which fostered a spatial, class, and ideological divide between the two groupings. The coalition's emphasis on carbon trading and technology subsidies reflected not just a limited imagination but the narrow range of options available to an environmental movement and wider political culture that had lost the capacity for

transformative politics through the post-industrial recomposition. The inevitability was that by prioritising mechanisms that preserved existing power relations over policies which might have addressed the economic devastation underlying regional resistance to climate action, USCAP reproduced the very conditions that made comprehensive climate legislation politically impossible. They ensured that Waxman-Markey would fail due to its corporate-designed framework, directly shaped and approved by fossil capital, because it did nothing to enable the possibility of popular labour-environmentalist mobilisation, which was necessary to challenge fossil capital's dominance over federal energy governance.

[4.2] The Leadership Question

Any comprehensive engagement with Waxman-Markey's failure must substantially address the contentious question of the Obama administration's responsibility, given the extensive expert debate surrounding this issue. The literature reveals a fundamental schism between those who attribute primary blame to Obama's inadequate leadership and those who largely exonerate the president from responsibility for the bill's defeat. Critics of Obama's approach, including prominent climate advocates and political analysts, argue that more decisive presidential intervention could have altered the legislative outcome. The New York Times (2010) released a scathing editorial that claimed that Obama never committed to the fight and failed to utilise the bully pulpit and other presidential resources to intervene in the struggle. Romm (2010) condemned Obama for not raising the stakes on climate action, despite showing earlier that he was aware of them. In Romm's view, Obama's chief mistake was his passivity and failure to present his own vision for action, leaving it to be passed through legislative backroom trading. Harkinson (2010) and Revkin (2010) both highlighted Obama's complete ineffectiveness,

through his near silence, in countering climate sceptic discourse and his failure to actively promote climate science, with Harkinson highlighting that even the Bush administration had worked more closely with climate scientists. Whilst Dickinson (2010) centred the squandered opportunities Obama failed to take advantage of to make decisive interventions, most notably the BP oil spill, which occurred late in the contestation, which he argued would have reshaped the debate.

Conversely, Skocpol's (2013) process analysis offers a controversial counter-narrative that essentially exonerates Obama from primary responsibility for Waxman-Markey's failure. Her argument centres on the strategic inadequacies of the environmental coalition's strategy, particularly USCAP's role in Waxman-Markey's technocratic market-centric design and the absence of grassroots mobilisation necessary to pressure wavering Democratic senators. From this perspective, Obama confronted insurmountable obstacles created by the environmental movement's strategic failures - no amount of presidential pressure could have overcome the fundamental disconnect between elite policy design and popular mobilisation capacity. Skocpol contends that the bill's corporate-dominated formulation process had already predetermined its political vulnerabilities, leaving Obama with limited options for effective intervention. Her analysis suggests that even the most skilled presidential leadership could not have compensated for the environmental movement's incapacity to build the popular coalition necessary to counter fossil capital's grassroots opposition in key battleground states. If Obama had intervened more forcefully, it would have likely backfired and burned precious political capital.

This section advances a nuanced position that simultaneously rejects Skocpol's argument about Obama's political impotence, whilst providing a structural account for why the administration was completely unwilling to pursue transformative leadership in the struggle. The analysis proceeds by first examining the alternative pathways available to Obama's administration, demonstrating that meaningful presidential intervention remained possible within the post-industrial context. This analysis integrates the critiques leveraged against Obama but extends beyond them to articulate a far more transformative and ambitious pathway open to Obama, taking an example from the pathways taken by the Tea Party and Trump's transformation of the Republican Party. However, drawing upon Chapter 3's actor analysis, it reveals why Obama's ideological orientation, policy-making approach, and transitional imaginary made such a transformative intervention fundamentally incompatible with his political positions. This creates a complex assessment of presidential responsibility: whilst Obama bears accountability for his dismal strategic choices that contributed to the bill's defeat, these choices must be understood as emerging from deindustrialisation's transformation of Democratic Party leadership and the broader political landscape.

A pathway for decisive presidential intervention remained structurally available despite the limitations analysed in previous chapters, contrary to Skocpol's assessment of Obama's limited ability to overcome USCAP and Waxman-Markey's failures. Obama's unique position in early 2009 - commanding unprecedented popular support with 89% approval among Democratic voters and 61% among independents - provided exceptional leverage for reshaping party priorities and mobilising grassroots pressure (Jones, 2017). This political capital, combined with unified Democratic control of government and widespread public demand for transformative

change following the financial crisis, created conditions where presidential leadership could have fundamentally altered the trajectory of climate politics.

Rather than outsourcing policy design to USCAP's corporate-dominated coalition, Obama could have leveraged his campaign organisation and mass support base to develop alternative legislative frameworks rooted in popular economic concerns rather than market mechanisms. Skocpol (2013) herself proposes one such popular mechanism - proposing a cap and dividend rather than a cap and trade, wherein the revenue from carbon credit sales would be distributed to US citizens, providing direct benefits to the average person and limiting fossil capitalism. Alternative public measures could have spoken directly to the consequences of deindustrialisation, by reframing climate action around job creation, industrial revitalisation, and regional economic development, which could have been organised through a series of expansive public works programmes. An additional benefit of directly creating jobs through federal programmes is that they could have guaranteed their status as union jobs, helping to overcome the uncertainty and unattractiveness of most green jobs discussed in Chapter 2. Moreover, if coordinated and organised through direct federal investment, the development of renewable manufacturing, capacity, and infrastructure could have been achieved with limited exposure to the pressing issues of energy price volatility, profitability, and grid connection delays, which frequently delayed projects. Finally, as experienced with the New Deal's rural electrification programmes, citizen ownership and control over these public renewable development programmes could have been distributed to the local level - enabling the distrust of federal control felt by rural populations to be drastically mitigated, even as the federal government's intervention into the energy sector was drastically expanded. The president's capacity to reframe

climate action around job creation, industrial revitalisation, and regional economic development - issues felt starkly in the aftermath of the Great Recession - could have neutralised fossil capital's narrative of economic sacrifice whilst building working-class support in precisely those battleground states where Democratic senators ultimately defected.

This alternative approach would have required Obama to break decisively with the elite consensus-building and technocratic model that dominated post-industrial Democratic governance, instead pursuing what might be characterised as popular climate mobilisation. This strategy would have involved bypassing USCAP's corporate stakeholder process in favour of directly engaging labour unions, community organisations, and grassroots environmental groups in policy formulation through the creation of new organisations. By leveraging the mobilisation of these groupings within his electoral campaign for further popular mobilisations, Obama had the opportunity to help foster an organisational basis for formulating and pushing popular demands for substantial reform. This is the exact type of grassroots mobilisation Skocpol (2013) argues USCAP and the wider environmental movement failed to foster. However, it was Obama who had the greatest capacity to drive forward popular climate mobilisation of this type, through his record levels of support and the particular political and economic moment he inherited. In looking to a model of how this might have worked in practice, we can, ironically, look to Obama's fiercest opposition and the destroyers of his limited green legacy: the Tea Party and the Trump Movement.

The Tea Party movement and its subsequent evolution into Trump's MAGA movement provide instructive examples of how populist mobilisations are capable of remaking parties' orientation

and policy priorities through a strategic combination of bottom-up grassroots organising and top-down leadership (Williamson, Skocpol, and Coggin, 2011). These movements demonstrated that entrenched party establishments, despite their institutional advantages and elite networks, remain vulnerable to sustained insurgent pressure when there is widespread political dissatisfaction amongst the base. The Tea Party emerged in 2009 as a direct response to Obama's presidency and the financial crisis, mobilising conservative activists around fiscal austerity - particularly against healthcare reform - through a decentralised network of local organisations that was supported by a series of high-profile party members and independent political actors - such as the Koch brothers (Goldenberg, 2010; Williamson, Skocpol, and Coggin, 2011). The populist right's effectiveness was its ability to channel genuine discontent amongst the base - even if their viewpoints were not perfectly aligned - into a unified movement with a minimal but coherent political programme that could be used to challenge the Republican establishment.

The populist right's success in reshaping the Republican Party operated through three interconnected mechanisms. First, Tea Party activists spread and popularised their alternative agenda, challenging the party establishment's ideological hold and opening up internal debate through sustained grassroots activity including protests, town halls, and social media campaigns that amplified anti-establishment messaging - this was further supported from above by media organisations like Fox News, who amplified the voice of the grassroots (Williamson, Skocpol, and Coggin, 2011). This grassroots mobilisation was further complemented by the central contribution of movement leaders who articulated alternative political visions - a dynamic later perfected by Trump's Make America Great Again vision of nationalist revival that provided ideological coherence to a vast array of grievances. Second, and most crucially, Tea Party

activists leveraged fierce critique of party insiders who remained opposed to their agenda, threatening them with having to fight costly primary battles against insurgent candidates backed by the movement's growing ranks and organisational capacity - either forcing them to concede ideological ground or outright replacing them with pro-populist candidates (Blum and Cowburn, 2023). Finally, the movement strategically offered its support to candidates who willingly aligned with its transformative agenda, creating material incentives for politicians to embrace insurgent positions rather than the establishment orthodoxy. This tactical approach proved so effective that it fundamentally altered the Republican Party's ideological orientation within a single electoral cycle, demonstrating how sustained populist pressure could overcome institutional inertia. The 2010 midterm elections represented the culmination of this strategy, as Tea Party-backed candidates defeated numerous establishment Republicans in primaries before going on to capture control of the House of Representatives and diminish the Democratic majority in the Senate. This was seen just as strikingly in the aftermath of Trump's 2016 election, where swathes of anti-Trump Republicans made drastic changes in their position to gain the support of the swelling MAGA movement.

Turning the clock backwards, Obama entered office in 2009 with far superior conditions for executing a similar transformation of the Democratic Party's programme around comprehensive climate action and economic reform. Obama had record levels of popular support with 89% approval among Democrats and 61% among Independents (Jones, 2017). Unlike the Tea Party's insurgent challenge to Republican power, Obama possessed the legitimacy of his recent electoral victory and unified party control of government that provided institutional advantages, enabling him to utilise the levers of government to potentially add to the pressure on his own party. More

importantly, the convergence of the financial crisis, widespread demand for fundamental political and economic change, and Obama's massive grassroots organisation created political conditions far more favourable to a transformative mobilisation than those the Tea Party and MAGA movements operated within. Obama's 2008 campaign had led to the largest grassroots mobilisations for a political candidate in US history (McKenna and Han, 2015). Moreover, in the months following his election, this mobilisation did not immediately dissipate - with the grassroots base actively seeking to convert it into a permanent social movement (Scherrer, 2009).

If Obama had leveraged this swelling movement and continued to mobilise it on the basis of their shared hope for political and economic reform - creating a platform of change away from the pre-financial crisis political paradigm - he would have had a capacity to realign the Democratic Party, rivalling, if not greater than, Trump's ability to realign the Republican Party. If Obama had put forward a transformative vision for transitional legislation through policies which spoke to the concerns of the average citizen and the losers of deindustrialisation, he could have used his extraordinary political capital and the threat of the swelling grassroots organisation to discipline recalcitrant senators. In the first place, by actively putting forward popular-oriented climate policies, Obama could have limited the friction with the T15 Democrats by carving out priority funding for green initiatives in their states, as Biden achieved with Republicans through the Inflation Reduction Act's concentration of green investment in red states (E2, 2024).

This approach would have transformed climate legislation from an elitist affair negotiated by corporate stakeholders in the backrooms of power into a popular economic development strategy that directly addressed the general and regional economic anxieties generated by

deindustrialisation. Rather than allowing USCAP's elite coalition to dominate policy formulation, Obama could have leveraged his grassroots organisation to develop alternative legislative frameworks rooted in common economic concerns about job creation, industrial revitalisation, and energy independence. Such an approach would have required breaking decisively with the post-industrial Democratic Party's technocratic governance model, instead pursuing what might be characterised as popular climate mobilisation that challenged both fossil capital's hegemony and the environmental movement's corporate capture. The Tea Party and Trump movements demonstrated that such transformative mobilisation remained possible even within America's post-industrial political economy.

However, Obama refused to attempt to take such a populist pathway through his presidency, instead replicating the same patterns of governance of the Bush and Clinton years. Despite the eagerness of the swelling social movement seeking direction, Obama would only minimally utilise his grassroots support base - primarily activating them to campaign for candidates in tight electoral competitions, defensively trying to stave off the Republican takeover of Congress. In this way, Obama is clearly partially responsible for the failure to pass comprehensive transitional legislation during his presidency - and thus the Green Divergence - as he had the capacity to alter the pathway of the contestation. Yet Obama's failure to pursue this transformative populist pathway cannot be understood merely as a personal or strategic misjudgement, but rather as the predictable outcome of the structural transformation of Democratic Party leadership through deindustrialisation. Drawing upon the actor analysis developed in Chapter 3, Obama's ideological orientation, policy-making approach, and transitional imaginary made such a confrontational strategy fundamentally incompatible with his political worldview and that of the

post-industrial Democratic establishment. His market-liberal ideology, forged within Chicago's neoliberal policy circles, rendered him incapable of conceiving climate action outside the framework of market mechanisms and corporate partnership. The notion of mobilising grassroots pressure against corporate stakeholders - the very forces Obama viewed as essential partners in economic modernisation - contradicted his fundamental belief that private sector innovation and competitive markets, appropriately regulated, represented the optimal pathway to addressing the climate crisis.

Obama's consensus-driven policy-making approach reflected the broader post-industrial retreat from redistributive and coalitional politics that had characterised New Deal-era governance. Where Roosevelt mobilised popular anger against extreme inequality to advance transformative legislation, Obama's political instincts gravitated toward elite stakeholder engagement and bipartisan compromise - approaches that were fundamentally incapable of challenging fossil capital's dominance. This preference for insider negotiation over mass mobilisation was not merely temperamental but reflected deindustrialisation's systematic erosion of the institutional arrangements and class relations that had previously enabled a more popular Democratic leadership. In the post-industrial context where industrial unions had been forced into permanent retreat, working-class political organisations fragmented, and the party increasingly dependent on professional-managerial elites and corporate donors, Obama's consensus-driven approach appeared as a pragmatic adaptation rather than a strategic failure.

Most fundamentally, Obama's transitional imaginary - emphasising energy security through domestic fossil fuel expansion and incremental eco-modernisation through market-driven

innovation - precluded the kind of transformative vision necessary to sustain popular mobilisation against entrenched interests. His embrace of all-of-the-above energy policies, including enthusiastic support for the fracking revolution, reflected not merely tactical accommodation to political realities but a genuine belief that natural gas represented a viable bridge fuel enabling a gradual transition without economic disruption. This transitional framework, analysed extensively in Chapter 3, was itself a product of deindustrialisation's hollowing-out of state capacity for industrial planning, which made market-driven technological solutions appear as the only feasible alternative to continued dependence on more polluting fuel imports.

This structural analysis reveals Obama's responsibility for Waxman-Markey's failure as simultaneously individual and systemic. While the president clearly possessed greater capacity for transformative intervention than Skocpol acknowledges, his unwillingness to exercise this capacity stemmed from ideological and strategic orientations that were themselves products of deindustrialisation's transformation of the US' political economy. Obama's market-centric incrementalism, consensus-seeking approach, and energy security-focused transitional imaginary were not aberrations but paradigmatic expressions of post-industrial Democratic governance, shaped by the same structural forces that had weakened labour-environmentalist coalitions and empowered fossil capital throughout the preceding decades.

The tragedy of Obama's leadership thus lies not simply in strategic incompetence but in the historical irony that America's first climate president emerged precisely when deindustrialisation had most thoroughly undermined the political and economic conditions necessary for

transformative climate action. Unlike the Tea Party movement, which could leverage genuine grassroots discontent against an establishment perceived as failing its base, Obama's potential popular mobilisation would have required challenging the very corporate partnerships and market mechanisms that post-industrial Democratic elites viewed as essential to both electoral viability and policy effectiveness. In this constrained landscape, Obama's failure to pursue transformative climate leadership was not merely probable but structurally determined by the contradictions of America's post-industrial political economy - a dynamic that would prove decisive not only in Waxman-Markey's defeat but in cementing America's continued fossil fuel dependence throughout the critical decade of the 2010s.

[4.3] Conclusion

This process analysis has demonstrated that Waxman-Markey's defeat crystallised the systematic barriers to transformative climate governance embedded within America's post-industrial political economy. The concrete mechanisms examined in this chapter - USCAP's corporate-dominated policy formulation and Obama's consensus-driven leadership approach - were not simply political failures but structural expressions of deindustrialisation's transformation of American energy politics.²⁸ By tracing how these process-level dynamics emerged from the contextual conditions and actor limitations analysed in preceding chapters, this analysis reveals the nature of America's transitional failure during the critical window of legislative activity.

²⁸ While structural conditions established the terrain of political contestation and systematic disadvantages for pro-transition forces, the specific pathway to legislative defeat still required the convergence of these background conditions with immediate political failures, institutional constraints, and strategic miscalculations that were not structurally predetermined.

The bill's market-centric design reflected the environmental movement's post-industrial recomposition into professionalised urban institutions structurally disconnected from working-class constituencies, whilst Obama's incremental approach embodied the hollowing-out of state capacity for transformative industrial planning. These elite-dominated processes created political vulnerabilities that fossil capital systematically exploited, positioning itself as the defender of working-class interests against technocratic climate policies that promised abstract market benefits whilst threatening tangible employment in deindustrialised regions. The effectiveness of fossil capital's \$700 million counter-mobilisation thus stemmed not merely from resource advantages but from structural conditions created by deindustrialisation: the spatial displacement of environmental consequences through manufacturing offshoring, the fracturing of labour-environmental solidarity, and the economic dependency of devastated communities on extractive industries.

Crucially, this analysis reveals how deindustrialisation operated across multiple analytical levels simultaneously to produce transitional inertia. The metabolic shift obscured climate urgency whilst positioning fracking as crisis management; organised labour fragmented into defensive sectoral positions; environmental organisations clustered in coastal metropolitan areas; and presidential leadership operated within market-liberal constraints that precluded popular mobilisation against entrenched interests. These interconnected dynamics created a self-reinforcing cycle wherein each adaptation to post-industrial conditions further weakened the collective capacity necessary to challenge fossil capital's hegemony.

The implications extend beyond explaining Waxman-Markey's specific defeat to illuminate the broader political economy of energy transitions under capitalism. America's experience demonstrates how deindustrialisation systematically dismantles the institutional infrastructure and social coalitions essential for state-led decarbonisation, creating conditions where renewable energy development becomes trapped in substitution dynamics that provoke fierce resistance from incumbent fossil interests. This stands in stark contrast to the dynamics examined in the following section, where China's rapid industrialisation created fundamentally different structural conditions for energy transition governance. Where America's post-industrial composition systematically amplified fossil capital's dominance whilst eroding pro-transition forces, China's industrialising economy would generate overlapping pressures and opportunities that enabled the construction of a green developmental state capable of challenging global fossil hegemony.

Emergence of the Green Leviathan: The Transitional Success of the Hu and Xi Eras

Chapter 5: The Chinese Context Analysis

This section of the dissertation examines the structural and political-economic forces that fostered the will and capacity in China to implement comprehensive energy transition policy-making during the Hu presidency and the first Xi term (2003-2017). In the early 2000s, few imagined China would become the world's leading renewable economy. China's ruling ideology was fundamentally productivist, and its material basis was a rapid process of capitalist industrialisation driven by its role as the destination for global manufacturing capital departing deindustrialised Western economies. As the US and other developed countries shed their manufacturing bases, China became the central beneficiary, with the flight of manufacturing capital leading to explosive development of Chinese industrial capacity in coastal cities like Shanghai, Guangzhou, and Shenzhen - made attractive by their ease of export, existing infrastructure, and, most importantly, a massive reserve of cheap and disciplined labour.²⁹

China's approach to development was brutally straightforward. As Chairman Deng Xiaoping had articulated, "In order to build socialism, we must first of all develop the productive forces, which is our main task. Whether the socialist economic policies we are pursuing are correct or not depends, in the final analysis, on whether the productive forces develop and people's incomes increase. This is the most important criterion." (Deng, 1980). The method was capitalist

²⁹ This massive reserve of labour swelled with the transition to capitalism (Chuang, 2019). The privatisation and consolidation of agriculture, driven by the death of the People's Communes, led to a drastic increase in the numbers of migrant labourers forced into seeking work in the cities. Whilst the collapse of the Iron Rice Bowl ended the system of guaranteed employment and welfare that structured industrial work in the cities, leading to waves of mass lay-offs as profitability became the chief organisational principle of industrial enterprises.

development and the breakneck expansion of industrial activity for export, powered overwhelmingly by coal. To meet soaring demand, China rapidly expanded coal power near industrial hubs, yet recurrent shortages still forced energy rationing (Fisher-Vaunden, Mansur, and Wang, 2012; Ming et al., 2013; Chen and Lees, 2016). The trajectory seemed clear: China would continue building coal plants, global emissions would rise as a result, and there was no prospect of a green future for the world's emerging manufacturing powerhouse.

Yet within two decades, this trajectory experienced a dramatic reversal. Today, China is unquestionably the world's leader in renewable energy development, manufacturing, and deployment. The CCP has accelerated its ambitions for creating a renewable-oriented energy system and has advanced ahead of other major economies in ecological policy-making. Any global transition hinges on China's participation - and likely leadership. This unexpected transformation, which represents the other half of what this dissertation terms the Green Divergence, raises urgent questions: how did China rapidly expand its green energy infrastructure while simultaneously remaining the world's largest consumer of coal? Why did an authoritarian party-state committed to breakneck industrialisation become the globe's most ambitious renewable energy developer?³⁰

³⁰ The reversal of expectations in China proved even more dramatic than America's failure to capitalise on its early advantages. The US entered the Obama era with technological leadership, financial resources, and apparent political momentum for climate action only to become locked into expanded fossil fuel dependence through fracking. By contrast, China began the 2000s with only the tiniest seedlings of a renewable energy sector and an economy entirely dependent on coal expansion, yet emerged as the dominant force in the global renewable and green technology markets. That China would be speculated to become the emerging "Climate Leviathan" less than two decades after Hu's ascendancy represents a near unthinkable reversal (Wainwright and Mann, 2018; Levrat, 2020).

However, China's energy transition remains contradictory and incomplete. The same period that witnessed China's renewable energy revolution also saw a manifold increase in coal mining, importing, and burning, with devastating ecological consequences. It remains unclear whether China's coal utilisation has finally peaked, although it appears increasingly likely that it has (Centre for Research on Energy and Clean Air, 2024). What is certain is the incredible pace of China's renewable development, which by the end of the 2010s was outpacing every other major economy. Understanding this contradiction - how the world's largest carbon emitter simultaneously became its renewable energy leader - requires examining how China's specific position within global capitalism created unique structural conditions for state-led green development.

This section is divided into three chapters, each at a different level of analysis. It argues that China's rapid industrialisation process reconfigured the dynamics of Chinese energy governance, simultaneously deepening its dependency on coal power whilst also creating the political-economic configuration necessary for ambitious climate action.

This China context analysis chapter advances three interconnected arguments demonstrating how rapid industrialisation drove renewable energy policy adoption. First, it is demonstrated how the concentration of manufacturing in coastal cities led to severe environmental and health crises, which visibly threatened the legitimacy of the CCP, forcing them to take action. Second, renewable energy production was well positioned to enable China to move up the value chain from the manufacture of low-cost consumer goods - a form of economic growth which was widely perceived to be unsustainable in the long term. Finally, the explosion of energy demand

created through rapid industrialisation enabled renewable expansion to meet new consumption needs without displacing fossil fuels. This lessened the antagonism between the two sectors, providing space in which the CCP could prioritise renewables without suffering significant resistance from the fossil fuel sector.

The China actor analysis chapter is organised around three distinct key actors: the industrial working class, the broader pro-renewable coalition, and the leadership of the party-state centred around Hu and Xi. It is argued that China's rapid industrialisation created unique conditions where renewable energy development aligned with the interests of multiple social forces, enabling the formation of a broad pro-transition coalition that contrasts sharply with the fragmented landscape observed in the post-industrial US. These actors are chosen for analysis because each has a clear significance to China's transitional success. The industrial working class represents the material base whose interests were served by China's manufacturing-oriented green economy. The broad pro-renewable coalition represents several of the key interest groups in China: environmentalist civil society organisations, green tech capitalists, and nationalists. Their joint broad support for green developmentalism, driven by differing but overlapping motives, created sufficient political support for the policies. Finally, the turmoil of managing rapid industrial growth fostered an emphasis on state planning amongst the political leadership. This developmental context enabled both President Hu and Xi to prioritise ambitious state-driven renewable energy strategies, standing in stark contrast to market-driven, incremental strategies pursued elsewhere. It is argued that Hu Jintao's concept of “Scientific Development” laid the groundwork for integrating environmental concerns into state planning, whilst Xi’s “Ecological Civilisation” elevated the green transition to a central government priority. This ideological

evolution reflected the material conditions created by industrialisation, where environmental degradation threatened the sustainability of China's development model, necessitating a strategic response that integrated ecological, economic and global political imperatives.

In the process analysis chapter, it is argued that China's iterative approach to renewable energy policy-making reflected the changing material conditions and evolving balance of social forces created by rapid industrialisation and capitalist development. It traces how the Renewable Energy Law of 2005 primarily responded to an energy shortage crisis and growing environmental concerns, establishing the legal framework for renewable energy development whilst addressing energy security imperatives created by rapid industrial growth. The 2009 revision, alongside the Golden Sun Demonstration and Rooftop Subsidy programmes, emerged as responses to the global financial crisis and declining international demand for Chinese renewable energy products, demonstrating how China's integration into global markets shaped policy adaptation. The inclusion and expansion of climate goals in the 2011 and 2016 Five-Year Plans reflected China's growing confidence in its renewable energy capabilities and its strategic decision to position itself as a leader in the global green transition. This evolution demonstrates how material conditions created by industrialisation - energy security concerns, manufacturing capacity development, and global market positioning - systematically shaped policy development whilst the party-state's institutional capacity enabled effective implementation and adaptation. It thus demonstrates how the Chinese party-state's institutional structure facilitated this iterative evolution, contrasted with the gridlock that characterised American federal institutions.

Through a multi-level analysis involving context, actor and process, this section of the dissertation advances a novel explanation for China's comparative transitional success: industrialisation reconfigured China's political economy of energy in a multitude of ways, which fostered the continual expansion of the green developmental state. China's industrial ascent concentrated ecological crises in its economic heartlands, compelling renewable adoption as both a survival strategy and a developmental imperative. Rapid industrialisation generated an additional dynamic of renewable development that defused tensions between fossil and renewable sectors, aligned working-class interests with green manufacturing, and enabled state-led industrial policy to dominate global clean tech markets. Where America's post-industrial economy obscured climate impacts and fostered denialism, China's breakneck industrialisation made ecological ruptures visceral, spurring a cohesive coalition of state planners, labour, environmentalists, green tech capitalists, and nationalists to pursue a pathway of green development.

[5.0] Chapter Outline

This chapter examines how China's rapid industrialisation from the 1990s to the 2010s paradoxically created the structural conditions enabling its emergence as the world's leading renewable energy developer. It begins by providing a succinct background regarding China's situation during the period. This background develops a clear account of the economic composition of China in the aftermath of the Reform Period, noting the uniqueness of the post-Maoist political situation.

With the background developed, the chapter then identifies three central ways in which China's economic composition created structural conditions that enabled the development of renewable energy policy. First, it explores how the spatial shift of developed countries' industrial activity into the highly populated and rapidly growing coastal cities of China created the conditions for intense public scrutiny over China's environmental degradation. It is argued that this fostered an intense pressure on the CCP to demonstrate its capacity, in the medium-to-long term, to resolve the consequences of the deepening national environmental crisis. Second, it argues that the industrialisation process, whilst leading to immense developmental gains in the 2000s, was well understood to be an unsustainable process - not just ecologically - but also in economic terms. The reliance of the process on the expansion of low-skill manufacturing, low labour costs, and the massive influx of foreign investment made China vulnerable to the offshoring that had plagued countries like the US. This created an imperative to develop a highly specialised, technologically advanced industrial base with long-term growth prospects. It is argued that the renewable industry was one of the most obvious sectors capable of meeting these demands. Finally, it discusses how the rapid industrialisation process led to a crisis-level increase in energy demand, creating a dynamic where renewable energy development was not an immediate or even medium-term impediment to the continued expansion of the fossil fuel industry. This additional dynamic created a context in which the CCP could pursue comprehensive green developmentalism without the political antagonisms experienced in states with a substitution dynamic, like the US.

The chapter's analysis thus reveals how the spatial, economic, and metabolic dimensions of rapid industrialisation systematically created the tools and imperatives necessary for comprehensive

renewable energy development. Importantly, this structural account does not seek to diminish the role of political agency, institutional arrangements, ideology, or culture but contextualises leadership choices within a landscape where ecological crisis management, economic upgrading, and energy security converged around renewable development as a strategic imperative.³¹

[5.1] The Background

The conclusion of China's Reform and Opening Up resulted in the introduction of capitalism to China and the integration of China into global capitalism. There was the dissolution of the two bedrock institutions of the old socialist economy: the People's Communes, which structured agrarian life, and the Iron Rice Bowl, which structured urban life.³² The economy was increasingly marketised and organised by the logic of capitalist accumulation. Private enterprises, previously strictly controlled and limited, came to rival state-owned enterprises (SOEs) in their prominence within the national economy. The near autarchic conditions of Chinese development were done away with. Foreign direct investment and joint ventures with foreign companies became central drivers of Chinese development. The economy's orientation was dominated by export - China was rapidly becoming the global centre of manufacturing,

³¹ It is important to recognise that China's particular pathway of renewable energy development was not the only possible outcome of rapid industrialisation. Alternative scenarios were plausible. That China pursued ambitious renewable energy development reflected the interaction between these structural conditions and contingent factors including ideological determinants, institutional capabilities, policy entrepreneur activities, and the particular timing of global renewable technology development.

³² The Iron Rice Bowl referred to the comprehensive system of social welfare and employment security provided to urban workers in pre-Reform China, primarily through SOE and government employment. This arrangement guaranteed workers not only permanent employment but also housing, healthcare, education, pensions, and other social benefits as part of their work unit membership. With China's economic reforms and transition to capitalism beginning in the late 1970s, this system was gradually dismantled as SOEs were restructured into competitive market entities, forcing workers to rely on market-based provision of services and ending the cradle-to-grave security that had characterised urban life under the planned economy.

producing the commodities which would be consumed the world over, a process accelerated through its accession to the World Trade Organization in 2001.

As Chuang (2019) convincingly argues, China underwent a transition to capitalism, not due to “capitalist roaders” but through an incremental process of experimentation which was directed at breaking the inertia gripping the old developmental regime.³³ With the transition to capitalism, the Chinese Communist Party (CCP) retained its monopoly over political power - resisting Western expectations that marketisation was the prelude to democratisation. Fearing that foreign influence and market instability within key sectors could create destabilising crises that would challenge CCP control, central pillars of the national economy remained firmly under state control (Yeh and Lewis, 2004). The energy sector was one such central pillar, with SOEs composing over 50% of the sector and private enterprises being strictly regulated. Their activity was still limited by the boundaries of the National Development and Reform Commission’s (NDRC) Five-Year Plans (FYPs).³⁴ The energy system was overwhelmingly composed of coal power plants and a substantial, but geographically maxed-out, conventional hydropower system.

This political-economic arrangement created a unique hybrid formation - a form of state capitalism - where market mechanisms and integration into the global capitalist system drove rapid accumulation while the party-state retained decisive influence over strategic sectors. The energy sector's continued state dominance would prove crucial for later renewable development, as it provided the institutional infrastructure necessary for coordinated industrial policy while

³³ This contrasts the Maoist reading of China’s transition to capitalism as the result of a conscious conspiracy of ideologically-driven capitalist elements within the CCP, who had abandoned - or never sincerely held - any commitment to communism.

³⁴ Some areas of the energy sector have as high as 80% SOE market-share. The operation of the grid (two distinct national grids) is entirely left to two national SOEs.

market mechanisms generated the economic dynamism that created both the demand and capacity for energy transition. This combination of market-driven growth with state-coordinated planning created conditions fundamentally different from both the centrally planned economy of the Maoist era and the fragmented neoliberal governance structures that had emerged in deindustrialised economies like the US.

This hybrid political-economic formation unleashed a developmental process that was truly unprecedented in human history - simultaneously miraculous and cataclysmic in its scope and intensity. Between 1980 and 2020, China experienced the most rapid industrialisation, urbanisation, and economic expansion ever recorded, lifting hundreds of millions from poverty while transforming itself from an agrarian society into the world's manufacturing powerhouse within a single generation. The scale of this transformation almost defies comprehension. Yet this developmental miracle came at an equally unprecedented environmental cost, as China's carbon emissions surged to make it the world's leading emitter and its cities became shrouded in toxic smog that shortened millions of lives while its local ecological conditions deteriorated in the face of breakneck industrialisation. This process represented not just China's achievement of national development but the uprooting of the old world order itself - the spatial reorganisation of global capitalism that simultaneously created the conditions for China's emergence as a potential green hegemon while threatening the planetary systems upon which all future development depends.

[5.2] Chinese Industrialisation as Metabolic Shift

This section examines how China's rapid industrialisation from the late 1990s through the 2010s fundamentally transformed the country's social metabolism, creating intensified demand for cheap energy from China's manufacturing sector and the structural conditions for the development of renewable energy policy. Drawing upon metabolic rift theory (Foster, 1999, 2000; Saito, 2023), it argues that the spatial redistribution of global manufacturing to China's coastal regions represented a profound metabolic shift in the world economy with far-reaching consequences for its energy governance. This analysis reveals how the concentration of the world's manufacturing capacity within China's densely populated urban centres generated unprecedented environmental degradation and public health crises that threatened the CCP's political legitimacy and necessitated a robust state response. Unlike the US context, where deindustrialisation obscured the consequences of carbon-intensive consumption and facilitated climate denialism, China's industrialisation made the ecological crisis immediately visible and tangible, creating powerful imperatives for state intervention.

As discussed in Chapter 2, the primary imperative driving deindustrialisation in the US, through offshoring and consolidation, was profitability. Whilst this process accelerated in the final years of the twentieth century, American and other nations' industrial capital increasingly sought to relocate to new sites of production to provide a spatial fix to their growing crises of profitability. In the 1990s and early 2000s, China became the primary site of relocation for global manufacturing. This was driven by three core reasons. First, the abundance of cheap, disciplined labour power. This abundance was due to the population boom but also the result of the economic restructuring that occurred during the Reform Period, with the consolidation of agrarian production and the marketisation of SOEs. Second, the development of an industrial

infrastructure to transport raw materials from China's interior to the coastal cities and export goods. Finally, China's stable regulatory regime and its commitment to economic development promised a stable business environment and an attractive location for foreign investment.

As the primary site of relocation for global manufacturing, industrial capital arrived in China's coastal cities like a cataclysmic flood, with unprecedented levels of foreign direct investment concentrating in cities like Shanghai, Shenzhen and Guangzhou.³⁵ The rapid arrival and development of industrial capital in China's coastal cities began to reshape the nation's economic and social fabric. Between 2000 and 2007, China's aggregate exports grew at an average of 27% annually, with over 60% of its exports being machinery, textiles, and apparel - reflecting the breakneck rate of expansion in China's manufacturing capacity (Brandt and Lim, 2024). This explosive growth coincided with a demographic revolution. In 2000, China's urban population stood at 459 million residents; by 2010, it had increased to 669 million - a 45% increase (National Bureau of Statistics of the People's Republic of China, 2024). Just Shanghai's urban population alone jumped from 14 million to 20 million in the same period (Shanghai Municipal Bureau of Statistics, 2011). In just ten years, China's urbanisation rate thus swelled from 36.22% to 49.95%. This represented the dissolution of old agrarian China and the mass proletarianisation of China, made possible through its integration as a central node in global capitalism.

China's integration into global capitalism and its subsequent rapid industrialisation proved to be an effective spatial fix to the stagnation facing capitalism in the developed world. As discussed

³⁵ Some of the most important reasons cities like Shanghai, Guangzhou, Shenzhen were the primary beneficiaries of FDI are: the concentration of labour in the cities, the ease of access the ports gave exports to international markets, the highest levels of developed infrastructure, high levels of human capital in the cities with engineers, developed bureaucracy, and industrial expertise.

in Chapter 2, the US and other countries shed their stagnant industries and restructured their national economies around services - a process that was partially enabled through the transfer of manufacturing to China and the cheapening of consumer goods. However, this reconfiguration of global capitalist production also led to a spatial reconfiguration of the social metabolism. This was a spatial shift of the metabolic rift which had opened up between humanity and nature, already wrought by industrial capitalism. In the US, this spatial shift led to the deterioration of traditional industrial communities but the improvement of air quality and health outcomes as the ecological degradation wrought by production was offshored. In China, this spatial shift led to an unprecedented boom in industrial activity and employment and the concentration of millions of Chinese workers into its swelling coastal cities. However, it also concentrated a massive proportion of the ecological burdens of global capitalist production into this string of rapidly expanding coastal cities. The sheer concentration and scale of production in China's cities, accompanied by the comparatively lax environmental regulatory regime, led to the sudden deterioration of the local environment.

The scale of emissions growth directly mirrored the breakneck pace of industrial expansion. Between 2000 and 2010, China's national carbon dioxide emissions more than doubled (IEA, 2023a). With the industrialisation process so concentrated into coastal hubs, cities like Shanghai experienced surges in emissions far above the rest of China in this period (Yansong et al., 2012). This spatial and quantitative intensification transformed the environmental crisis from a distant policy concern into an immediate material crisis for China's urban populations. Unlike the abstracted climate debates prevalent in the US - where sceptics dismissed calls for emissions reductions as alarmism over gradual atmospheric shifts - China's pollution manifested as

visceral, localised catastrophe. The rapid process of industrialisation had unleashed a thick smog that permanently choked the burgeoning coastal cities of China, sweeping into the central districts from the industrial peripheries. Far from being limited to an issue of visibility, this pollution unleashed a health crisis in China's cities, as the rates of patients suffering from strokes, heart disease, lung cancer, chronic obstructive pulmonary disease, and respiratory infections were driven up (WHO, 2023). In China, the consequences of the metabolic rift were undeniable; moreover, they were actively impacting and shortening the lives of hundreds of thousands of Chinese through the health crisis.

Importantly, the impact of this growing health crisis was intensified by one of the preconditions of industrialisation of China - the destruction of the Iron Rice Bowl. Healthcare in China had never operated on a universal basis due to material constraints, the scale of the country, and the unevenness of development. Within the cities, healthcare had primarily been provided to urban residents as part of the package of social benefits that were associated with their employment within SOEs or the state bureaucracy. This arrangement, referring to the various welfare measures provided via employment in an urban SOE, was known as the Iron Rice Bowl. Urban proletarians in China had historically been in receipt of the highest quality healthcare in the country, bested only by that available to the party elite. However, with the marketisation of the economy and the restructuring of the SOEs into competitive capitalist enterprises, this old system of welfare provision in the industrial cities - including healthcare provision - had been disrupted (Grogan, 1995).³⁶ The result was the average Chinese being limited to only very basic healthcare, with more advanced treatment being prohibitively expensive (Song et al., 2020). Thus, China's

³⁶ It is also worth noting that, even during the high period of Maoism, there were significant portions of the urban population who were not in receipt of these benefits.

ongoing industrialisation had ushered in a dual-fold attack on the health of the urban Chinese: it led to the removal of healthcare access for vast swathes of the population whilst worsening their local environmental conditions, creating a public health catastrophe that starkly manifested the human costs of breakneck industrial expansion.

The spiralling environmental and health crisis, driven by the intensification of the metabolic rift, meant the political context for advancing environmentalism was drastically different from that in the US. The crisis was actively degrading the lives of urban Chinese. Although climate change was discussed, concern over the long-term outcomes predicted by climate models was not the primary driver of activity. Therefore, the Chinese environmental context here more closely mirrored the formation of the labour-environmental coalition in the US during the 1960s and 1970s. There was a growing widespread discontent regarding the environmental deterioration plaguing Chinese cities. This meant that, even as self-identified environmentalists were overwhelmingly “students, intellectuals, journalists, professionals”, they were not alone in demanding action from the government (Yang and Calhoun, 2007). The consequences of pollution affected all. Undoubtedly, the environmental consequences of industrialisation most devastatingly affected the impoverished working class, particularly the internal-migrant workers. For they spent the majority of their waking lives in the industrial districts, were least able to access sufficient healthcare, and whose shelters often lacked sufficient ventilation. However, even affluent Shanghainese and members of the party-state were made to endure the all-too-visible consequences of the widening metabolic rift.

In this context, it is no surprise that there was an explosion of highly successful environmentalist organisations across the early years of the Hu presidency. A mix of local activist groups, bottom-up NGOs, international NGOs, and government-organised NGOs, mostly founded/arriving in the 1990s, swelled in membership, funding, and activity as the environmental conditions in China continued to worsen under the strain of its rapid industrialisation (Xie, 2011). These organisations worked on educating the public about the deepening environmental crisis and sought to hold local governments and enterprises to account regarding pollution through requesting, collecting, and publishing environmental data. Importantly, the Hu presidency was characterised, in contrast to the later Xi presidency, as a period of relative openness in the development of Chinese civil society - although there was no legal framework developed to guarantee the independent activity of these organisations (Froissart, 2017). In the absence of heavy censorship and restriction, they were able to capitalise on the growing environmental discontent and expand their influence. The result was that many of these organisations were increasingly brought into consultation with local and central government, helping to integrate green perspectives into the policy-making process, which was otherwise dominated by the economistic logic of development (Yang and Calhoun, 2007).

The integration of environmentalist considerations, particularly during the early years of the Hu presidency, was a crucial driver behind the steady construction and expansions of the green developmental state. However, this integration must be understood within the fundamental constraints of the Chinese political economy, where environmental concerns were systematically subordinated to the overriding imperative of economic development. Just like the mainstream

environmental movements in the West, there was no challenging the basic premises of industrial capitalism - Chinese environmentalism operated within strict boundaries that precluded any fundamental disruption of the nation's development trajectory.

With industrialisation already underway and China experiencing unprecedented economic growth, it was clear that there could be no retreat from the path of industrial development. This position reflected a firm belief that continued development was an existential necessity for China. Development was necessary to achieve three foundational imperatives, which drove Chinese policy-making, originally identified by Deng (1980) - the alleviation of mass poverty, the reinforcement of national sovereignty, and the achievement of global influence reflective of China's size. Environmental concerns were thus taken seriously, but they could never be allowed to threaten these foundational imperatives. Reflecting this relation, Hu's commitment to "accelerate the economic restructuring, change the economic growth pattern, improve the innovation capacity and make great efforts to build an energy-efficient and environmentally-friendly society" demonstrated an understanding that environmental degradation posed genuine threats to sustained development (Ministry of Foreign Affairs of the People's Republic of China, 2005). However, the sequencing and language of these priorities made clear that ecological improvements would be pursued through, rather than instead of, continued economic growth. This represented a form of ecological modernisation that sought technological solutions to environmental problems while maintaining the fundamental trajectory of rapid industrialisation.

The sheer intensity of the metabolic rift, created by the spatial concentration of global manufacturing in China's coastal cities, generated the strongest governmental drive among all major states to seriously engage with the challenge of ecological modernisation. This intensity created a unique historical situation where environmental degradation was both immediately threatening to state legitimacy and clearly linked to the country's integration into global capitalism. Unlike gradual environmental degradation that could be ignored or deferred, the acute air pollution and health crises in China's industrial centres demanded immediate state response while the underlying developmental trajectory continued. This crisis-driven approach to ecological modernisation meant that China would pursue environmental policy-making not as alternatives to industrial development, but as necessary components of sustaining China's development. The goal became the development of alternative technologies, infrastructure, and material processes that could enable continued economic growth while mitigating the most severe environmental consequences.

The Chinese approach thus represented a distinctive form of environmental governance that took ecological concerns seriously precisely because they threatened the immediate developmental project. This contradiction would prove generative, creating potent incentives for environmental innovation while maintaining the fundamental commitment to rapid economic growth. However, these structural pressures did not automatically translate into renewable energy policies. As shown throughout the literature, the CCP's specific institutional capacity to respond to environmental crises through robust state intervention, the particular policy entrepreneurs who championed green development within the party-state, and the cultural resonance of ecological concepts within Chinese political discourse all mediated how these structural conditions

manifested in concrete policy outcomes (Corwin and Johnson, 2019; Chen, 2016, 2023; Gallagher and Xuan, 2019; Andrews-Speed and Zhang, 2019; Huang and Westman, 2021). Without these enabling factors, environmental degradation could have led to different responses - from authoritarian repression of environmental concerns to purely technocratic pollution control measures that ignored renewable energy development.

[5.3] The Contradictions and Opportunities of Chinese Industrialisation

This section argues that China's rapid industrialisation process contained fundamental economic contradictions that necessitated a strategic pivot toward high-value manufacturing sectors, with renewable energy emerging as the ideal candidate for state-led development. While the previous section demonstrated how industrialisation's environmental consequences created visible pressures for ecological modernisation, this analysis reveals how the economic foundations of China's export-oriented growth model were themselves inherently unstable and required urgent restructuring to avoid developmental stagnation. The argument proceeds by examining three interconnected vulnerabilities embedded within China's manufacturing boom: excessive dependence on foreign direct investment and foreign-owned enterprises, rapidly rising labour costs that threatened competitiveness, and structural exposure to global market fluctuations that left the economy vulnerable to external shocks. Unlike post-industrial economies that could rely on existing technological advantages and established global market positions, China faced the imperative to rapidly climb the value chain while its comparative advantages in low-cost manufacturing were eroding. This analysis reveals how renewable energy manufacturing emerged as the optimal strategic response, offering long-term growth potential, domestic

applicability, and opportunities for global market dominance in an emerging sector where China could leverage its accumulated industrial capabilities.³⁷ By situating renewable energy development within China's broader developmental trajectory, this section illuminates how industrialisation's economic contradictions systematically aligned with ecological pressures to advance green developmental policies. This economic imperative for sectoral upgrading, combined with the environmental crisis analysed in the previous section, established the structural foundations for China's emergence as the global leader in renewable energy manufacturing and deployment.

The ecological crisis engendered by the spatial shift in the metabolic rift represented only one dimension of the structural vulnerabilities inherent in China's development model. While environmental degradation threatened the conditions for sustained industrial expansion, equally pressing concerns emerged from the economic foundations of China's export-oriented growth strategy itself. The CCP's recognition of these dual crises - ecological and economic - facilitated a shift in developmental thinking, as captured in Hu's statement (2005) that China must "change the economic growth pattern" through innovation and efficiency gains. This imperative arose from the understanding that the very factors driving China's economic miracle - foreign direct investment (FDI), low-cost labour markets, and export-focused manufacturing - contained the seeds of their own obsolescence. The development model that had begun to lift hundreds of millions from poverty now risked trapping China in the middle-income trap - where rising production costs outpace technological capabilities and value chain positioning, leaving the

³⁷ While these economic contradictions created powerful incentives for industrial upgrading, they did not entirely guarantee that renewable energy would become one of the chosen strategic sectors. This selection also reflected specific institutional capabilities within China's state planning agencies, the particular vision of political leadership, and the contingent timing of global renewable technology development. Alternative responses to these contradictions - such as focusing solely on higher-value manufacturing in traditional sectors or more aggressively pursuing service sector development - remained options that other rapidly industrialising economies have pursued.

economy unable to effectively develop further. Importantly, this was not a distant challenge, but one that was rapidly approaching. By the end of the Hu presidency, China's GDP growth rate had begun to slow, as labour costs rose, with the deceleration only deepening as Xi's presidency began. The average 12% GDP annual growth rate of the early 2000s slowed to 7% in the 2010s and then 5% by 2020 (National Bureau of Statistics of the People's Republic of China, 2024).

The economic fragility of China's industrial model manifested through three interconnected vulnerabilities. First, the reliance on FDI in China meant that in the late 1990s and early 2000s, over half of Chinese exports were produced by foreign-owned enterprises (Venables and Yueh, 2006). The danger here is that these enterprises, which dominated the few high-value productive activities in China, were not bound to remain in China. Once the economic conditions changed, FDI would flow into other regions - such as SEA and Africa - and these enterprises would offshore their activity away from China. Second, the low wages and abundance of workers that made Chinese labour cheap and disciplined were not going to last. In 2002, labour costs in Chinese manufacturing were 2% of the US costs; by 2009, they had risen to 5% (Banister, 2013).³⁸ The rapid pace of Chinese urbanisation has already been discussed, but despite this drastic social transformation, there were still rolling labour shortages. Moreover, as the Chinese economy developed, the expectations regarding compensation and living standards amongst the Chinese working class continued to rise - along with the cost of living in China. The result was a surge in labour organisation, worker protests, and industrial disputes across the 2000s (China Labour Bulletin, 2012).³⁹ Finally, the reliance on the export of low-value consumer goods left

³⁸ This cost is not equivalent to wages but to the total costs of utilising labour in China, including social insurance and employee benefits required to be paid by employers.

³⁹ A marked difference between the Hu and Xi era is the suppression of NGOs, particularly independent labour organisations, which drastically increased across the Xi era as they were targeted by police, occasionally closed, and effectively coopted by the state-organised union and its local branches (Congressional-Executive Committee on China, 2017).

China's economy highly exposed to global market fluctuations, as experienced during the 2008 financial crisis when global demand plunged. Moreover, there were clear limits to the market share that China could capture in these sectors, facing growing competition at the bottom of the value chain (Guo and N'Diaye, 2009).

The combination of these structural weaknesses was sufficient to generate a clear understanding that China's pathway through industrialisation was not sustainable. Without careful guidance and intervention, the Chinese economy would inevitably slow, face international competition from lower-income countries, and lose the ability to continue its national development as it became slowly deprived of FDI flows and the offshoring of its manufacturing base - just as had occurred to the light manufacturing industries in the US. In order to maintain China's development, the CCP was compelled to construct a comprehensive industrial policy, with the primary aim being to boost China's innovation capacity, modernise its industrial capacity and technical expertise, and ascend the value chain. A central task of the Chinese government was to select strategic sectors which could be the primary recipients of the developmental state model, in order to shift the Chinese economic composition away from low-value manufacturing and thus secure its long-term stability.

Renewable energy emerged as the ideal strategic sector, offering long-term growth potential, domestic applicability, and opportunities for global market dominance in an underdeveloped field. The nascent global renewable sector presented China with a unique window of opportunity for dominance while serving domestic modernisation needs.⁴⁰ The US had yet to develop a

⁴⁰ The role of renewables in modernising rural villages was proven effective through the Golden Sun Demonstration Programme and the Rooftop Subsidy Programme, both initiated in 2009 (Wang, Luo and Kang, 2017).

federal-level renewable energy policy and was plagued by political and cultural divides over the issue, and the EU, whilst successfully working to develop carbon trading schemes, lacked a centralised industrial policy to support the development and manufacturing of renewable technologies - leaving this to individual states. In contrast, China's manufacturing system was ascendant, developing significant technical expertise, and its capacity for centrally coordinated industrial planning had remained largely intact. There was thus a clear opportunity for China to leap forward and build a dominant grip over the emergent sector. This trifecta of attributes made the renewable energy sector and wider green technologies an ideal candidate for being prioritised by the developmental state to produce a comparative advantage and build a more sustainable basis for Chinese economic growth.

The renewable energy sector's alignment with China's strategic imperatives was further reinforced by the specific characteristics of its manufacturing requirements, which aligned perfectly with the accumulated capabilities and institutional arrangements forged through China's industrialisation process. Unlike many high-technology sectors that relied primarily on research and development advantages or proprietary intellectual property, renewable energy manufacturing demanded precisely the combination of attributes that China's industrial transformation had cultivated: large-scale production capacity, supply chain integration, process innovation capabilities, and the ability to achieve economies of scale through coordinated mass investment (Nemet, 2006; Qiu and Anadon, 2012; van der Zwaan et al., 2012; Elia et al., 2021; Pratama et al., 2025). The production of solar panels, wind turbines, and battery technologies required extensive manufacturing infrastructure, disciplined industrial workforces, and the capacity to swiftly scale production in response to policy directives - capabilities that China's

rapid industrialisation had developed at scale. This manufacturing-intensive character meant that China's comparative advantages in industrial production could be directly leveraged to dominate global renewable energy markets, rather than competing primarily on technological innovation, where Western firms maintained substantial lead times.

The strategic selection of renewable energy as a priority sector was also shaped by China's positioning within global production networks during the 2000s, which created unique opportunities for technological leapfrogging and value chain capture. China's role as the primary destination for manufacturing FDI meant that it had developed extensive supplier networks, technical expertise, and production capabilities across multiple industries that could be rapidly recombined to support renewable energy manufacturing. The country's experience in electronics manufacturing provided crucial capabilities for solar panel production, while its steel and machinery industries offered foundations for wind turbine manufacturing. This industrial ecosystem enabled China to rapidly scale renewable energy production without requiring the decades-long technological development that had characterised earlier energy transitions. Furthermore, China's integration into global value chains meant that it could access foreign technology and expertise while leveraging its manufacturing advantages to become the dominant global supplier, creating a pathway to technological advancement through production rather than pure innovation (Nahm, 2021).

Moreover, the renewable energy sector offered a unique solution to one of the most pressing contradictions of China's industrialisation: the growing tension between manufacturing employment and environmental sustainability. Traditional heavy industries like steel, cement,

and chemicals had provided crucial employment opportunities during the rapid urbanisation process, but they also generated the most severe environmental degradation and health impacts that threatened the CCP's legitimacy (Xi et al., 2013; Zhang et al., 2019; Wu et al., 2024). The green technology manufacturing sector promised to resolve this tension by providing industrial employment opportunities that simultaneously contributed to environmental improvement rather than degradation. Solar panel and wind turbine manufacturing could absorb workers from the heaviest polluting industries, and fresh arrivals from the provinces, while simultaneously positioning China as a global leader in an emergent strategic sector. This alignment between employment generation and environmental goals created structural conditions that lessened the political tensions in pursuing ambitious green energy policy-making, as it circumvented the labour-environment conflicts that plagued transitions in post-industrial economies.

Finally, the developmental state's capacity to coordinate this industrial transformation can be understood as reflecting the institutional legacy of China's planned economy, which had maintained centralised planning capabilities even as market mechanisms were introduced - particularly in the energy sector (Yu, 2020). Unlike the fragmented policy environment that characterised post-industrial economies, China's party-state possessed the institutional infrastructure necessary to implement comprehensive industrial policy across multiple levels of government. The combination of state ownership in strategic sectors, centralised financial resources, and administrative capacity to coordinate between different government levels enabled the rapid mobilisation of resources required for renewable energy development (Chen and Lees, 2016). This institutional architecture allowed the CCP to treat renewable energy not merely as an environmental policy issue but as a comprehensive industrial strategy requiring coordinated

investment in research, manufacturing, infrastructure, and market development. The result was a systematic approach to renewable energy development that integrated technological innovation, manufacturing capacity building, domestic market creation, and global export strategy into a coherent developmental framework.

However, this institutional capacity should not be understood primarily as the result of superior institutional design or the legacy of the Maoist planned economy, but rather as the reflection of China's ongoing industrialisation. As discussed in Chapter 2, the US possessed comparable developmental state capabilities during the height of its post-war industrial expansion, with institutions capable of coordinated economic planning and strategic sector development that enabled its manufacturing dominance from the 1940s to the 1970s. Similarly, Japan's Ministry of International Trade and Industry demonstrated remarkable capacity for industrial coordination and long-term planning during Japan's economic miracle, successfully driving the nation's transformation from low-value to high-value manufacturing through targeted intervention in strategic sectors (Kasahara, 2013). The Four Asian Tigers likewise deployed powerful developmental state institutions during their rapid industrialisation phases, combining state intervention with export orientation to develop dominance in high-value manufacturing (Chuang, 2019). Yet as these economies transitioned toward post-industrial compositions - with the US embracing financialisation and knowledge-based sectors, Japan moving toward services, and even the Asian Tigers evolving beyond manufacturing-intensive growth - their developmental state institutions were systematically weakened, reformed, or abandoned. This suggests that effective industrial planning institutions are not preserved through institutional inertia alone, but require the material foundation of ongoing industrial development to maintain their political

relevance and operational capacity. As their economic composition shifted, the necessity of maintaining the institutions of the developmental regime faded away. In this reading, China's ability to deploy its developmental regime to advance its renewable energy sector is not the result of institutional design, but rather one of fortunate timing. China's delayed integration into global capitalism and late industrialisation meant that it was positioned to take advantage of the opportunity available to it.

The analysis of this section, combined with that of the former, reveals how China's rapid industrialisation process created the structural conditions that made the renewable energy sector both necessary and viable as the foundation for a developmental state model. The ecological and economic contradictions generated by export-oriented manufacturing compelled the CCP to seek alternative development pathways, while the accumulated industrial capabilities, institutional arrangements, and global positioning forged through industrialisation provided the tools necessary for renewable energy dominance. This stands in stark contrast to the dynamics examined in the US context analysis, where deindustrialisation systematically undermined the conditions necessary for comprehensive energy transition governance. Where China's manufacturing-intensive economy created alignment between industrial employment and environmental improvement, America's post-industrial transformation generated antagonism between these objectives. Where China's centralised planning capabilities enabled coordinated industrial policy, America's post-industrial governance structures inhibited comprehensive federal action. Where China's integration into global manufacturing networks provided pathways for technological advancement through production, America's focus on research and development created innovation without domestic manufacturing capacity. Most fundamentally,

where China's industrialisation generated both the necessity and opportunity for state-led renewable energy development, America's deindustrialisation amplified fossil capital's dominance while weakening the political coalitions necessary to challenge it. The Green Divergence thus emerged not from two independent national strategies but from the contradictory effects of a unified global process of capitalist development that simultaneously created the conditions for China's renewable energy revolution and America's continued fossil fuel dependence.

[5.4] Explosive Energy Demand and Renewable Development

This section argues that China's rapid industrialisation created a third critical structural condition that facilitated renewable energy development during the Hu and Xi presidencies: explosive growth in energy demand that enabled a dynamic of renewable addition rather than substitution. Unlike America's post-industrial economy, where renewable development required displacing fossil fuel generation in a zero-sum contest, China's breakneck industrialisation generated such a voracious appetite for energy that renewables could expand by capturing new demand without directly threatening existing fossil fuel interests. This addition dynamic fundamentally transformed the political economy of energy development, creating space for the CCP to pursue ambitious renewable targets while simultaneously expanding coal capacity to meet immediate industrial needs. The result was a contradictory but strategically coherent approach that built renewable manufacturing dominance through ecological modernisation rather than immediate decarbonisation.

By the dawn of the new millennium, China's entry into global capitalism had triggered an unprecedented surge in energy consumption driven by the spatial concentration of manufacturing investment in coastal industrial cities. Between 2000 and 2010, China's energy demand grew at an astounding rate. Industrial demand alone tripled during this period - an unprecedented increase in a nation's energy demand (IEA, 2023a). This explosive growth reflected the rapid pace of industrial expansion as foreign direct investment transformed cities like Shanghai into global manufacturing hubs. The industrial sector's contribution to total energy consumption increased from around 42.8% in 2000 to 56.1% in 2010, demonstrating how manufacturing-intensive development was the key driver of swelling energy demand (IEA, 2023a). Unlike the gradual energy demand stagnation characteristic of mature industrial economies, China's appetite for power grew so rapidly that it repeatedly outstripped the capacity to generate supply, creating rolling energy crises that exposed the fragility of the country's existing infrastructure (Ming et al., 2013).

The summer of 2004 crystallised these contradictions in the form of nationwide power shortages that dwarfed energy disruptions experienced elsewhere. As economic growth soared beyond the capacity of new coal power plant construction, 24 provinces experienced blackouts and rolling power cuts (Ming et al., 2013). Industrial enterprises across major manufacturing centres faced forced shutdowns for days at a time, while authorities implemented emergency rationing measures that revealed how China's integration into global capitalism had created energy demands that consistently exceeded the state's capacity to provide adequate supply through conventional means (Fisher-Vaunden, Mansur, and Wang, 2012). Chinese coal-fueled energy production increased by 16% from 2003 to 2004, yet failed to satisfy the swelling demand driven

by industrialisation (IEA, 2023a). These recurring energy crises exposed a fundamental contradiction in China's development model: the same rapid industrialisation that delivered unprecedented economic growth also generated energy demands that threatened to constrain further expansion.

The political implications of these energy crises proved decisive in shaping China's approach to renewable development. Where American policymakers faced the challenge of displacing existing energy sources in a context of stagnant demand, the CCP confronted the more immediate imperative to rapidly expand total energy supply in order to avoid further industrial disruptions. This fundamental difference created what can be characterised as an addition dynamic rather than a substitution dynamic for renewable energy development (Haas, 2019).

The addition dynamic fundamentally altered the calculations of key stakeholders in China's energy sector. Unlike in the US, where utilities and fossil fuel companies perceived renewable mandates as direct threats to existing market share, Chinese energy companies could embrace renewable development as a necessary diversification to meet surging demand. State-owned enterprises dominating China's power sector faced the immediate challenge of avoiding future supply shortages that would disrupt industrial production and threaten social stability. In this context, renewable energy represented not ideological environmentalism but pragmatic risk management - an additional source of supply that could reduce vulnerability to coal shortages and provide energy security in regions distant from traditional fuel sources. The result was significantly reduced resistance to renewable policies compared to contexts where such policies threatened incumbent energy interests.

This addition dynamic enabled the CCP to pursue renewable development through ecological modernisation and an “all-of-the-above” approach to energy development as a whole.⁴¹ Rather than demanding the phase-out of existing coal plants, renewable policies focused on building additional capacity to meet new demand while simultaneously expanding conventional generation to maintain industrial growth. The 2005 Renewable Energy Law, for instance, mandated increasing renewable shares without imposing immediate constraints on fossil fuel development, creating protected market space for clean energy while allowing continued coal expansion (Ministry of Commerce of the People’s Republic of China, 2013). This approach proved politically sustainable because it avoided zero-sum conflicts between energy sectors, enabling both fossil and renewable interests to expand their operations simultaneously.

The contrast with America's substitution dynamic illuminates how fundamentally different economic compositions shape the political possibilities for energy transition. In the US context analysis chapter, stagnant energy demand forced renewable development into direct competition with entrenched fossil fuel generation. Every wind farm or solar installation represented lost market share for coal or natural gas plants, intensifying resistance from utilities and energy workers whose livelihoods depended on conventional generation. This substitution dynamic heightened the political costs of renewable policies, as supporters had to overcome not merely technical or economic barriers but active opposition from threatened interests with substantial political influence. China's addition dynamic, by contrast, created space for renewable expansion without immediately threatening existing energy stakeholders. The sheer scale of demand growth

⁴¹ All-of-the-above development here refers to choosing to advance all forms of energy production simultaneously, this name being popularised by Obama to characterise his administration’s approach.

meant that even aggressive renewable deployment could complement rather than replace fossil fuel expansion. Between 2000 and 2010, China's total electricity generation capacity expanded dramatically while renewable generation grew from minimal levels to substantial capacity without reducing fossil fuel output in absolute terms (IEA, 2023a). This enabled Chinese policymakers to frame renewable development as enhancing rather than constraining energy security, building political support across stakeholders who might otherwise oppose decarbonisation policies.⁴²

The strategic implications of this addition dynamic extended beyond immediate political expediency to shape China's long-term approach to renewable industrial policy. Renewable development did not require confronting fossil fuel interests directly, and as such, the CCP could pursue ambitious manufacturing targets and technological development programmes without triggering the kind of industry-wide resistance that characterised climate politics in post-industrial economies like the US - as seen during the struggle over Waxman-Markey. Chinese renewable manufacturers could expand production, knowing that growing domestic demand would absorb increasing output, while state planners could direct investment toward building global competitive advantages in emerging green technologies. The result was a self-reinforcing cycle where renewable development strengthened China's industrial base while expanding energy options, creating momentum for continued policy support.⁴³

⁴² Importantly, this addition dynamic required political leadership capable of perceiving and acting upon these opportunities. The CCP's ability to frame renewable energy development as enhancing rather than constraining energy security reflected both the structural conditions created by explosive demand growth and the particular strategic vision of political leaders who could translate structural possibilities into concrete policies. Without this political agency, the same addition dynamic could have simply led to expanded fossil fuel development without renewable energy investment.

⁴³ That is not to say that there was zero resistance from fossil fuel interests in China. For instance, there is a well-documented history of resistance to the implementation of carbon trading schemes in provinces with higher rates of dependency on the coal economy, mostly taking the form of attempting to water down or slow down the implementation of centrally-dictated policies (Zhao et al., 2014; Andrews-Speed and Zhang, 2019).

However, it must be highlighted that this addition dynamic contained a fundamental contradiction that would prove both enabling and constraining for China's energy transition. While it facilitated the rapid development of renewable manufacturing capacity and domestic markets, it simultaneously enabled continued expansion of coal-fired generation that increased absolute emissions even as renewable capacity grew (IEA, 2023a). The same explosive energy demand that created political space for renewable development also drove unprecedented coal consumption, as the CCP prioritised maintaining industrial growth over immediate emission reductions. This meant that China's early renewable development represented ecological modernisation rather than genuine decarbonisation - building the infrastructure for future transition while deepening fossil fuel dependency.

The contradictory nature of China's addition dynamic approach becomes apparent when examining the parallel expansion of both renewable and fossil fuel capacity during this period. While renewable energy capacity grew from nearly negligible levels to substantial scale between 2000 and 2010, coal-fired generation expanded even more rapidly to meet industrial demands (IEA, 2023a). China continued to add significant coal capacity well into the 2020s. This pattern revealed how the addition dynamic enabled comprehensive renewable development while simultaneously entrenching continued fossil fuel growth. This is a contradiction that still has yet to be resolved, it is unclear whether coal usage in China has peaked (Centre for Research on Energy and Clean Air, 2024). As such, it is unclear whether in the following decades China will be able to leverage its advantages to curtail coal usage and undertake a full-fledged energy transition.

The explosion of Chinese energy demand thus represents a third critical way in which industrialisation created China's motivation and capacity for pursuing renewable energy development during the Hu and Xi era. Building atop the ecological fallout of industrialisation and the economic unsustainability, both of which fostered the demand for renewable development, industrialisation fundamentally aligned the dynamics of energy development by creating a growth context that enabled a less confrontational policy-making context. Whilst this growth contained within it contradictions that did not enable a straightforward transition, it did enable China to advance into the world-leading position in renewable development and the most advantageous position to pursue a comprehensive renewable energy transition today.

[5.5] Conclusion

This context analysis has established how China's rapid industrialisation created three interconnected structural conditions that systematically enabled comprehensive renewable energy development: the spatial concentration of ecological crisis in economic heartlands, the strategic imperatives of economic upgrading through green technology, and the additive dynamic emerging from explosive energy demand growth. These dynamics fundamentally reconfigured China's political economy of energy, aligning environmental necessity with developmental imperatives in ways that contrast sharply with America's post-industrial constraints.

Where deindustrialisation obscured the metabolic rift's consequences for American consumers, industrialisation made ecological degradation viscerally immediate for China's urban populations

and political elite. Where America's economic hollowing-out eliminated state capacity for coordinated planning, China's developmental trajectory preserved and strengthened institutional arrangements capable of comprehensive industrial strategy. Where stagnant American energy demand forced renewable development into zero-sum substitution conflicts, China's voracious industrial appetite enabled additive expansion that circumvented fossil fuel resistance.

However, these favourable structural conditions alone cannot explain China's transitional success. The alignment of environmental crisis, economic upgrading, and energy security around renewable development created opportunities that required mobilisation by specific social forces and mediation through concrete policy processes. The following actor analysis examines how industrialisation shaped the interests and capacities of key stakeholders - the industrial working class, the broader pro-renewable coalition, and party-state leadership - whose alignment enabled comprehensive green developmentalism. This multi-level analysis reveals how China's manufacturing-oriented economy created not merely structural opportunities but also the social foundations necessary to realise those opportunities through sustained political action.

Chapter 6: The Chinese Actor Analysis

[6.0] Chapter Outline

This chapter provides an actor analysis of China's energy transition, examining how the country's rapid industrialisation fundamentally reshaped the composition, interests, and strategic alignments of key political actors in ways that facilitated the emergence of a robust pro-transition coalition. The chapter argues that China's unique position as a rapidly industrialising economy within the global capitalist system created conditions for an unprecedented convergence of diverse social forces around renewable energy development. This stands in stark contrast to the fragmentation and antagonism that characterised the American transition. The analysis demonstrates how the structural transformation of China's economy through intensive manufacturing-led growth generated both the material conditions and political imperatives that enabled the CCP to capitalise on a broad-based consensus supporting the green transition whilst simultaneously sidelining opposition from fossil fuel interests.⁴⁴

China's industrialisation process, mediated through institutional legacies and the decisions of key policymakers, created a uniquely favourable configuration of actors for energy transition governance through three interconnected mechanisms. First, the manufacturing-intensive nature of China's green technology sector provided the industrial working class with tangible economic benefits, creating a material foundation for working-class support that was absent in the

⁴⁴ While this chapter emphasises how economic composition shaped actor interests and capacities, it recognises that these structural tendencies required political activation through specific institutional arrangements, leadership strategies, and policy choices. The renewable energy coalition's formation was not automatic but emerged through the dynamic interaction between material conditions and political agency, leaving space for alternative outcomes had different choices been made.

post-industrial US. Second, the visible environmental and health crises resulting from rapid industrialisation generated an unprecedented alignment of civil society organisations, green technology capitalists, and nationalist forces around the imperative for environmental action. Third, the ongoing challenges of managing rapid industrialisation necessitated a renewal of state planning capacity, enabling Chinese political leadership to develop and implement a transformative vision for renewable energy development that integrated economic, environmental, and geopolitical objectives. This actor analysis thus reveals how China's economic structure systematically brought together pro-transition forces, creating political conditions fundamentally different from those experienced in the deindustrialised American context. By examining the evolving interests, strategies, and power relations of key actors during China's energy transition, this chapter illuminates the crucial role of political-economic composition in determining transitional outcomes.

The first section analyses how China's manufacturing-intensive industrialisation created unprecedented conditions for working-class support of the energy transition, contrasting sharply with the labour-environmentalist split that characterised the American struggle. It argues that China's green technology sector, emerging within the broader context of the country's role as the world's manufacturing hub, offered the industrial working class concrete material benefits through the provision of stable, relatively well-compensated manufacturing employment in expanding industries. Unlike the US, where deindustrialisation had relegated most green jobs to service sector positions in installation and maintenance, China's renewable energy sector was characterised by large-scale manufacturing operations requiring significant industrial labour inputs. Finally, beyond China's urban core and out into its periphery, the rapid development of

green industry also created a booming extractivist sector dedicated to the provision of rare minerals required for green development. This created a steady stream of employment in the less developed regions of China, which, unlike coal, had the promise of longevity and continued centrality in the new economy. The section thus demonstrates how this manufacturing orientation of China's green economy helped forge a coalition between labour and environmentalists, linking the interests of industrial workers with environmental objectives.

The second section analyses the formation of the “Big Green Tent” - a loose but strong coalition of labour, environmental organisations, big tech capitalists, and nationalist forces that converged around support for China's renewable energy development. The analysis argues that China's rapid industrialisation and accompanying environmental crisis created unique conditions enabling these typically divergent social forces to align their interests around the green transition, generating a powerful political coalition that fundamentally altered the balance of forces in Chinese energy governance. The section begins by building on the analysis of Chapter 5, examining how the environmental degradation and public health crises from China's manufacturing boom created widespread constituencies for environmental action that transcended traditional political divisions. Unlike the US, where environmental consequences were spatially displaced through deindustrialisation, China's concentration of global manufacturing made environmental problems highly visible and immediately consequential for urban populations in the country's most economically important regions. This visibility enabled environmental civil society organisations to gain unprecedented legitimacy and support, despite operating within China's constrained political environment. The analysis explores how organisations like Friends of Nature and associated local environmental activist networks

successfully mobilised public concern about air quality, water pollution, and health impacts to support renewable energy development.

The section then analyses how China's strategic designation of renewable energy as a priority industry for economic development created powerful constituencies among the emergent big tech capitalists. Unlike in the US, where renewable energy never developed beyond a niche market dependent on subsidies, which were inconsistently deployed and occasionally revoked, China's state-led approach created massive domestic and international market opportunities for green technology firms. The analysis examines how companies like BYD, CATL, and Tongwei Solar - so-called national champions - became powerful forces for continued renewable energy expansion, not merely supporting environmental policy but putting into practice industrial policy essential for China's economic development. This section demonstrates how the profitability and growth prospects of green technology industries created a capitalist constituency for continued renewable energy support that could match or exceed the political influence of fossil fuel interests. Finally, the section explores how Chinese nationalist forces embraced renewable energy development as a means of asserting technological leadership and reducing dependence on foreign energy sources. The analysis examines how renewable energy development became integrated into narratives of national rejuvenation and technological sovereignty, enabling the CCP to present the green transition as a patriotic opportunity rather than an economic burden. This nationalist dimension of renewable energy support helped broaden the coalition beyond environmental and economic constituencies to include conservative and security-oriented actors who might otherwise have opposed rapid energy system transformation.

The chapter's final section examines how China's rapid industrialisation and the expansion and reorientation of existing state planning capacity enabled Chinese political leadership to develop and implement a transformative vision for renewable energy development that integrated economic, environmental, and geopolitical objectives. The analysis argues that the structural conditions created by China's manufacturing-led growth trajectory provided Hu Jintao and Xi Jinping with both the necessity and capacity to pursue ambitious renewable energy policies that would have been impossible in the post-industrial American context. The section begins by analysing how Hu Jintao's leadership approach emerged from the challenges of managing China's rapid industrialisation and the accompanying social and environmental tensions. The analysis examines how Hu's concept of Scientific Development represented a response to the contradictions of China's growth model, particularly the tension between continued economic expansion and environmental sustainability. This section demonstrates how the visible environmental and social costs of rapid industrialisation created political imperatives for Chinese leadership to demonstrate capacity for managing these contradictions, making renewable energy development a crucial component of governing legitimacy. The section then analyses Xi Jinping's expansion of this approach through his vision of Ecological Civilisation, examining how this concept represented both continuity with and advancement beyond Hu's Scientific Development framework. The analysis explores how Xi's leadership integrated renewable energy development into a comprehensive reimagining of China's development trajectory, positioning the green transition as essential for achieving the Chinese Dream of national rejuvenation. This section demonstrates how Xi's approach combined environmental objectives with industrial policy, technological development, and geopolitical strategy in ways that integrated the Big Green Tent under CCP leadership.

The analysis further examines how both leaders benefited from the structural advantages created by China's industrialisation process, particularly the renewal of state planning capacity and the availability of state-owned enterprises as instruments of policy implementation. Unlike Obama, who faced a fragmented political system and had to rely primarily on regulatory measures and market incentives, Chinese leadership could directly mobilise state resources for renewable energy development through industrial policy, state-owned enterprise mandates, and centralised planning mechanisms. The section concludes by noting how the evolution of the CCP's approaches to renewable energy development reflected and reinforced the broader political coalition supporting the green transition. As renewable energy industries grew and demonstrated their economic and technological potential, they became increasingly central to the CCP's vision of national development, creating a mutual dependency that ensured continued high-level political support for the energy transition. This analysis demonstrates how the alignment between leadership vision and structural conditions created the kind of sustained, transformative approach to renewable energy development that proved elusive in the American context.

[6.1] A Green Future for Chinese Labour

This section analyses the alignment of China's industrial working class with the emerging green developmental state, arguing that it represented a crucial dimension of the country's successful energy policy-making. In undertaking this analysis, the section demonstrates a fundamental cause of the Green Divergence by distinguishing the ways in which China's rapid industrialisation in the 2000s prevented the emergence of worker resistance to the green

transition that characterised the US' struggles over renewable policy-making. This section thus examines how China's rapid industrialisation created the material conditions and institutional mechanisms that enabled widespread working-class support for the green transition. The analysis demonstrates that this alignment resulted from two interconnected processes. First, China's economic composition fostered the creation of diverse employment opportunities across the full spectrum of green industries that provided economic alternatives precisely as traditional manufacturing growth began to decelerate. Second, breakneck industrialisation fostered the development of institutional capacities and state structures that effectively channelled worker concerns through state-sanctioned pathways rather than oppositional mobilisation, thereby giving greater confidence to the CCP in its ability to handle widespread social transformation.

The section begins by tracing the explosive growth of green employment from its nascent stages during the Hu administration into its rapid expansion under the Xi administration. This quantitative transformation is analysed not simply as an emerging avenue of job creation but as the foundation for a qualitatively different relationship between labour and environmental transition compared to the US. The analysis then examines how China's unique economic composition, characterised by continued manufacturing expansion during the early phases of the green transition, enabled the development of comprehensive domestic supply chains that created employment opportunities spanning manufacturing, construction, installation, maintenance, and extractivist sectors - in stark contrast to the narrow focus on installation and maintenance work that characterised green employment in the United States. It is argued that the sectoral diversity of China's green transition created pathways for workers across different skill levels, geographical regions, and industrial backgrounds to find their economic interests aligned with

the emergent green developmental state. From migrant workers in the installation economy to manufacturing workers transitioning into green production, from high-skilled technical positions to accessible entry-level roles, the breadth of employment opportunities enabled a comprehensive incorporation of working-class interests into the green developmental project. This economic dimension was reinforced by the temporal dynamics of China's transition, which followed a pattern of addition rather than substitution - renewable energy development proceeded alongside continued coal sector employment growth until 2013, minimising direct conflict between traditional energy workers and green development during the crucial early phases of institutional consolidation.

Beyond these underlying economic dynamics, the section analyses how China's rapid industrialisation simultaneously developed the institutional mechanisms necessary to secure and maintain working-class support for the green transition. It is argued that the All-China Federation of Trade Unions' role in facilitating labour's role in the transition while remaining subordinated to state developmental priorities exemplifies how China's institutional architecture channelled worker concerns into supportive rather than oppositional directions. Similarly, the state's demonstrated capacity for managing large-scale economic restructuring provided credible foundations for worker acceptance of green transition promises, while comprehensive ecological restoration programmes in former coal communities created material buy-in from key populations. Finally, it is argued that these institutional mechanisms - trade union facilitation and co-optation, robust state planning capacity, and the credibility of the CCP's ecological restoration promises - each emerged as direct products of China's rapid industrialisation process, creating

organisational structures and state legitimacy that enabled effective management of what was a disruptive economic transformation.

The emergent alignment of China's industrial working class' economic interests and the green transition was in its earliest stages during the Hu administration. In 2009, just prior to China's pivot to more rigorously developing a domestic market for renewable energy, there were about 242,000 jobs provided by the solar photovoltaic industry, ranging from mining, material transport, manufacturing, construction, engineering, maintenance, and installation (Zhang et al., 2017). This represented only around 0.03% of total employment in China. However, with the 2009 reform of the Renewable Energy Law and passage of the Golden Sun Demonstration Programme and Rooftop Subsidy Programme, each demonstrating a firm commitment from the CCP to fostering a strong domestic market for renewable energy, the growth of renewable jobs exploded. Between 2009 and 2015, solar photovoltaic employment alone tripled, coming to represent 0.1% of total employment in 2015 (Zhang et al., 2017). This made it one of the fastest-growing industries in China. Importantly, the tendency of the employment growth rate was toward steady acceleration and thus by 2024, there were over 4.6 million jobs in China's solar photovoltaic industry - and over 7 million in the total renewable energy sector (IRENA, 2024). By 2024, then, roughly 0.6% of China's employment was in solar, whilst just under 1% was employed in renewables sector overall.

Importantly, the emerging alignment of China's working class to the green transition was not limited to jobs in the renewable energy sector, but also in the wider associated industries. Batteries, grid infrastructure, electric vehicles, and other low-carbon technologies would all

require designing, materials, manufacturing, construction, installation, and maintenance (Liu et al., 2023). Estimating total figures for employment generated by the energy transition is difficult due to the dispersed nature of the jobs across a multitude of sectors. The International Labor Organization generously claimed that already in 2007-2008 there were 20 million workers employed “in industries, sectors, enterprises, and positions which have low input, high output, low consumption, low emissions, recyclability and sustainability” (ILO, 2010). Even with a far more strict definition in mind, by the end of the first Trump administration, when the US was confronted with the stark reality of the Green Divergence, it is clear that China had already produced millions of jobs directly resulting from the developing green transition, whilst the US had drastically lagged behind.

Contrary to the US, the growth of new green jobs in China was not limited predominantly to the installation and maintenance sector, with significant numbers of jobs being created in the manufacturing, construction, and extractivist sectors. For example, in 2023, 3 million of China’s over 7 million renewable jobs were in manufacturing (IEA, 2023b). This was a direct result of China’s economic composition. Riding the wave of its rapid industrialisation and integration into the global capitalist economy, China’s manufacturing sector was still reaching towards its historic peak. By virtue of this, China’s renewable sector developed in reverse to the developed countries, first developing a large-scale domestic manufacturing capacity aimed almost exclusively at export, before then developing a domestic market and further scaling up its manufacturing capacity alongside its installed capacity. This was important in producing the alignment between the green transition and Chinese workers because it meant that there was a wide array of employment opportunities being provided.

The sectoral diversity of the Chinese energy transition enabled a broad spectrum of workers to find their economic interests aligned with the green developmental state across multiple sectors and regions of the Chinese economy. Migrant and regional workers secured employment opportunities within the rapidly expanding installation economy, while manufacturing industrial workers transitioned into green manufacturing roles that leveraged their existing skill sets and industrial experience. The transition simultaneously created diverse career pathways spanning the full spectrum of skill requirements: high-skilled technical work and engineering positions attracted graduates and professionals, while low-skilled installation work provided accessible entry points for workers with limited formal qualifications. In addition, project management roles emerged to coordinate the complex logistics of renewable energy deployment. Beyond the core manufacturing centres, the peripheral regions - such as Inner Mongolia and Xinjiang - developed new economies focused on rare mineral extraction alongside jobs in refinement and transportation to support the essential supply chain infrastructure. Although skills shortages in certain specialised areas posed ongoing challenges, the diversity of green jobs meant that both existing and new workers could undergo targeted (re)training to secure comparable or more attractive employment relative to other slowing sectors. This stands in stark contrast to the limited pathways available to displaced workers in the US, where a coal miner in Appalachia faced the prospect of retraining for solar panel or wind turbine installation and maintenance work - roles fundamentally misaligned with their existing skill sets and lifestyle. China's relative abundance of green employment opportunities across differing industrial forms provided crucial economic alternatives precisely as the manufacturing employment boom of the early 2000s began to slow. In spite of this, there were still certain limitations in the transferability of workers

between industries, which remained a persistent challenge for policymakers managing the transition (Gong and Lewis, 2024).

Furthermore, due to the renewable development dynamic in China being one of addition, not substitution, this increased the widespread embrace of the green transition by Chinese workers when compared to the US. During the Hu administration, coal mining employment had yet to peak and was still growing at a steady rate, only peaking in 2013 at 6.3 million jobs, with the 2000s being referred to as China's Golden Age of Coal (Zhang et al., 2024). This meant that there was little resistance from workers in the booming coal sector, whilst the green developmental state was in its infantile stages. After coal mining employment's peak in 2013 and its gradual decline, the green developmental state was already well institutionalised and had been clearly marked by Xi's new administration as a central national priority for securing China's future. As such, resistance grew amongst Chinese coal workers too late to prevent legislative advances. Whilst in the US, coal worker resistance had already peaked by the time Obama tried to pass transitional legislation. The issue of resistance was further complicated by the fact that coal's decline in China was not entirely attributable to the green transition. The initial downturn was driven by the slowdown in economic activity after the initial boom of China's rapid industrialisation, which reduced energy demand growth (Niu et al., 2024; Gong and Lewis, 2024). Consolidation of employment in China's coal industry was driven by mechanisation, retiring older workers, and closing inefficient mines. There was thus far less direct antagonism between Chinese coal workers and the emergent green transition when compared to their counterparts in the US.

China's rapid industrialisation not only drove and facilitated working class alignment with the green transition through these underlying economic interests, but also through its development and reinforcement of key state institutions and capacities. One central part of this alignment was the facilitatory role of the All-China Federation of Trade Unions (ACFTU) and its vast association of local unions, which was crucial in representing labour concerns within the policy-making process and economic negotiations while simultaneously facilitating the organisation of reskilling programmes and the transfer of labour between industries (ILO, 2010, 2016). However, the ACFTU's role in facilitating worker buy-in for the green transition must be understood within the context of its fundamental subordination to the central state apparatus. As a state-dependent organisation rather than an independent workers' organisation, the ACFTU operates as an instrument of state policy rather than a vehicle for worker struggles. This institutional arrangement meant that once the green developmental state was being established and elevated to a central political priority by the Hu and Xi administrations, the ACFTU was organisationally compelled to champion workers' interests within the parameters of an accelerated green transition rather than oppose the transition itself. Thus, when workers in coal communities were beginning to face the economic consequences of the accelerated transition - and general economic transformations - in the mid-2010s, there were no independent organisations through which to oppose the central government's policy-making (Kingsmith, 2018).⁴⁵ The Federation's role in facilitating green jobs training and industry transitions thus did not represent independent labour advocacy but rather the state's capacity to co-opt and channel

⁴⁵ A noteworthy detail here is the timing of the rise and fall of independent labour organisations, typically taking the form of workers' centres (legally grey labour-oriented NGOs), which sought to develop external avenues of worker struggles. They saw their strongest development during the Hu administration, when civil society organisations as a whole were expanding widely in response to a more open organising environment (China Labour Bulletin, 2012). However, with Xi's ascent to power - and the general slowdown in the economic growth rate and the beginning of new, more painful, economic reconfigurations - there was a widespread clampdown on these independent labour organisations and any hope of forming fully independent unions was crushed (China Labour Bulletin, 2018).

worker concerns through officially sanctioned institutional pathways, ensuring that labour organisation reinforced rather than challenged the developmental trajectory.

The state planning apparatus and China's exceptional administrative capacity for undertaking large-scale economic restructuring provided additional institutional foundations for securing worker acceptance of the green transition promises. Despite the significant growth of industrial disputes across the late 2000s and early 2010s, the CCP retained considerable legitimacy amongst the working population based on its demonstrated ability to organise, direct, and successfully manage the explosive social and economic transformations that had characterised the Hu administration period (China Labour Bulletin, 2012). This legitimacy is derived from the Party's track record of delivering sustained economic growth, massive infrastructure development, and rising living standards through coordinated state intervention. Workers' willingness to accept promises of green development opportunities was thus grounded not merely in abstract policy commitments but in the observable state capacity to mobilise resources, coordinate complex industrial transitions, and deliver on ambitious development targets. The Party's systematic approach to economic planning through successive Five-Year Plans, combined with its ability to direct investment flows and coordinate between different levels of government, provided tangible evidence of institutional competence that made green transition promises credible to workers who had witnessed similar large-scale transformations across the previous two decades.

Perhaps most significantly, the CCP's comprehensive commitment to ecological repair and restoration work in former coal mining communities created material buy-in from rural workers

while demonstrating the state's capacity to address the environmental and social consequences of its industrial transition. This commitment was initially raised as part of Xi's concept of ecological civilisation, with many of its core programmes later developed in 2016, as the green developmental state was reaching toward a new state of expansion and the impacts on coal communities were intensifying - such as in Shanxi (Xinhua, 2025). The central state provided funding and instruction to local governments to systematically undertake ecological restoration of closed coal mining and other fossil industrial sites. These programmes were far more credible as a trade-off to "coal belt" Chinese workers than comparable proposals in the US, precisely because they were backed by a sustained political commitment and institutional capacity rather than being subject to the political divisiveness and constant uncertainty that characterised American environmental policy-making - where investment and state backing could be reversed with each electoral cycle. Moreover, the CCP's historical record of successfully undertaking massive projects of rural transformation - from the initial land reforms, to the development of rural industrial enterprises, and through rural poverty alleviation campaigns under Hu and Xi - provided a foundation of demonstrated competence that made contemporary ecological restoration commitments more believable (Fitzgerald, 1974; Cheng, 2025).

These three institutional mechanisms - trade union co-optation, state planning capacity, and ecological restoration credibility - each emerged as direct products of China's rapid industrialisation process, which simultaneously built, reshaped, and maintained the organisational structures, administrative capacities, and governmental legitimacy that enabled effective management of the green transition. The subordination of the ACFTU to state priorities reflected the broader pattern of institutional development during China's market reforms and

industrialisation, where the Party maintained control over key social organisations while adapting them to serve developmental objectives (Yeh and Lewis, 2004). The state's advanced capacity for economic coordination and restructuring was forged through decades of managing large-scale industrial transformation, from the initial socialist industrialisation drive through the market-oriented reforms and integration into global production networks (Chuang, 2016, 2019). Similarly, the credibility of ecological restoration programmes drew upon institutional capabilities and policy experiences developed through successive rural development campaigns, land use reforms, and poverty alleviation initiatives that had demonstrated the state's ability to deliver material improvements to communities beyond the urban centres - with these rural poverty alleviation initiatives being directly tied to the influx of capital brought in via China's rapid industrialisation. The broad legitimacy that underpinned working class acceptance of the CCP's green transition promises was thus not merely based on authoritarian ideology or repression of opposition but was grounded in the observable robust state capacity that enabled the green developmental state - a capacity which had been reforged and reinforced through the recent experiences of initiating, mediating, and advancing China's rapid industrialisation.

What we see, then, is that China's rapid industrialisation and the transformations within its economic composition created a situation in which the working class of China was brought into comparative alignment with the green transition and thus many came to support the emergence, buildout, and continued expansion of the green developmental state. It did this via the creation of diverse employment opportunities across manufacturing, installation, construction, and extractivist sectors precisely as traditional manufacturing growth began to decelerate, with solar photovoltaic employment alone expanding from 242,000 jobs in 2009 to 4.6 million by 2024,

while the broader green economy generated over 7 million renewable energy jobs and millions more in associated industries by 2023 (Zhang et al., 2017; IRENA, 2024). The section has also provided a clear analysis of why any would-be worker resistance to the green developmental state was effectively neutered in this context. This neutralisation was based on multiple key factors. The “late” timing of coal employment's peak in 2013 meant that tension between coal communities and transitional policy-making only properly emerged after the green developmental state was already institutionally consolidated. The ACFTU played a crucial role in coordinating labour's participation in the transition while simultaneously co-opting independent labour struggles through its subordination to central state priorities. The state's proven capacity to undertake and mediate drastic social transformations, as demonstrated through successive development campaigns and infrastructure projects, provided credible foundations for worker acceptance of transition promises. Finally, the state's strong commitment to ecological restoration in former coal regions through comprehensive rehabilitation programmes created material buy-in from affected communities. These programmes demonstrated institutional credibility that distinguished Chinese environmental promises from the politically divisive and uncertain commitments characteristic of democratic contexts.

[6.2] The Big Green Tent

The prior section outlined the multifaceted ways in which China's economic composition helped to align the working class with the energy transition. Expanding this contrast further, this section looks to the wider and highly effective coalition of actors that, through the transformations wrought by rapid industrialisation, were aligned with the green transition. This coalition of

labour, environmentalists, nationalists, and entrepreneurial capitalists provided a wide and varied basis of support for the founding, deepening, and expansion of the green developmental state. This section thus explains why China's energy transition policy-making has been characterised by a comparative absence of major national opposition.⁴⁶

The section begins by analysing the environmentalist movement and examining their role in facilitating the development of China's green policy-making, particularly major national organisations like the Friends of Nature, alongside a collection of local activist groupings. Building on the analysis of the previous chapter, it argues that their success in finding momentum and pressuring the CCP into a green developmental direction was enabled through the ecological consequences of China's capitalist development. The section then turns to analysing the role of the growing tech capitalist class in China, fostered through the industrialisation process, who became an elite interest grouping making the economic case for the pathway of green developmentalism. The analysis thus examines the role of the mutual dependency of the party-state and the entrepreneurial class that founded China's so-called national champions - firms like BYD, CATL, and Tongwei Solar - and how this deepening relationship was central to the development of green policy-making. Finally, the section examines the role of Chinese nationalism in leading to the formation and development of its renewable energy policy, looking at the reflexive relationship between an emergent nationalist generation - experiencing the drastic transformations of capitalist development - and the CCP. It is argued that this nationalist dimension helped to foster the green developmental state whilst

⁴⁶ While institutionalist scholars like Chen (2016) and Andrews-Speed and Zhang (2019) have demonstrated the importance of state capacity and policy coordination in China's renewable success, this analysis suggests that such institutional capabilities were made effective because they operated within a context where economic composition had aligned diverse social forces around green development. This analysis brings forward the role of China's composition as constitutive of its transitional success, rather than treating it as a background contextual factor.

also providing a broader base of support for it, enabling the full political spectrum of Chinese society to align with green developmentalism.

China's environmental movement during the Hu and Xi presidencies represented a distinctive configuration of civil society mobilisation that contrasts sharply with the post-industrial environmental politics examined in the American context. Rather than operating as an elite-dominated coalition disconnected from the grassroots, Chinese environmentalism had a more popular character because it emerged organically from the immediate ecological consequences of rapid industrialisation, as analysed in the previous chapter. The movement's effectiveness in influencing renewable energy policy development stemmed from its direct embeddedness within the ecological crisis generated by China's manufacturing boom. As outlined, this material foundation enabled environmental organisations to articulate compelling narratives linking immediate health concerns with long-term developmental imperatives, creating mounting political pressure that the CCP could not ignore, leading to its strategic integration of aspects of the movement into its policy-making procedures.

The emergence of Friends of Nature in 1994 marked the beginning of China's modern environmental movement, but the organisation's most significant influence on renewable energy policy occurred during the Hu presidency when industrialisation's environmental consequences reached a crisis point. Friends of Nature and other environmental NGOs in China lacked the resources, institutional robustness, and elite connections that their Western counterparts enjoyed. Their limited full-time staff meant they relied extensively on growing networks of volunteers the vast majority of whom were university students and young professionals, many attracted by the

ability to gain social prestige and recognition whilst taking up a just social cause (Yang, 2005).

The swelling ranks of the urban middle class were aligned with the cause of environmentalism in such great numbers because the social ecological crisis was directly at their doorstep, with the thick smog of the industrial hubs continually rolling into the urban cores they surrounded.

Compared to the American environmentalist organisations, China's movement was thus characterised by vast networks of grassroots mobilisations, with core nuclei of professional organisers helping to facilitate mobilisations and design campaigns. Importantly, they thus had a mass organisational basis in the core political battlegrounds. This political-economic dynamic created a crucial difference: because pollution was concentrated in China's major political and economic centres, environmental degradation directly affected the urban populations whose support was essential to maintaining CCP legitimacy. This generated strong political incentives for responsive environmental policy-making - incentives that were notably absent in the US, where environmental costs had been spatially displaced overseas through deindustrialisation.

In the early years of the movement, the late 1990s and 2000s, organisations like Friends of Nature predominantly focused on networking and public education campaigns, raising awareness of the consequences of industrialisation, instances of local pollution, and the alternative pathways available - including energy conservation and renewables (Fiedler, 2010; Zhuang, Zinda, and Lassoie, 2022). As the early 2000s progressed and the energy and ecological crisis intensified, they began to increasingly engage in policy advocacy, actively seeking to alter the direction of the CCP's policy-making. This was achieved through continual submission of motions through the Chinese People's Political Consultative Conference, calling for expanded environmental protections and the enforcement and support for sustainable development

practices (Zhuang, Zinda, and Lassoie, 2022). In their submissions, they argued that it was possible to resolve the contradictions between economic growth and environmental sustainability. With the passage of the 2005 Renewable Energy Law and through their continued activities highlighting environmental degradation, representatives from Friends of Nature and a collection of other NGOs were invited to continually consult with the State Environmental Protection Administration (Wu, 2018).

Their focus on policy advocacy intensified in the later Hu years, when the State Environment Protection Administration was upgraded to a full ministry and further consultative channels for green policy-making were institutionalised.⁴⁷ With the green development state's foundations substantially laid down, they turned to pushing for its continual expansion, continually calling for further environmental protections and more ambitious renewable development targets. For instance, they co-authored a report for policymakers in 2014 with other environmentalist NGOs, putting forward the case for drastic expansions to renewable targets in the Five-Year Plan and pointing out China's abundant opportunities in solar and wind development (Chun, 2014). The environmentalist movement was thus instrumental in the formulation and expansion of the green development state. However, they were also key contributors to its enforcement, as organisations like Friends of Nature began to embrace litigation tactics on the basis of the new laws being passed. Across the 2010s, Friends of Nature was involved in numerous high profile lawsuits against provincial grid authorities for their failure to properly facilitate the development of renewables, on the basis of the provisions of the revised 2009 Renewable Energy Law (The Friends of Nature Institute v. Gansu State Grid, 2018; The Friends of Nature Institute v. Ningxia

⁴⁷ These channels were a key example of China's model of consultative democracy which is the policy-making process by which its authoritarian environmentalism is actualised (Wang and Lo, 2022; Xiang and Lo, 2024). They will be given a more comprehensive discussion in the following process analysis chapter.

State Grid, 2018; Wang and Lo, 2022). In this way, they acted as an enforcer of the central government's green policy-making against local actors who, shielded through their connections with local and provincial governments, were often able to skirt the emergent regulations and avoid consequences for underperforming the targets being set by the central government (Zhao et al., 2014; Andrews-Speed and Zhang, 2019). They provided much-needed external accountability in a system which otherwise was based upon the disciplinary structures of the Party, which, even with Xi's reinforcement of anti-corruption measures, were far from immune to being compromised.

Importantly, the success of groupings like Friends of Nature must be understood within the broader political economy of China's industrialisation, which created structural conditions favouring environmental mobilisation. Moreover, the widespread desire for continued development amongst the emergent urban classes - without the dire ecological consequences - engendered a commitment to a sustainable development framework within the movement, perfectly aligning it to pragmatically push the CCP towards and support it in adopting green industrial policy-making. Within the movement's leadership there was a recognition that China's capitalist development would inevitably continue across the coming decades. We see this in Li Bo's (Former Director of Friends of Nature) comment that "We cannot yet say China has finished industrialisation and the dirty phase is finished. This will last quite some time." (Watts, 2012). Whilst admitting this, he stressed the necessity of "social responsibility and eco-civilisation", which neatly aligned with the emergent environmentalist framework of the CCP as it transitioned toward Xi's leadership. This framework was one that sought to continue the gains of China's development and industrialisation, but in a more conscious and responsible

fashion, seeking harmonisation between growing living standards whilst limiting and managing the harms of industrial production (Huang and Westman, 2021). It was thus one that emerged directly from the contradictory conditions of China's rapid industrialisation.

Moving from civil society to the economy, the emergence and consolidation of China's entrepreneurial tech capitalist class during the Hu and Xi eras constituted a decisive shift in the country's political economy that fundamentally altered the alignment of elite interests in favour of the green developmental state. Unlike the entrenched fossil capitalists of the United States - whose political power was amplified by deindustrialisation and the decline of manufacturing - China's rapid industrialisation throughout the 1990s and 2000s gave rise to a new cohort of entrepreneurial capitalists whose fortunes became intimately bound to the expansion and upgrading of the green economy. This class of tech capitalists, exemplified by firms such as BYD, CATL, and Tongwei Solar, emerged initially at the margins of China's reform-era economy but found their ascendancy accelerated dramatically as the state's industrial policy shifted to prioritise the development of strategic sectors, most notably renewable energy, electric vehicles, and advanced battery technologies (Chen, 2016). Unlike the old guard of state-owned fossil fuel enterprises, these entrepreneurial firms were recipients of targeted central and, crucially, local government support designed to cultivate provincial and, ultimately, national champions capable of competing in global markets while advancing China's strategic economic objectives.

China's transition to capitalism and integration into global markets catalysed the rapid growth of this entrepreneurial class, whose increasing influence was formally recognised in 2001 when

Jiang Zemin permitted private owners of “scientific and technical enterprises” to join the Communist Party, thus granting them direct access to policy-making (Coble, 2001). However, the dominance of state-owned enterprises over traditional industries, particularly within the energy sector, created formidable barriers to entry for Chinese capitalists seeking to establish themselves in the fossil economy. Consequently, their opportunities for achieving market competitiveness lie primarily in alternative emergent technologies, creating substantial openings for entrepreneurial activity and investment in the clean-tech sector. This dynamic proved particularly significant in the solar photovoltaic industry, which was not initially considered a strategic sector for national development until the late 2000s, distinguishing it from wind and electric vehicles, which the state had earmarked early as strategic industries and thus incentivised SOEs to pursue aggressively (Sheng, 2020). For China's emergent capitalist class seeking to invest in the energy economy, solar photovoltaics represented the most advantageous entry point - rather than coal, oil, or gas - resulting in the industry's initial domination by private entrepreneurs oriented toward export growth (Urban, Wang, and Geall, 2018).

While solar was not initially prioritised as a strategic industry for national development, it was recognised as a sector with substantial high-growth potential regarding exports, making it worthy of industrial support within the broader export-oriented growth model. Local governments, seeking to cultivate domestic champions capable of competing internationally, provided considerable support through subsidies, research assistance, low-interest loans, and various other measures (Binz and Anadon, 2018; Corwin and Johnson, 2019). This state support reflected a deeper structural alignment between the entrepreneurial class and green development that extended beyond mere policy incentives to encompass fundamental class dynamics. A majority

of these entrepreneurial capitalists had started their careers as technical and managerial workers within manufacturing sites in the clean-tech sector, representing a distinctive class background that shaped their orientation toward green technologies (Sheng, 2020). China's economic composition, characterised by rapid industrial development, produced its emerging capitalist class from technical and managerial strata who, until Deng's reforms, had constituted merely a privileged subsection of the working class. This stood in stark contrast to the United States' capitalist class, whose positions, in the vast majority, had been cemented over generations through familial histories composed of corporate executives, financiers, oil barons, mine owners, and industrialists (Useem, 1978).

The class background of Chinese entrepreneurs fundamentally influenced their technological orientation and industrial specialisation choices. When forming new technology companies, a far greater proportion of Chinese entrepreneurs were drawn toward clean technologies based on their direct experience and technical expertise in manufacturing processes. Moreover, their intimate knowledge of industrial processes enabled them to refine and expand production capabilities, further developing China's industrial specialisation in clean technology fields - an effort that effectively synthesised with the CCP's green industrial policy-making agenda. This alignment between entrepreneurial expertise and state priorities created a mutually reinforcing dynamic that would prove crucial to the green developmental state's success. For the emboldened entrepreneurial tech capitalist class, the emergence of the green developmental state thus represented not merely a policy environment but an unprecedented opportunity to secure privileged positions within China's evolving economic hierarchy through alignment with state strategic objectives.

The green transition promised this rising class a tripartite pathway to accumulation that aligned perfectly with their material interests while addressing their structural vulnerabilities as emergent capitalists competing against established SOEs. First, expanded funding and policy guarantees from central and local governments eager to foster technological innovation provided the capital necessary for scaling operations and developing competitive advantages. Second, comprehensive technical assistance and infrastructure support significantly reduced the risks associated with technological innovation and market entry, offering protection during the vulnerable early phases of business development. Third, protection from international competition through tariffs, local content requirements, and strategic procurement policies allowed nascent firms to build capacity and expertise before confronting global rivals (Chen and Lees, 2016). This state-supported incubation process was designed not merely to create viable domestic competitors but to position Chinese firms for eventual international expansion, with the explicit goal of capturing significant global market share in strategic emerging sectors that would define the twenty-first-century economy.

The mutual dependency between the party-state and these emerging tech capitalists created a symbiotic relationship that helped drive forward the expansion of the green developmental state. Central and local governments recognised that achieving technological leadership in renewable energy required not merely state investment but the dynamism and innovation capacity that private entrepreneurship could provide, while tech capitalists understood that their pathway to market dominance was inseparable from the success of the state's green modernisation strategy. This alignment was reinforced by the particular characteristics of green technology sectors,

which demanded substantial upfront capital investments, long development timelines, and coordinated infrastructure development - requirements that made state support not merely advantageous but essential for achieving competitive scale and technological sophistication. The resulting partnership enabled firms like BYD to evolve from small battery manufacturers into global leaders in electric vehicles and energy storage, while CATL emerged as the world's largest producer of lithium-ion batteries through strategic integration with the state's electric vehicle promotion policies and grid modernisation programmes.

Crucially, the absence of significant concern among China's tech capitalists regarding the potential displacement of the old fossil economy reflected both their structural position within China's economic transformation and the specific dynamics of energy development during this period. Unlike incumbent fossil interests in post-industrial economies, Chinese capitalists had limited vested interests in defending existing energy infrastructure or protecting legacy employment in coal and oil sectors. Their business models were premised on technological disruption and market creation rather than preservation of existing arrangements, making them natural allies of policies designed to accelerate energy transition and industrial upgrading. Furthermore, the rapid growth of energy demand during China's industrialisation meant that renewable development could proceed through addition rather than substitution, reducing direct conflicts between emerging green sectors and established fossil interests during the crucial early phases of renewable capacity building. This additive dynamic enabled a more harmonious coexistence between traditional and emerging energy sectors, minimising the political resistance that might otherwise have emerged from displaced incumbent interests.

The tech capitalist class' enthusiastic support for green developmentalism was further enabled by China's particular political economy, which systematically limited the capacity of incumbent fossil interests - predominantly SOEs - to effectively resist the green transition. While SOEs in the energy sectors maintained significant political influence through their integration with party-state structures, their resistance was constrained by several factors that distinguished the Chinese context from the fossil capital dominance observed in the US. First, the subordination of SOEs to broader state strategic objectives meant that even powerful fossil enterprises could not simply veto policies that conflicted with their immediate commercial interests when those policies were deemed essential to national competitiveness and energy security. At most, they were able to delay implementation and temporarily water down policy-making, but the balance of power always leaned toward the central state (Zhao et al., 2014). Second, the party-state's capacity to discipline underperforming SOEs and redirect investment flows enabled a more directive approach to energy transition than was possible in contexts where fossil capital retained greater autonomy from state coordination (Lin et al., 2020). This structural arrangement ensured that traditional energy interests, while influential, could not exercise the obstructionist power that characterised fossil capital's relationship with climate policy in market-oriented democracies.

In this context, the tech capitalist class became both beneficiaries and architects of the green developmental state, ensuring that elite economic interests were structurally aligned with the ongoing expansion of renewable energy capacity and green technology manufacturing. Their rise from marginal actors to central players in China's political economy reflected not merely successful entrepreneurship but the broader transformation of Chinese capitalism toward high-technology, export-oriented sectors that could compete globally while advancing national

strategic objectives. This alignment between private entrepreneurial interests and state developmental priorities created a powerful constituency for continued green investment and policy support, contributing to the stability and expansion of China's renewable energy sector throughout the Hu and Xi eras. It was thus the case that their green orientation, growing influence, and absence of antagonistic internal divisions were directly shaped by China's unique economic composition.

Beyond the roles of labour, environmentalists, and tech capitalists, the alignment of Chinese nationalism with the green developmental state during the Hu and Xi eras represents a crucial, yet occasionally overlooked, dimension of China's energy transition that reveals yet another way in which its economic composition drove its green policy-making forward. In the Chinese situation, national interests, not just environmentalist ones, became deeply intertwined with renewable energy development. This convergence reflected deeper structural transformations in how rapid industrialisation had reconfigured both China's position within global capitalism and the political consciousness of significant sections of the Chinese population. Unlike the environmental movements of the US and EU, which were primarily motivated by environmentalist concerns, the Chinese case demonstrates how nationalist sentiment - rooted in the country's industrial ascent and evolving international status - became a powerful driver of green developmentalism that operated independently of, yet complementary to, environmental concerns.

Chinese nationalism during this period manifested through two distinct but interconnected forms, each of which would prove crucial to building support for the green developmental state. At the

government level, party figures articulated a state nationalism organised around developmentalism and narratives of national rejuvenation - centred around making another century of humiliation impossible (Callahan, 2006; Lovell, 2008; Zhao, 2013; Wang, 2017). This state nationalism, subordinated to the interests of the government, produced an ideological framework in which technological mastery and economic advancement were understood as essential to restoring China's rightful position as a global power and to secure its future. This state nationalism positioned the green developmental state not merely as environmental policy but as a strategic component of China's broader modernisation project, where dominance in emerging technologies would demonstrate the superiority of the Chinese development model. It emerged out of the alignment of the economic shortfalls of rapid industrialisation, as discussed in the prior chapter.

Alongside state nationalism, a popular nationalism emerged through the *fen qing* - angry or cynical youths - whose internet-organised activism demanded that China achieve the international respect and recognition that its growing economic power warranted (Gries et al., 2011; Niyiri, Zhang and Varall, 2010; Yang and Lim, 2011; Liu, 2012; Zhao, 2013; Weiss, 2014; Stroup, 2022). The *fen qing* movement embodied what Yang and Lim (2011) characterised as “social nationalism” during the Hu era, representing a complex political formation that was simultaneously critical of the CCP's neoliberal orientation and fiercely devoted to advancing China's international standing. These predominantly young, urban, and educated activists articulated a nationalist critique that encompassed both domestic discontents - particularly the social dislocations and environmental degradation wrought by rapid industrialisation - and international grievances over China's perceived mistreatment by Western powers. Their activism,

organised primarily through internet forums and emerging social media platforms, created sustained pressure on the party-state to pursue more assertive policies that would secure China the respect they believed it deserved on the world stage (Gries et al., 2011). The 2008 Beijing Olympics became a crucial focal point for these nationalist aspirations, as the *fen qing* demanded that China demonstrate not merely its economic achievements. With China coming under global scrutiny in the lead up to the event, these popular nationalists further denounced their country's misrepresentation in the global media, partaking in protests nationally and abroad (Nyiri, Zhang and Varral, 20120).

For both these nationalist tendencies, the green developmental state represented an ideal synthesis of their core political demands; it would provide technological advancement that would showcase Chinese innovation, sustainable industrial development that would secure long-term economic competitiveness, and environmental improvement that would counter Western criticisms of China's development model. Chinese nationalists were particularly sensitive to China's international image as a polluting, coal-dependent economy that reinforced Western stereotypes of Chinese development as primitive - built on the basis of child labour and other inhuman labour practices and fueled by a careless abandon regarding the environment. From their perspective, China's association with environmental degradation represented a fundamental barrier to achieving the international recognition and respect that the country's economic achievements warranted. Incidents such as French President Nicolas Sarkozy criticising Premier Wen Jinbiao and China for holding back COP climate negotiations were particularly sensitive (Watts, 2009). The development of renewable energy technologies thus offered a pathway to

reverse this narrative, positioning China not as an environmental laggard but as a technological leader capable of being the core player in combating the environmental crisis.

Crucially, this nationalist support for green developmentalism was not motivated by ecological concerns per se, but by the understanding that environmental leadership would enhance China's international prestige, repudiate criticisms against it, and demonstrate its technological sophistication. They viewed China's pollution problems equally as environmental challenges and as sources of national shame that prevented the country from taking its rightful place in the international system. Renewable energy development promised to resolve this contradiction by enabling China to present itself simultaneously as an environmental champion and a master of advanced technologies capable of outcompeting Western rivals in strategic emerging sectors. This framing proved particularly powerful because it aligned environmental improvement with national strength rather than positioning them as competing priorities.

Notably, the transition from the Hu to Xi presidencies marked a significant evolution in how the party-state engaged with nationalist sentiment around green development. During the Hu era, the CCP found itself under sustained pressure from nationalist activists demanding more assertive policies to enhance China's international standing and address the environmental costs of rapid industrialisation (Yang and Lim, 2010). The party leadership's response was often reactive, attempting to balance nationalist demands with the imperatives of continued economic growth and international stability. However, Xi's ascension marked a strategic shift toward actively co-opting and integrating nationalist energy into the governing apparatus, transforming what had been external pressure into a core component of legitimacy-building strategy. Xi's administration

successfully harnessed nationalist sentiment to legitimise increasingly ambitious renewable energy targets and position China as the inevitable leader of the global energy transition. The concept of the “Chinese Dream” became a vehicle for nationalist expression (Wang, 2017). This enabled the party to present the energy transition and environmental leadership not as a constraint on Chinese development but as evidence of the superiority of the Chinese political system and development model. This co-optation proved remarkably effective because it channelled nationalist aspirations into support for policies that simultaneously advanced the party's strategic objectives while satisfying popular demands for international recognition and technological leadership.

The nationalist dimension of support for green developmentalism reveals a crucial aspect of China's energy transition that distinguishes it from the primarily ecologically-driven movements in the US and EU during the 2000s and 2010s. While the environmental consequences of rapid industrialisation were undeniably severe and created genuine popular pressure for action, nationalist constituencies framed these problems primarily as obstacles to China achieving its deserved international status. This framing proved politically powerful because it enabled environmental policies to be presented as assertions of national strength rather than admissions of developmental failure. Importantly, the alignment of nationalist sentiment with green developmentalism was not predetermined but emerged from the specific historical conjuncture of China's rapid industrialisation and its particular position within global capitalism during the early twenty-first century. Had China's economic ascent occurred two decades earlier, when environmental concerns were less prominent in international discourse and renewable technologies were less mature, nationalist constituencies might well have embraced fossil fuel

development as a demonstration of Chinese industrial prowess. Similarly, had China achieved developed status before the emergence of climate change as a global political issue, Chinese nationalists might have viewed environmental regulations as Western attempts to constrain Chinese industrial dominance rather than opportunities for technological leadership - just as the Tea Party decried Waxman-Markey as economic suicide.

The contingent nature of this nationalist-environmentalist alignment underscores how China's success in renewable energy development cannot be understood simply as the product of superior environmental consciousness or institutional design, but must be situated within the specific political-economic conditions created by the timing and character of China's industrialisation. The concentration of global manufacturing in Chinese coastal cities during the precise historical moment when environmental concerns were gaining international prominence created unique opportunities for positioning environmental leadership as national advancement. This fortuitous alignment enabled Chinese policymakers to mobilise nationalist sentiment in support of green developmentalism while simultaneously addressing the environmental contradictions generated by rapid industrial growth. Where post-industrial economies like the US experienced nationalism as a force opposed to environmental regulation - with fossil fuel interests successfully mobilising economic nationalism against climate policies - China's economic composition enabled nationalism to become a driver of renewable energy development.

This analysis of China's "big green tent" coalition - containing labour, environmentalists, entrepreneurial capitalists, and nationalists - reveals how rapid industrialisation created structural conditions that systematically aligned diverse social forces behind the green developmental state,

producing a stark contrast with the fractured coalitions examined in the US actor analysis. Unlike the post-industrial US, where deindustrialisation severed the material basis for labour-environmental solidarity and transformed environmentalism into an elite coastal project, China's manufacturing boom generated immediate ecological crises that unified urban populations around demands for environmental action while creating new entrepreneurial opportunities in clean technology sectors. The convergence of grassroots environmental mobilisation, tech capitalist accumulation strategies, and nationalist aspirations for international recognition was not coincidental but emerged directly from the contradictory dynamics of China's capitalist development, where they created visible environmental degradation, entrepreneurial openings in emerging green sectors, and national anxieties about China's international image as a polluting economy.

The effectiveness of this encompassing coalition stemmed from its capacity to articulate green developmentalism as simultaneously addressing immediate material concerns and advancing long-term strategic objectives. Environmental organisations like Friends of Nature gained political leverage not through corporate partnerships but through their embeddedness in the everyday health and safety concerns of urban and rural populations directly experiencing industrial pollution, enabling them to pressure the CCP for responsive policy-making while maintaining organic connections to a vast grassroots base. China's ascendant capitalists embraced renewable energy development not despite China's industrial trajectory but because of it - their class origins in technical and managerial strata, combined with SOE dominance over traditional energy sectors, channelled entrepreneurial ambitions toward clean technology manufacturing where state support and export opportunities promised robust and stable

accumulation. Nationalist sentiment, both official and popular, aligned with the green developmental not through abstract ecological consciousness but because green technology mastery offered a pathway to international prestige, technological sovereignty, and economic security that addressed the “century of humiliation” narrative central to Chinese political identity.

This analysis demonstrates that China's renewable energy acceleration cannot be understood simply as the product of superior state capacity or environmental consciousness, but must be situated within the specific political-economic dynamics created by rapid industrialisation's timing and character. The “big green tent” coalition's stability and effectiveness reflected not cultural predispositions toward environmental protection but the material alignment of diverse interests produced by China's position within global capitalism during the early twenty-first century. Where deindustrialisation in the United States created spatial displacement, sectoral fragmentation, and elite capture that systematically weakened pro-transition forces, industrialisation in China generated spatial concentration, sectoral opportunities, and popular mobilisation that strengthened them. This further reveals the Green Divergence as the product not of institutional design, cultural differences, or leadership choices alone, but of deeper transformations in economic composition that systematically privilege certain political coalitions while undermining others.

[6.3] The Green Helmsmen

The prior sections of this chapter have demonstrated how China's rapid industrialisation created structural conditions that systematically aligned diverse social forces - from industrial workers to

tech capitalists, environmentalists to nationalists - behind the green developmental state, forming what this analysis has characterised as China's "big green tent" coalition supporting renewable energy expansion. This section turns to the top of China's political system to examine how the country's leadership, particularly Presidents Hu Jintao and Xi Jinping, developed increasingly sophisticated transitional imaginaries that provided the ideological foundation and legitimating framework for China's green developmental state. Unlike the fragmented and constrained leadership examined in the American case, where deindustrialisation had eroded the material basis for transformative climate action, China's industrialising trajectory created both the necessity and opportunity for decisive state-led renewable energy development under what this chapter terms the "Green Helmsmen" - leaders who navigated China's complex transition from fossil-fuelled growth toward green developmentalism through the articulation of coherent ecological modernisation visions that aligned environmental protection with national rejuvenation.

This section argues that Chinese leadership during the Hu and Xi eras represented a qualitatively different approach to energy transition governance than that observed in post-industrial democracies, characterised by the systematic development of transitional imaginaries that positioned renewable energy development not as a constraint on economic growth but as essential to China's long-term competitiveness, energy security, and international standing. The analysis traces the evolution from Hu's "Scientific Outlook on Development" - a crisis management framework that treated environmental concerns as one challenge among many requiring technocratic solutions - to Xi's "Ecological Civilisation," which elevated ecological modernisation to a foundational principle of China's developmental trajectory and national

rejuvenation. This ideological evolution both reflected and enabled the material transformation of China's renewable energy sector from policy experiment to pillar industry, providing the legitimating discourse that justified increasingly ambitious state intervention in energy markets while positioning environmental leadership as evidence of the Chinese development model's superiority over Western alternatives. Alongside the evolution of China's transitional imaginary, this section also highlights how the CCP's green policy-making approach evolved from reactive crisis management during Hu's early tenure toward fully fledged proactive industrial planning under Xi. It is argued that this shift reflected the deepening institutional capacity of the party-state to coordinate complex technological transitions while maintaining political control earned through navigating the challenges of rapid industrialisation.

In parallel with the development of the Chinese economy, its contradictions, and the shifting of its composition, there has been the development of the transitional imaginary of the CCP's leadership, embodied within the ideology professed by its leadership. The imagination of the CCP has increasingly moved in the direction of an ambitious project of ecological modernisation, seeking to resolve the contradictions between environmental preservation and economic growth through the mass deployment of green technologies. In fact, in keeping with the pace of the development of the renewable industry in China, the CCP has developed its state ideology, which is the most straightforward expression of ecological modernisation. This development is easily traced through the ideological innovations of Presidents Hu and Xi, from the Scientific Outlook on Development and the Harmonious Society to Ecological Civilisation. The clear trajectory of China's ideological development is on a greater emphasis on environmentalism as the role of its renewable energy sector has become ever more central to its

economic composition, with it now being a key pillar of the CCP's claim to continued legitimacy.

When President Hu ascended to power in 2003, China was in a highly precarious situation. The old social institutions that had guaranteed a basic degree of social stability had been broken apart across the reform era. Through China's integration into global capitalism, it was experiencing industrial development at a historically unprecedented rate, leading to the rapid social, economic, and environmental transformations discussed in the prior chapter. Beyond these changes, there was rapidly growing wealth inequality, internal and external pressure for democratisation of the political system, rampant levels of corruption within the government and economy, expanding regional inequalities between the Chinese coastal cities and the hinterland, and a plethora of other existential challenges to the CCP's legitimacy (Puthenkalam, 2009; Xing, 2009).

Moreover, in the face of the monumental challenges, Hu was the weakest (non-transitional) leader in post-revolutionary Chinese history, understood to have been selected to rule as a compromise candidate between divided and competing factions within the party - with a fierce divide between ascendant reformists and leftist conservatives and various regional and generational cliques (Duchâtel and Godement, 2009; Le, 2023).⁴⁸ Hu's elevation took place under the assumption that, in his weak position, he would undertake a technocratic and managerial approach to governance, ruling by consensus of the party's elite, without seeking to substantially transform the party's structure or its balance of power (Bo, 2007).⁴⁹

⁴⁸ One key reflection of this historic weakness is the common referral to Hu's period as President not as the Hu era but as the Hu-Wen era - an inclusion of Premier Wen Jiabao, the second highest ranking political figure in the period. This is unique in comparison to all other major post-revolutionary leaders whose respective tenures are referred to exclusively based on their own name (Mao era, Deng era, Jiang era, Xi era).

⁴⁹ Interpretations of Hu's governance-in-practice differ, he is commonly characterised by his managerial style and consensus making between differing factions, but has also been read as more factionally-engaged, with this reading emphasising him as aligning with the leftist faction of the party against the lingering rule of his predecessor President Jiang (Fewsmith, 2005; Le, 2023).

It is under these conditions that Hu formulated the Scientific Outlook on Development (SOD) concept, and it is a clear reflection of the multiple problems facing China. The fundamental aim of the SOD is to correct the imbalances that emerged from the Deng and Jiang “growth-first” policy-making approach, producing an imperative for the party-state to rebalance the national development trajectory to create “less income inequality, less regional disparity, more social justice, more protection of the vulnerable, more energy efficiency, and more environment friendly development” (Puthenkalam, 2009). In practice, the SOD effectively called for the development of an “overall plan” which could effectively counter these contradictions and create a more harmonious relationship between continued economic growth and the health of China’s society, politics, and environment (Xu, 2021). Importantly, this was not a call for a return to the old planning regime of the Mao era but for the party-state to undertake modernisation, build its capacity, and take a more active role in guiding social development through policy-making and daily governance (Fewsmith, 2004).

What is immediately apparent is that the SOD, whilst containing elements aligning it with the energy transition and environmental protection, were conceived as part of a general project of modernisation in order to rectify a variety of social ills emerging out of development. In Hu’s report to the 17th Party Congress, he stressed that the party “must regard development as the top priority” (Xinhua, 2007). Fundamentally, the SOD was an ideological framework which sought to limit the worst excesses of China’s rapid industrialisation, without challenging the underlying economic logic driving it. It saw problems of ecology as one among many which needed solving and could principally be solved through technical innovation and management to produce a

sustainable form of development, laying the foundations of an ecological modernisation transitional imaginary to develop amongst party elites. It is under the banner of sustainable development, as part of the SOD, that China's green developmental state would emerge - a political project seeking to continue reaping and enhancing the economic gains of China's industrialisation process whilst utilising new technological innovations to lessen the environmental consequences. What the SOD thus contributed was an ideology and an imaginary which gave legitimacy to the emergent green policy-making. The green developmental state, in its infancy, was thus conceived as part of a wider project of state-driven modernisation, as part of the response to the generalised crisis that rapid development had unleashed on Chinese society.

Contrasting with Hu, when Xi's ascension to power occurred in 2012, the situation in China had been drastically altered over the prior ten years. China was in a far stronger position, and the process of rapid industrialisation had begun to slow down. It had jumped from the 6th to the 2nd largest economy in the world and the world's largest exporter (McCurry and Kollewe, 2011). The GDP growth rate had begun to slow, from over 12% annually to around 7% annually (National Bureau of Statistics of the People's Republic of China, 2024). The ecological crisis had continued to intensify, with the nation's emissions continually spiking following the ever-expanding usage of coal power. However, in turn, the nation's renewable energy industry had already become a world-leading force - even if this was only being recognised by industry experts (National Foreign Trade Council, 2010). Hu's establishment of the green developmental state, a process which had been accelerated in the crisis response to the global financial crisis, had fostered a swelling manufacturing capacity, technical expertise, a leading position in meeting the growing global demand, and, most importantly, a steadily growing domestic market. As

mentioned earlier in this chapter, employment within the renewable and wider green tech sector was beginning to grow at an accelerated rate. All put together and four years on from the Beijing Olympics, China's position in the global sphere had definitively shifted; its growing power was slowly becoming recognised. Finally, Xi's arrival to power was markedly distinct from Hu's, wherein his ascension was not marked by the same levels of contestation. With a stronger basis of initial factional support from the Shanghai clique, other princelings, and a mix of both reformers and leftist conservatives, Xi was able to consolidate power far quicker than Hu (Choi, Givens and MacDonald, 2021).⁵⁰ Beyond consolidating the expected powers of the presidency, Xi went further by recentralising political authority through his wide-ranging anti-corruption campaigns and reprioritisation of SOEs, which severely weakened competing powers within the party-state and economy (Economy, 2018).

Under these conditions, Xi promulgated one of the key ideological leaps of his presidency - the framework of Ecological Civilisation (EC). Unlike the SOD's reactive approach to managing development's contradictions, EC represented a proactive articulation of the end goal of China's developmental trajectory, positioning ecological modernisation not as damage control but as part of the fundamental pathway to national rejuvenation and achieving China's destiny (Wei et al., 2021). Where the SOD had emerged from crisis and weakness, treating environmental concerns as one problem among many requiring technocratic solutions, EC emerged from a growing strength and confidence in China's green capacity, elevating ecological considerations to the core

⁵⁰ Princelings here refers to party members who themselves were the children of mid-to-high ranking members of the party. Whilst lacking a coherent political faction, there are common observations of mutual support between princelings seeking to protect their own positions within the party.

⁵¹ Xi's early support partly emerged because of the lingering power of the Shanghai clique - the factional base of Jiang Zeming which served to severely limit President Hu's power (Choi, Givens and MacDonald, 2021). However, it also emerged out of his ability to appeal to both reformers and leftist conservatives - his tenure in Shanghai was characterised as pro-private enterprise and marketisation attractive to reformers, but his appeals to the legacy and unique importance of the party endeared him to conservatives.

of China's national ambitions. This transformation reflected the material reality that China's renewable energy sector had evolved from a fledgling industry into a proven engine of accumulation and growing site of energy sovereignty, enabling the CCP to reimagine environmentalism as one of its national strengths rather than as just a medicine to be applied.

The conceptual architecture of EC fundamentally differed from its predecessor through its integration of ecological considerations into the Party's core ideological framework. Rather than treating environmental protection as a technical adjustment to growth-oriented development, EC positioned itself as one of the “Five-in-One” forms of development alongside economic, political, cultural, and social development - thereby elevating environmental considerations to a foundational principle behind all policy-making (Huang and Westman, 2021). This elevation was not merely rhetorical but reflected the transformed material conditions of China's political economy, where the renewable energy sector's proven capacity for job creation, export earnings, and technological advancement had demonstrated that ecological modernisation could serve as a vehicle for continued accumulation rather than an impediment to it.

The evolution from SOD to EC also reflected the changing temporal logic behind China's green developmental policy-making, as the acute crisis management of the Hu era gave way to the strategic long-term planning that was characteristic of Xi's policy-making approach. Indeed, Hu's green policy-making had emerged primarily as a crisis response - addressing the energy shortages of 2003-2004, managing the social instability generated by environmental degradation, and responding to the drought of export demands for renewables after the global financial crisis by fostering domestic demand. These interventions, while strategically important and made with

an awareness of future opportunities, remained reactive measures designed to resolve immediate contradictions rather than proactive attempts to reshape China's developmental pathway. In contrast, Xi's EC framework and more ambitious policy-making emerged from the institutional capacity and industrial foundation established during the Hu era, enabling a transition from defensive crisis management to comprehensive industrial strategy. This transformation in policy-making approach reflected the deepening state capacity and industrial sophistication that China had achieved through the process of rapid industrialisation. Hu's relatively weak political position and rule by committee had constrained his ability to pursue more ambitious projects, forcing him to navigate between competing factions and interests through incremental adjustments and crisis responses (Bo, 2007). However, the success of these crisis management strategies in building renewable energy capacity and establishing China's technological competitiveness had strengthened the Party's confidence in the green developmental model while demonstrating the political rewards of environmental leadership. Xi's stronger political position and recentralisation of power enabled him to leverage these accumulated successes into a more ambitious and coordinated approach to ecological modernisation that led to it becoming central to the creation of both the Five-Year Plans and state ideology.

Crucially, both leaders' transitional imaginaries emerged organically from the contradictions and opportunities generated by China's rapid industrialisation rather than being imposed through external pressure or abstract ideological commitment.⁵² The visible ecological crisis created by industrial concentration demanded state intervention, while the economic dynamism generated

⁵² It must be acknowledged that both Hu's SOD and Xi's EC concepts represented strategic choices about how to respond to industrialisation's contradictions. Alternative responses were possible - either leader could have doubled down on heavy industry expansion, prioritised different technological sectors, or pursued less ambitious environmental policies. The green developmental path taken reflected structural pressures and material developments, but was not guaranteed to emerge just based on economic composition alone.

by manufacturing growth provided the resources and institutional capacity necessary for increasingly ambitious environmental policy-making. The success of renewable energy development in creating employment, establishing technological leadership, and enhancing international prestige demonstrated that ecological modernisation could serve China's developmental imperatives rather than constraining them, enabling the evolution from Hu's defensive SOD to Xi's confident EC. This evolution reveals how China's industrialising trajectory created both the necessity and opportunity for decisive state-led renewable energy development, contrasting sharply with the post-industrial constraints that limited American leadership's capacity for transformative climate action. Where Obama's market-liberal incrementalism reflected deindustrialisation's erosion of state capacity for industrial coordination, Hu and Xi leveraged industrialisation's concentration of state resources and planning capabilities to pursue increasingly ambitious renewable energy targets through direct state investment, strategic industrial policy, and coordinated infrastructure development, their approach transcended the market-centric approaches that characterised Western climate governance, instead embedding energy transition within broader projects of national development that provided ideological coherence and legitimacy for sustained green policy-making.

[6.4] Conclusion

This chapter's actor analysis has traced how China's rapid industrialisation systematically reconfigured the interests and alignments of key social forces in ways that enabled the emergence of China's green developmental state. The analysis has revealed three interconnected

dynamics through which China's economic composition created structural conditions favouring renewable energy expansion. First, the manufacturing-intensive character of China's green economy aligned working-class material interests with ecological modernisation, contrasting sharply with the service-oriented green jobs that characterised the deindustrialised US context. Second, the visible ecological crisis generated by industrial concentration created organic constituencies for environmental action among urban populations while simultaneously opening entrepreneurial opportunities in clean technology sectors that attracted China's emerging capitalist class. Third, the convergence of state and popular nationalism around technological sovereignty, environmental guardianship and energy security transformed renewable energy development from an environmental constraint into a patriotic imperative, enabling the CCP leadership to articulate increasingly ambitious ecological modernisation visions through Hu's SOD and Xi's EC.

The strength of China's "big green tent" coalition stemmed not from ideological coherence but from the material convergence of diverse interests produced by the specific timing and character of China's industrialisation within global capitalism.⁵³ This encompassing alignment provided the social foundation that distinguished China's energy transition governance from the fractured coalitions examined in the American context, where deindustrialisation had systematically weakened potential pro-transition forces.

⁵³ The concentration of global manufacturing in Chinese coastal cities during the precise historical moment when environmental concerns were gaining international prominence and green technological advances were being made created unique opportunities for positioning environmental leadership as national advancement. Had China's industrialisation occurred two decades earlier, when environmental concerns were less prominent in international discourse and renewable technologies less mature, nationalist constituencies might well have embraced fossil fuel development as demonstration of industrial prowess, while tech capitalists would have found greater opportunities in conventional manufacturing, and environmental organisations would have lacked the material basis for mass mobilisation around immediate health concerns.

Having established how China's economic composition shaped actor configurations, the analysis now turns to examine how these structural conditions and social alignments crystallised in the concrete policy-making processes that established China's global dominance in renewable energy development.

Chapter 7: The Chinese Process Analysis

[7.0] Chapter Outline

This process analysis chapter synthesises the contextual and actor-level findings from the prior two chapters to examine how the concrete policy-making processes surrounding China's renewable energy development reflected and reinforced the structural dynamics of rapid industrialisation, which enabled transformative green transition governance. This chapter builds upon the context analysis' demonstration of how industrialisation created structural conditions favouring renewable energy development through visible ecological crises, explosive energy demand, and strategic industrial imperatives. It also integrates the actor analysis' revelation of how diverse social forces - from industrial workers to tech capitalists, and environmentalists to nationalists - aligned behind the green developmental state. In utilising these prior findings, this chapter traces the processes through which China's structural advantages and social coalitions shaped the party-state's construction and deepening of its renewable energy policy-making framework.

This process analysis builds upon the substantial institutionalist literature on China's renewable energy development, which often attributes China's success primarily to its institutional structure, experimental policy-making approach, and authoritarian capacity for consistent policy direction (Yu, 2010; Zhao et al., 2014; Lo, 2015; Chen, 2016; Chen and Lees, 2016; Gallagher and Xuan, 2019; Andrews-Speed and Zhang, 2019; Yu, 2020; Xiang and Lo, 2024). While these scholars have thoroughly documented the mechanisms through which China's developmental state facilitated renewable energy expansion, this chapter argues that their explanations, while

accurate in describing the “how” of policy implementation, require deeper theoretical grounding in the structural conditions that made such policies both necessary and politically viable. Chen's (2016) analysis of the green developmental state effectively dissects the institutional architecture of China's industrial policy-making organs that drove forward renewable energy advancement. Similarly, Andrews-Speed and Zhang's (2019) neo-institutionalist analysis provides a sophisticated, fine-grained explanation of the complex interplay between the party-state's central policy-making and the implementation of these policies by various provincial and local governments, explaining the complex iterative process of policy evolution that resulted. However, while these accounts effectively document the mechanisms of policy implementation, they provide less systematic analysis of why China's leadership found this particular institutional framework politically viable and economically attractive compared to alternative responses to mounting ecological and economic pressures. By utilising this dissertation's analysis of China's economic composition and the evolving balance of power amongst key actors, this process analysis seeks to provide a more comprehensive explanation for why China was able to successfully build its green developmental state.

This chapter does not dispute the importance of China's institutional arrangement in its renewable energy success - indeed, the party-state's existing capacity for decisive policy-making, coordinated planning, and resource mobilisation was clearly essential to the scale and speed of China's green transformation. Rather, it argues that existing institutionalist accounts treat these institutional arrangements as relatively autonomous political choices, inadequately theorising how China's specific economic composition during its rapid industrialisation phase created both the necessity for such institutions and the political conditions under which they could operate

effectively. The question is not whether institutional design mattered, but why China developed these particular institutions while other states with comparable governance challenges - including other authoritarian regimes - failed to construct similar frameworks for renewable energy development. While acknowledging the facilitating role of its institutional arrangements, this analysis argues that China's iterative and consistent approach to green policy-making must be understood as emerging fundamentally from the crisis-response dynamics and strategic adaptations necessitated by rapid industrialisation. Rather than treating China's green policy achievements as primarily resulting from superior institutional design and its authoritarian environmentalism, this analysis demonstrates how China's particular position within global capitalism created structural conditions that made renewable energy policies appear increasingly attractive and necessary to policymakers, while simultaneously providing the institutional and material resources needed for their implementation.

The chapter is organised around two substantive chronological sections that reveal how industrialisation's effects manifested in concrete policy-making processes. The division corresponds roughly to the Hu Jintao era (pre-2011) and the early Xi Jinping era (post-2011), capturing a qualitative shift in China's green policy-making that reflects changes in the country's economic composition and the maturation of its renewable energy capabilities. The first section examines the foundational period when renewable energy policies emerged through reactive responses to acute crises generated by rapid industrialisation. This section traces how successive energy shortages (2003-2004), mounting environmental degradation, and the global financial crisis' impact on export demand (2008-2009) compelled the party-state to incrementally

construct the institutional architecture of what would become the green developmental state.⁵⁴

Through analysis of the 2005 Renewable Energy Law, its 2009 amendments, the Golden Sun Demonstration Programme, the Rooftop Subsidy Programme, and relevant aspects of the 4 Trillion Yuan Stimulus, this section demonstrates how immediate crisis management gradually accumulated into a comprehensive policy framework, revealing the fundamentally adaptive and contingent origins of China's green developmental success.

The second section examines how the reactive, crisis-driven policies of the mid-2000s had crystallised by 2011 into a coherent, long-term strategic framework that embedded green development at the centre of China's economic policy-making. This section analyses three policy developments that exemplify the qualitative shift toward strategic, anticipatory planning: the integration of ambitious climate and renewable targets into the 12th and 13th Five-Year Plans, which elevated green development to the highest level of national priorities; aspects of the Belt and Road Initiative that secured critical mineral supply chains and created export markets for China's expanding renewable manufacturing capacity; and the development of pilot carbon trading schemes that began building institutional capacity for emissions governance to scale up to the national level. This section situates these strategic developments within the mounting contradictions of China's maturing industrialisation process, demonstrating how the party-state's recognition of the need to transition toward higher-value economic activities positioned

⁵⁴ This chapter's analysis of the green developmental state's emergence out of crisis adaptations builds on institutionalist accounts by Yu (2010), Chen and Lees (2016), and Andrews-Speed and Zhang (2019) while offering a crucial theoretical reframing. Where institutionalists treat crises as discrete policy challenges creating autonomous windows for institutional adaptation, this analysis argues that the specific sequence and intensity of China's crises - energy shortages, environmental legitimacy threats, export vulnerabilities - were structurally determined by its accelerated industrialisation trajectory within global capitalism. This shifts focus from China's institutional capacity to manage contingent shocks toward understanding how its economic composition systematically generated both the growing felt necessity for green developmental policies and the political conditions enabling their successful implementation, revealing the Green Divergence as emerging from capitalism's spatially and temporally uneven development rather than differential institutional designs.

renewable energy leadership as essential to avoiding industrial stagnation and maintaining developmental momentum.

Together, these sections reveal how each phase of policy development emerged from the specific conjuncture of China's evolving economic composition and the pressures generated by its integration into global capitalism. The first phase demonstrates how the material necessities of managing industrialisation's immediate contradictions - energy supply bottlenecks, environmental legitimacy crises, and export vulnerability - drove the initial construction of renewable energy institutions through pragmatic crisis responses. The second phase shows how the proven success of these policies, combined with the strategic imperatives of late industrialisation, enabled their evolution into comprehensive long-term planning that positioned China as the global leader in renewable energy development. By examining these policy development processes through the lens of critical political economy, this chapter reveals how China's green developmental state emerged as a contingent historical product of industrialisation's contradictions. This analysis demonstrates that China's transitional success resulted from the fortuitous temporal alignment between the structural imperatives of delayed industrialisation and the emergent opportunities presented by global renewable energy development, creating conditions where adaptive crisis management gradually accumulated into the systematic displacement of fossil fuel dependency through industrial rather than environmental logic.

[7.1] Forged by Crisis: Constructing the Green Developmental State

This section argues that the foundational development and expansion of China's green developmental state were inseparable from the series of acute crises generated by the contradictions of rapid industrialisation. Through a chronological analysis of the major policy developments from 2003 to 2010, this section demonstrates how successive crises of industrialisation - notably energy shortages, environmental breakdown, and export demand shocks - forced the Chinese party-state, in pursuit of sustainable development and regime legitimacy, to adopt renewable energy policies. The cumulative effect of these responses was an iterative process wherein immediate crisis management built the foundational layers of policy architecture that characterise China's contemporary green developmental state. This section is subsequently oriented around the two key crisis points of the Hu era. It begins with the energy crisis of 2003-2004 and the associated spike in environmental degradation, identifying them as the primary driver of the REL's passage in 2005. Whilst the REL marked the first systematic legal framework for China's renewable development, its orientation is shown to be primarily concerned with limiting the possibility of future energy shocks and addressing growing anti-pollution protests. The second crisis point analysed is the Great Recession, which led to a catastrophic decline in demand for Chinese exports, with the fledgling renewable energy sector being one of the hardest hit sectors. This crisis is identified as the primary driver behind the fledgling green developmental state's consolidation and buildup, achieved through analysing the 2009 amendments to the REL, the Golden Sun Demonstration Programme, Rooftop Subsidy Programme, and the 4 Trillion Yuan Stimulus.

The 2003-2004 energy crisis that gripped China's coastal manufacturing centres represented the first major juncture where renewable energy development gained serious traction within central policy-making circles. The crisis emerged directly from the success of China's export-oriented manufacturing strategy, as analysed in Chapter 5, where explosive industrial growth in coastal cities, such as Shanghai, Guangzhou, and Shenzhen, created energy demand that consistently outpaced the capacity of coal-fired power generation to expand sufficiently rapidly to meet it. The resulting power shortages forced factory closures, disrupted supply chains serving global markets, and threatened the foreign direct investment flows upon which China's growth model depended (Chen and Lees, 2016). The initial response from the party-state was to enact energy rationing to prioritise key industries and manufacturing hubs, alongside promoting energy efficiency measures. As the crisis continued, the National Development and Reform Commission (NDRC), the body responsible for China's economic planning, revised the 10th FYP's targets for energy capacity buildout (People's Daily, 2003). However, whilst the construction of more power plants was essential, the more dire limiting factor was the inability to secure enough coal. While coal was not China's sole energy source, it represented upwards of 75% of the energy mix and was still growing its share (National Bureau of Statistics of the People's Republic of China, 2024). The crisis exposed the fundamental contradiction of China's industrialisation model: even with the state's full support behind rapid coal capacity expansion, the fossil fuel industry could not keep pace with the explosive energy demand generated by export-oriented manufacturing growth. This structural bottleneck made energy diversification appear increasingly urgent to policymakers, who recognised that continued reliance on coal alone risked recurring supply disruptions that could undermine China's developmental trajectory. Importantly, this crisis

occurred immediately after Hu came to power, shaping the trajectory of his administration's energy policy at an early juncture.

The 2005 Renewable Energy Law emerged as a direct response to the diversification imperatives created by the energy security crisis. Even though the peak of the crisis had waned by the time of its passage, one of the law's primary aims was to ensure the prevention of its return and to shore up China's energy supply shortages through diversification. Its goal was: "to solve the contradiction between energy supply and demand and achieve sustainable development", wherein sustainable development referred not just to environmental degradation but also a pattern of development free of economic imbalances (State Council of the People's Republic of China, 2007). Importantly, the law's passage coincided with the growing public backlash to the ecological crisis analysed in the prior chapters, particularly air quality deterioration in Beijing and Shanghai which was beginning to generate popular discontent among urban working and middle-class constituencies whose support was essential to CCP legitimacy (Xi et al., 2013; Zhang et al., 2019; Wu et al., 2024). The emergent policy framework was thus oriented primarily toward mitigating energy supply constraints through diversification, whilst simultaneously looking to address the growing environmental concerns of China's core constituencies..

The REL instituted a wide variety of pro-renewable measures that would lay the groundwork for the green developmental state, including mandatory targets for market share, favourable pricing mechanisms, guaranteed grid and pipeline access, financial support and cost-sharing, research funding, legal protections for renewable energy developers, and public education about the benefits of renewables.⁵⁵ Typical of the Chinese policy-making process, the REL laid out general

⁵⁵ The full translated text of the Renewable Energy Law is available at: <https://policy.asiapacificenergy.org/node/43>

guidelines and principles for the measures that Hu's administration sought to see implemented, but lacked specific details about targets, funding levels and timelines. Instead, it acted as a decree for the central ministries and provincial governments to begin working towards realising its implementation, with a division of responsibilities being laid out. Important tasks such as setting targets, medium and long-term development plans, price setting, and allocating investment were subsequently undertaken by the NDRC. As part of this delegation, in 2007, the NDRC published the Medium and Long-Term Development Plan for Renewable Energy (MLDP).⁵⁶ The MLDP set a mandated target for each governing body (municipal, regional, provincial, special administration) to ensure renewable energy reached a 15% share of their energy mix by 2020, with the actual national result being 15.9% by the end of 2020 (Hu, 2022).

With the implementation of the REL, Hu's administration managed to achieve, without any significant contestation, one of the central aims of the failed Waxman-Markey bill by creating the equivalent of nationwide Renewable Portfolio Standards (RPS). One of the most important aspects of the REL and MLDP was to begin integrating renewable energy quotas into the considerations of governments and planning authorities at every level of the country, propagating foundational knowledge and building the institutional capacity for effective green industrial policy. In terms of propagating knowledge, the NDRC did this directly by issuing a "Guidance Catalogue for the Development of the Renewable Energy Industry" to every relevant government, instructing officials to study it and then conduct reviews about the applicability of various renewable energy technologies within their jurisdiction, whether it be backing

⁵⁶ The full translated text of the Medium and Long-Term Development Plan for Renewable Energy is available at: <https://policy.asiapacificenergy.org/node/42>

commercial projects, pilot projects, or supporting research and development (National Development and Reform Committee, 2005).

The CCP's decision to pursue renewable energy development through the 2005 Renewable Energy Law represented one of several possible responses to the mounting energy and environmental crises facing China's industrialising economy. One might reasonably ask why the Chinese leadership chose this particular pathway rather than alternative strategies that could have addressed these challenges without requiring the complex institutional infrastructure of green developmentalism. China could theoretically have pursued an earlier spatial relocation of coal plants and heavy industry to less populated interior regions, intensified pollution control measures on existing coal plants, or simply accepted environmental degradation as a temporary cost of continued development - approaches that other rapidly industrialising nations have adopted when facing similar pressures.

The institutionalist literature provides partial explanations for these policy choices. Most convincingly, Chen (2016) emphasises the securitising, centralising, and entrepreneurial tendencies in CCP governance in leading to its embrace of green developmentalism, ingrained in it through the experience of the Soviet Union's collapse and institutional experience gained through its reform process. In producing this argument, he emphasises the contingency of the decision-making, noting that it could have gone otherwise if the political balance had shifted. However, the institutionalist accounts do not fully explain why renewable energy emerged as the preferred solution compared to alternatives that might have appeared less institutionally demanding or economically risky. The critical political-economic analysis developed in this

dissertation suggests that renewable energy development was selected precisely because it aligned with multiple imperatives simultaneously: addressing the visible environmental crisis that threatened CCP legitimacy, providing a pathway for economic upgrading away from low-value manufacturing, responding to nationalist demands, supporting the fledgling tech capitalist class, and creating employment opportunities in an emerging strategic sector. Furthermore, it has shown why these imperatives, through the development of China's economic composition, have become so pressing to respond to. Alternative responses - such as spatial relocation of industry or continued acceptance of environmental degradation - would have failed to address the fundamental contradictions of China's development model analysed in Chapter 5, making renewable energy development not simply a policy choice but a multi-faceted structural imperative for sustaining China's development trajectory.

Whilst the REL and MLDP laid the foundations of China's green developmental state, creating the baseline incentives, knowledge base, and planning structures that would begin to accelerate renewable adoption nationwide, they were only the first steps. It would take the next crisis juncture and subsequent adaptive response to consolidate the basic institutions and to begin expanding its scope. As discussed in Chapter 5, the global financial crisis caused a collapse of global demand for Chinese manufacturing exports, threatening the export-oriented growth model that had sustained China's development. Whilst China's financial sector was relatively sheltered from the financial meltdown, due to the state's strict control over the sector, the country still experienced a drastic slowdown in its economic growth rate (Whalley et al., 2009; National Bureau of Statistics of the People's Republic of China, 2024). One of the hardest hit sectors in China was the renewable energy sector, particularly solar PV and wind turbine manufacturers.

Whilst the REL and MLDP had instituted some mechanisms for producing domestic demand for renewables, the sector's dominant activity was exporting to the US and the EU (Andrews-Speed and Zhang, 2019). As the US and EU were consumed by recession, their governments relaxed environmental regulations and reduced support for renewable projects, accelerating the collapse of the export markets upon which Chinese renewable manufacturers had become dependent (Burns and Tobin, 2016). This created an existential crisis for Chinese renewable firms that exposed the vulnerability of export-oriented development and demonstrated the necessity of building robust domestic demand to sustain strategic green industries.

In response to the crisis, the party-state undertook a flurry of policy-making activity, seeking to substitute export demand with state-generated domestic demand. The renewable sector received particular attention throughout the policy-making process. This was in part because of the particularly dire condition of the sector. However, it was also because it had been identified as a key strategic sector for the reasons discussed in chapter 5, whilst its growth in the 2000s had already created the political coalition of the Big Green Tent discussed in chapter 6. To let the renewable sector stagnate - or worse die out - was not an option. There were four key pieces of central policy-making that constituted the party-state's response to the crisis afflicting the renewable industry: the amendments to the REL, the Golden Sun Demonstration Programme (GSDP), the Rooftop Subsidy Programme (RSP), and the 4 Trillion Yuan Stimulus. The cumulative effect of these bills was a quantitative and qualitative evolution of the green developmental state by substantially increasing the allocation of domestic energy demand to renewable projects, developing further policy mechanisms and infrastructure to support their

deployment, and pushing for a shift in the orientation of the emergent renewable sector toward development for China's modernisation and thus balancing out its export-orientation.

These four policy innovations enhanced the green developmental state in distinct areas. The amendments to the REL primarily sought to rectify issues with the original formulation of the 2005 law, particularly by clarifying aspects of the law lacking sufficient details regarding implementation or inefficient mechanisms.⁵⁷ For one example of the clarificatory aspects of the revisions, after the law's initial passage in 2005, wind farms began to spring up rapidly. However, they found themselves in excessively long waiting times to be connected to the grid. This is because the grid companies were not initially coordinating with the development of wind farms, which were occasionally being built in places difficult to establish grid connections to. This was built atop issues with certain farms suffering from low efficiency and poor electricity quality, which could risk destabilising the grid, producing further incentives not to pursue connections. Though the 2005 REL had made it mandatory to provide a connection, it had not specified mechanisms of coordination, guarantees of compliance or timely connection. In 2007, the State Electricity Regulatory Commission passed the "Measures on Grid Company Full Purchase of Electricity from Renewable Energy", which tried to ensure prompt connection services by creating a timescale for connection, granted renewable generators priority in electricity dispatch and allowed the grid companies to temporarily take control of generators in situations threatening grid instability to allow for curtailment (Schuman and Lin, 2012; Andrews-Speed and Zhang, 2016). To further rectify this issue, the 2009 amendments gave greater oversight powers to the central government in the drafting and implementation of

⁵⁷ The full translated text of the 2009 Amended Renewable Energy Law is available at: <https://chinaenergyportal.org/wp-content/uploads/2016/03/20091226-RE-Law-amended-EN-CN.pdf>

provincial plans to boost coordination and prevent local mismanagement. The revised law also introduced new technical standards and funding regulations, which would, in most instances, favour large-scale developers, ensuring higher quality developments and diminishing grid connectivity issues (Schuman and Lin, 2012).

The RSP provided generous subsidies for the purchase and installation of solar panels in integrated projects - referring to construction projects installing panels on rooftops to generate additional electricity, which would then be sold to the grid or used locally (Wang et al., 2017). The latter was especially the case for rural developments, where electrification had lagged due to the unevenness of China's development, which had become excessively concentrated in the coastal urban cores. This unevenness was an issue which Hu centrally sought to address through his Scientific Outlook on Development framework, making the RSP a characteristic Hu policy based on its concerns for rural poverty alleviation and responding to the uneven outcomes of China's rapid industrialisation (Xinhua, 2007; Xing, 2009). Whilst the RSP provided for non-utility-scale projects, the GSDP was intended to boost the development of utility-scale projects on and off the grid, by providing subsidies for larger projects which were evaluated as important to meeting the MLDP's capacity targets (Wang et al., 2017).

The GSDP was subsequently implemented at the national, provincial, and local levels in response to the MLDP's tiered plans. Enterprises submitted project proposals to their local authority, which evaluated their financial merit and approved the most viable projects, then provided them with subsidies and technical support as required - providing 50% of the costs for on-grid projects and 70% for off-grid projects, again reflecting Hu's attempt to utilise renewable

development for rural uplifting (Wang et al., 2017; Zhang and Ye, 2013). Beyond boosting domestic demand, the clear intention of the GSDP was to demonstrate the economic viability of large-scale solar PV generation projects and to discover existing limitations through practical experimentation. A variety of different styles of PV generators were deployed, allowing for comparisons between projects on the basis of their economic viability, technical limitations, and geographic specificities. It also provided opportunities to experiment with the state's capacity to demonstrate competence in approving projects and establish implementation plans, building institutional experience and allowing for effective administrators to be rewarded with promotions (Andrews-Speed and Zhang, 2019).

The other major development was the 4 Trillion Yuan Stimulus, officially the Ten Measures to Expand Domestic Demand and Promote Economic Growth, which helped to expand the foundations for the green developmental state primarily through public investments into infrastructure development (General Office of the State Council, 2008). There were three main relevant aspects of this stimulus. First, mass investment into the development of rural energy grids, which helped to overcome issues of grid connectivity and stability issues plaguing rural renewable projects, whilst building grid resilience, enabling faster integration of future projects. Second, it invested in upgrading and modernising urban energy grids, helping them deal with the intermittency issues of renewable generation as urban renewable utilisation would continue to develop over the coming years. Finally, it provided investment in energy-saving and emissions reduction projects, although it is unclear what exact projects this funding went toward due to an absence of government reporting about the allocation or results (Jaeger, Westphal, and Park, 2020). Notably, unlike the other policies that helped to expand the green developmental state, the

4 Trillion Yuan Stimulus also directly contributed to the expansion of the fossil economy. There were direct provisions for investment in the expansion of coal transportation corridors, and the investments in rural and urban energy grids also served to help the integration of new coal power plants into the grid. This is of no surprise as it is characteristic of China's renewable energy development, wherein the easiest pathway forward was the expansion of both the fossil and renewable economy.

The analysis of these initial crisis junctures reveals that China's green developmental state emerged through an incremental process of adaptive policy-making wherein each successive crisis compelled the party-state to deepen and expand its renewable energy institutions. The 2003-2004 energy shortage crisis established the foundational legal architecture through the REL, whilst the 2008 financial crisis' devastating impact on renewable exports forced a qualitative expansion through domestic demand creation and enhanced policy mechanisms. This iterative pattern demonstrates that the green developmental state's construction was fundamentally shaped by the contradictions inherent in China's rapid industrialisation process - each policy response representing an adaptive solution to immediate threats to regime legitimacy and developmental sustainability. China's renewable energy leadership emerged from the material necessity of managing the cascading consequences of export-oriented manufacturing growth, rather than reflecting superior institutional design or an abstract ideological commitment to ecological modernisation. The apparent coherence of the green developmental state thus masks its fundamentally reactive origins, wherein crisis management gradually accumulated into a comprehensive industrial policy.

Crucially, both the genesis of these successive crises and the party-state's capacity to respond effectively must be understood as products of China's specific economic composition during its industrialisation phase. The energy shortages that necessitated diversification emerged directly from the explosive growth in manufacturing demand that outpaced coal supply expansion, whilst the environmental degradation that threatened CCP legitimacy stemmed from the spatial concentration of global production in China's coastal cities. Similarly, the export demand collapse that devastated the renewable sector reflected China's integration into global capitalism as the primary destination for manufacturing FDI. However, the same industrialisation process that generated these crises also provided the baseline institutional and material foundations for effective response: the retention of centralised planning capacity enabled coordinated policy implementation across multiple levels of government, whilst the accumulated manufacturing capabilities and industrial expertise facilitated rapid scaling of renewable production. The renewable addition dynamic created by explosive energy demand growth meant that renewable expansion could proceed without directly threatening fossil fuel interests, enabling the party-state to pursue ambitious green policies without facing the zero-sum political resistance that paralysed the US.

This relationship between crisis generation and response capacity illuminates how China's economic composition systematically advantaged renewable energy development during the critical period of the 2000s. Where deindustrialisation in the US weakened state capacity for industrial coordination whilst creating substitution dynamics that intensified fossil fuel resistance, China's ongoing industrialisation preserved and strengthened developmental state institutions whilst generating additional dynamics that facilitated renewable expansion. The

environmental and economic contradictions of rapid industrialisation created visible, immediate pressures for state intervention that could not be ignored or spatially displaced, whilst the material foundations of industrial development provided the tools necessary for effective response. The green developmental state's emergence thus represents not institutional superiority but historical contingency - China's delayed integration into global capitalism positioned it to leverage industrialisation's contradictions for renewable energy leadership precisely when post-industrial economies had lost the political and economic foundations necessary for transformative climate action. Understanding this temporal dimension reveals the Green Divergence as fundamentally rooted in the uneven spatial and temporal dynamics of global capitalist development rather than divergent national ideologies or institutional arrangements.

[7.2] Maintaining the Agenda: The Deepening of the Green Developmental State

This section builds on the analysis of the prior section, examining how the reactive, crisis-adaptive policies of the mid-2000s had crystallised by 2011 into a coherent, long-term strategy that embedded green development at the very heart of China's economic policy-making. Building on the contextual and actor analyses developed in earlier chapters, it examines three policy milestones that are representative of the qualitative shift toward a strategic and long-term approach to renewable energy policy-making. First, the 12th and 13th FYPs, which integrated ambitious climate and renewable capacity targets, elevated them as core metrics for evaluating national development alongside GDP. Second, aspects of the Belt and Road Initiative, particularly regarding securing critical mineral supply chains, renewable exports, and overseas infrastructure development, helped to secure the continual expansion of China's renewable

energy and other green tech sectors. Finally, the development of pilot carbon trading schemes in key urban and industrial centres, which were being operated with the stated intention of developing the institutional expertise and capacity to operate a national carbon market.

This section situates these turns to long-term green strategising within the mounting contradictions of China's maturing industrial model. As double-digit GDP growth ended, labour costs climbed, and low-value export advantages began to be eroded, the CCP identified technological leadership in strategic green sectors as a principal route to resist industrial stagnation and decline. Moreover, the broad pro-transition coalition forged under - uniting industrial workers, environmental NGOs, green-tech capital, and nationalists - had, by the early 2010s, stabilised into a durable bloc whose interests converged around continued expansion of the renewable sector. Its success in delivering high-quality manufacturing jobs, export revenues, and a pathway to environmental stability ensured renewables were no longer merely a remedy for the contradictions of breakneck industrialisation but a cornerstone of national policy-making. The deepening of the green developmental state is shown to have operated as a calculated response to the long-term crises of industrialisation and the evolving nature of China's economic composition. In combination with the prior section, this section demonstrates the inseparability of China's green developmental state, and thus the Green Divergence, from the nation's delayed integration into global capitalism and the subsequent accelerated pace of its industrialisation process.

The strategic deepening of China's green developmental state from 2011 onward was brought about by a historical convergence of late industrialisation's maturing contradictions and the

CCP's recognition of the opportunities and necessities presented by green advancement.

Symbolic of the historic shift to come, this period was inaugurated by a final echo of the high industrialisation-era energy crisis. The beginning of 2011 was marked by a potent, regionally uneven energy crisis, echoing the nationwide crisis of 2003-2004. Understanding both the altered dynamics of this final crisis and the qualitative policy shifts that followed reveals precisely how the party-state's policy-making moved from reactive crisis management to long-term, strategic ecological modernisation. As in earlier cycles, the 2011 energy crisis exposed the CCP's vulnerability to the recurrent imbalances of the rapidly industrialising economy, even as the developmental trajectory was beginning to decelerate. The roots of this final crisis were multifaceted but grounded in China's economic composition. In the wake of the collapse of global demand for exports, China's 4 Trillion Yuan Stimulus was deployed to stabilise investment and productive activity. As discussed, the vast majority of the stimulus flowed into infrastructure construction. This meant that whilst China's energy demand growth was dragged down by the slowdown in export manufacturing, this was somewhat counterbalanced by the massive power demands required by the rush of construction activity (Li, Song, and Liu, 2014). By late 2010, with Western demand recovering, the Chinese export machine reaccelerated, as the infrastructure construction boom continued unabated. The result was the demand for electricity surging past original projections, with coal supplies being unable to keep pace. The surge of demand built atop government efforts to impose energy efficiency and insufficient coordination of energy and regional development plans, provoking a new energy crisis on a level not seen since 2003-4 (Ming et al., 2013).

Power generation bottlenecks, rolling blackouts, and supply rationing once again erupted, though

now their geographic footprint was clearly concentrated in the coastal provinces and inland emergent industrial hubs in provinces such as Hunan, Jiangxi, and Chongqing, rather than the previous nationwide disruptions (Ming et al., 2013). What differentiated the 2011 crisis from its 2003-2004 predecessor was precisely this uneven spatial distribution. Whereas the previous energy crises had reflected a relatively uniform supply and infrastructural weakness, 2011's was defined primarily by the weakness of inter-provincial transmission. The least affected provinces were those in the West and Northwest of the country. This is where wind and solar installations had surged, whilst export manufacturing had not taken off. The lack of adequate inter-provincial transmission infrastructure prevented the dispatch of surplus energy supplies from these regions to those in deficit (Ming et al., 2013). Thus, in 2011, the party-state was confronted with the reality that there was still great fragility in its energy system. However, the changed dynamics underlying the crisis pointed even more strongly to the pathway out: continuing to scale up renewables, building storage, and, most importantly, developing reliable ultra-high-voltage inter-provincial transmission infrastructure. The commitment to the green developmental state had to be further deepened, requiring long-term strategising to secure its future, rather than improvisational, crisis-adaptation.

The promulgation of the 12th Five-Year Plan (2011-15) and the 13th FYP (2016-20) saw the decisive embedding of green developmental objectives within the highest echelon of the party-state's planning apparatus.⁵⁸⁵⁹ For the first time, the FYPs integrated not only capacity targets for wind and solar, but also binding carbon-intensity and air-pollution reduction targets, all elevated to metrics of achievement on par with GDP growth and poverty alleviation. In the

⁵⁸ The full translated text of the 12th Five Year Plan is available at: <https://policy.asiapacificenergy.org/node/37>

⁵⁹ The full translated text of the 13th Five Year Plan is available at: <https://policy.asiapacificenergy.org/node/2837>

first paragraph of the section outlining its main targets, the 12th FYP called for renewables to meet 11.4% of primary energy consumption, for energy consumption per unit of GDP to decrease by 16% and CO2 emissions per unit of GDP to decrease by 17% by 2016. The 13th FYP set a new target for 15% of primary energy consumption to be met by 2020. By elevating green developmental objectives as central components of the FYPs, the Central Committee was signalling to provincial governments that it was to become a foremost priority of their policy-making and administration, as failure to meet the targets of the FYP would be intolerable and prevent political advancement.

The elevation of renewable development into the FYP's was reflective of the industry's growth across the Hu period. What had been a marginal sector at the turn of the millennium, in the course of a decade, had become a key strategic industry which the party-state identified as central to continual development. Its ability to manufacture and install renewable capacity was unparalleled in the world by the time Xi came to power. The CCP increasingly came to see the green developmental state and its outputs as one of the crowning gems of the national economy. However, what had become apparent, partially through experiencing the limitations of the REL and the 2011 energy crisis, is that there needed to be a greater emphasis on the coordination of renewable development, requiring long-term investments in infrastructure, and more effective management of the energy system. Elevating renewable development as a top-level priority within the FYPs was a key step to ensuring that the entire party-state apparatus would work toward this end. The greening of the FYPs thus served as the key piece of official policy-making to reflect the elevation of green developmentalism into a permanent, central, political priority to the long-term national development of China.

Whilst the FYPs institutionalised green developmentalism as a central priority of domestic governance, the Belt and Road Initiative (BRI), formally launched in 2013, integrated green supply security concerns into China's global diplomacy. The basic nature of the BRI is an area of great dispute, being simultaneously labelled as a scheme to debt-trap developing nations, an elaborate marketing campaign, a simple foreign policy, a beacon for furthering globalisation, a grand geopolitical strategy, and the clearest pathway to Global South development (Schulof et al., 2025). A full examination and judgement regarding the nature of the BRI is far beyond the scope of this chapter. However, what must be clearly examined is its strategic role in securing the future of the green developmental state. As Xi came to power, the renewable and green tech sectors were increasingly elevated as part of China's national developmental paradigm. There were two central issues that needed to be addressed. First, securing critical mineral supply chains. Second, addressing growing issues of industrial overcapacity. The BRI partially functioned as a solution to both issues.

As China developed its production capacity for manufacturing renewables and associated green technologies, with these industries becoming increasingly central to the health of its domestic economy, securing access to the raw materials required for their production - copper, lithium, cobalt, and other rare earth minerals - became a central priority. If China could not acquire sufficient materials, this would, at the lower end, create production and installation bottlenecks, and at the higher end, outright threaten the pathway to energy sovereignty the party-state was pursuing. China pursued domestic solutions to this problem through the FYPs by providing subsidies to mining companies, private and state-owned, to develop critical mineral mines, with

Inner Mongolia becoming a focal point of these investments. However, China lacked the mineral reserves to develop an autarchic supply chain. Here, the BRI proved crucial to developing China's international supply chains. In exchange for financing and building infrastructure projects in developing countries across Central Asia, Southeast Asia, Africa, and Latin America, China established long-term supply contracts and even took logistical control over key mining and processing operations (Wells, 2023). The "national champion" firms that had been grown under China's developmental state spearheaded these international projects, taking the expertise and economies of scale they had built with state assistance to efficiently construct international supply chains. In a key example of the success of this scheme, ten years after the BRI was launched, Chinese firms operated 15 of the 17 cobalt mines in the Democratic Republic of the Congo, giving it leading control over one of the most critical nodes in the emerging international green economy (Wells, 2023; Zhou, Crochet, and Wang, 2025). The success of the BRI in securing supply chains for China's green development has been so great that it has become recognised as a threat to the US' capacity to undertake its own transition (McHugh, 2021).

The other long-term issue the BRI served to partially resolve was that of industrial overcapacity in China's renewable sector. A key result of the green developmental state's continual expansion across the 2000s and early 2010s, enabling the continual startup and upscaling of manufacturing firms, was the growing issue of industrial overcapacity, which threatened to erode profitability in wind, solar, and battery production (Wang, Luo and Guo, 2014; Zhang et al., 2015). Although the party-state, at both the central and provincial level, sought to absorb overcapacity issues as much as possible, through subsidisation and intervention aimed at increasing demand levels, this approach had its limitations (Li et al., 2022). The BRI acted as a strategic measure to overcome

this issue by fostering the creation of new export markets for Chinese renewables and grid technologies. Alongside China's BRI building coal-power plants in the recipient countries, Chinese enterprises were also tasked with developing renewable utilities and even entire modern energy grids in major emerging economies.⁶⁰ Up to 2017, around 13% of China's investments in electrical generation abroad were in non-hydro renewables (Cabr , Gallagher, and Li, 2018).⁶¹ Importantly, by playing a central role in the development of emergent economies' fledgling renewable sectors and wider technical economies, China was able to align them to Chinese technological and industrial standards (Seaman, 2025). This increased the likelihood that they would continue to seek out Chinese renewables as their energy demand further grew, producing long-term demand for China's exports.

The other clear example of the qualitative shift in China's green policy-making was the introduction of pilot carbon trading markets. These pilot schemes were launched first in seven provinces and cities, which were characterised by their large urban populations and high levels of air pollution wrought by the processes of industrialisation, beginning with Beijing and Shanghai in 2013 (Zhang, 2022). These schemes established cap and trade systems wherein major industrial emitters within designated regional and sectoral boundaries were allocated emission allowances and permitted to trade surplus quotas, creating market-based incentives for carbon reduction whilst generating practical experience in emissions monitoring and enforcement.

Whilst still a clear response to the ecological crises of industrialisation, like the early policies

⁶⁰ Here, the BRI's pattern of renewable development clearly mirrored that of China's domestic development, with a significant majority of investment flowing toward developing coal power plants rather than renewables (Liu, Hale and Urpelainen, 2023). It is worth remembering that, despite the remarkable achievements of China's green developmental state, it existed in an "all-of-the-above" styled framework on the basis of continuous energy demand growth.

⁶¹ Although beyond the scope of this dissertation's period of study, it is noteworthy that in the latter part of the 2010s that China began to take efforts to begin "greening" the BRI, making renewables a greater priority, taking more care with environmental regulation, and limiting coal-based projects (Chiengkul, 2025).

leading to the formation of the green developmental state, the development of carbon markets in China differed in its temporal qualities. Unlike the immediate crisis-response measures that characterised early renewable energy policies, the carbon trading schemes emerged from a strategic assessment of China's evolving economic composition and the maturing capabilities of its renewable sector. The geographical selection of pilot schemes reflected the changing dynamics of China's spatial development, as industrialisation began to mature in the original, predominantly coastal hubs whilst simultaneously expanding into interior provinces. Cities like Beijing and Shanghai were experiencing a dual transformation: their manufacturing sectors were increasingly relocating to lower-cost regions within China's interior, emulating the spatial shifts previously witnessed in the US context, whilst their economies were actively shifting toward service sector employment and high-value industrial activities (Wang et al., 2013). This regional economic recomposition created new political dynamics around energy governance, as the immediate employment dependencies on heavy manufacturing weakened whilst environmental concerns intensified among the growing urban professional classes whose livelihoods were no longer directly tied to carbon-intensive production.

The pilot carbon trading schemes thus represented a strategic intervention which accelerated this spatial transition whilst addressing the mounting environmental pressures that threatened the CCP's legitimacy in its urban cores. As manufacturing employment in these cities stabilised and service sector growth accelerated, local governments faced reduced political resistance from industrial workers to policies that would impose constraints on carbon-intensive activities. Moreover, in these cities, the emergent high-value manufacturing jobs were increasingly focused on renewables, EVs, batteries, and other advanced technologies (Wang et al., 2021).

Simultaneously, the visible environmental degradation that had sparked widespread activism during the height of industrialisation created sustained pressure from urban environmentalists. The carbon markets offered a technocratic mechanism to resolve this environmental discontent, thus demonstrating the party-state's capacity to manage the ecological consequences of development whilst continuing to raise living standards.

More fundamentally, the carbon trading pilots reflected the CCP's growing confidence in renewable energy's capacity to serve major urban energy demand without compromising economic stability. Unlike the early 2000s, when renewable deployment was primarily viewed as supplementary capacity for urban development and an alternate pathway to rural electrification, by the 2010s, China's manufacturing capabilities had matured to the point where renewables could begin to realistically partially substitute new fossil generation in major metropolitan areas. The technical advances in grid integration, storage technologies, and renewable efficiency - all products of the decade-long developmental state investment - had eliminated many of the infrastructural barriers that previously made large-scale urban renewable deployment impractical. This technological maturation was crucial because it meant that carbon constraints imposed through trading schemes would not simply create energy shortages but would instead create market space for renewable expansion, aligning environmental goals with the continued growth of China's strategic green industries.

The pilot carbon markets also functioned as deliberate policy experimentation designed to build institutional capacity for eventual national emissions trading scheme implementation, representing a qualitative departure from the ad-hoc crisis management that had characterised

earlier policy-making. Rather than reactive responses to immediate energy supply bottlenecks or export shocks, the carbon trading development reflected systematic institutional learning aimed at mastering the complex administrative and technical challenges of large-scale emissions governance. The selection of diverse pilot locations - from manufacturing-heavy Guangdong to service-oriented Beijing - enabled the party-state to test different design parameters and administrative approaches whilst developing the bureaucratic expertise necessary for national-level carbon market operation (Zhang, 2022; Sun, 2025). This experimental approach embodied the shift toward long-term strategic planning, as policymakers recognised that effective carbon governance required sophisticated institutional capabilities that could only be developed through sustained practical experience rather than theoretical preparation.

Crucially, the timing of carbon market introduction coincided with a deceleration in energy demand growth rates that fundamentally altered the political economy of energy development in China's mature industrial centres. Unlike the explosive demand growth of the early 2000s that had enabled renewable addition without threatening fossil fuel interests, by the 2010s, energy consumption growth had moderated as these cities transitioned toward service-dominated economies with lower energy intensity per unit of economic output. This moderation created conditions where renewable expansion increasingly required, on a regional basis, limiting the expansion of fossil fuel utilisation. This was far from approaching the substitution dynamic that operated in the US, yet it still heightened political resistance from the fossil economy - with local governments cooperating with large firms to water down and delay the implementation of the pilot schemes and other environmental measures (Shen and Xie, 2018; Zhang, Orbie and Delputte, 2020; Wang and Paavola, 2023). However, the spatial restructuring of China's

industrial base meant that the most carbon-intensive production was actively being relocated to interior provinces, whilst the renewable sector's demonstrated capacity for high-quality manufacturing employment provided credible alternatives for workers transitioning out of fossil fuel industries. This, in combination with the centralisation of political authority under the Xi administration, effectively neutralised any budding resistance to the deepening green developmental state.

The marked intensification of China's renewable energy ambitions during Xi Jinping's presidency raises important questions about the relative importance of leadership style versus structural economic conditions in driving policy development. Indeed, there is a wealth of literature that links the drive toward more bold and strategic policy-making to Xi Jinping's leadership style, particularly concerning the sidelining of collective decision-making and adoption of a more assertive and centralised leadership style (Ferdinand, 2016; Economy, 2018; Zhang, 2019). From this perspective, Xi's more assertive and centralised leadership style - exemplified by his drive to enhance the role of the party-state in economic coordination - could be interpreted as the real primary driver behind China's strategic shift in green policy-making, rather than changes in the economic composition.

Leadership styles and political choices played crucial roles in shaping the pace and direction of policy development, while the broader trajectory reflected the interaction between these political decisions and evolving structural conditions. The continuity across the Hu-Xi transition suggests both leaders were responding to similar underlying pressures, though through different approaches that reflected their distinct political styles and the changing structural conditions they

faced. Xi's intensification of green developmentalism built directly upon the institutional and industrial foundations established during Hu's presidency, rather than representing a fundamental reorientation of China's approach. Moreover, one of the key examples of the shift toward more strategic and ambitious green policy-making, the introduction of climate targets into the FYPs, occurred before the transition to the Xi presidency had even begun - with the targets being announced in 2011. Both Hu and Xi were responding to the same underlying structural imperatives - particularly the need to address environmental legitimacy crises whilst evolving the nature of industrial employment and economic growth. Xi's more assertive approach reflects China's strengthened position in global renewable energy markets rather than a fundamentally different approach to the challenges facing Chinese development. This does not diminish the importance of Xi's leadership innovations, particularly his success in elevating environmental concerns within party ideology and improving coordination between different governmental levels. Rather, the analysis produced here suggests that Xi's effectiveness stemmed from his ability to articulate and institutionalise responses to evolving structural pressures and the interests of core actor groupings that had been building throughout China's industrialisation process, making his leadership the medium through which deeper economic contradictions were politically mediated rather than the driving cause.

Beyond the question of leadership style, the institutionalist literature's emphasis on China's authoritarian governance structure raises a crucial question about the relationship between political systems and renewable energy development that this dissertation's critical political-economic framework must address directly. Within the literature, Gilley (2012) has argued that the authoritarian nature of China's political system, particularly at the central

government level, was a key driver in its green policy-making. In particular, he highlights the absence of formal oppositional processes during the passage of policy, due to the absence of participatory policy-making. Similarly, Chen and Lees (2016) highlight the affinity between China's developmental state model and its authoritarian political system, providing qualitative advantages over democratic systems in designing and implementing comprehensive industrial policies. Lo (2015) and Xiang and Lo (2024) have developed more nuanced understandings, showing the roles of activism and participation within China's authoritarian environmentalism, whilst still maintaining the core role of authoritarianism in its policy-making success. These analyses suggest that authoritarian governance was not merely helpful but potentially necessary for the scale and speed of China's renewable energy transformation, raising questions about whether similar outcomes could have been achieved under different political arrangements.

This institutionalist argument cannot be ignored, particularly given this dissertation's comparison of China's authoritarian governance and its renewable energy success to the fragmented policy-making in the democratic system of the US. Building upon these insights, this dissertation's analysis suggests that authoritarian governance interacted with specific economic conditions to enable China's renewable energy success, rather than operating as an independent causal factor. There is no denying that China's authoritarian governance structure was advantageous for implementing coordinated industrial policy, but similar institutional arrangements exist in other authoritarian contexts, such as Vietnam, that did not pursue comparable green developmentalist policies. The key distinction lies not in the authoritarian nature of China's party-state per se, but in the combination of authoritarian governance with the specific economic contradictions generated by rapid industrialisation that created both the

necessity for renewable energy development and the political conditions for its successful implementation.

Furthermore, democratic governance in other contexts did not prevent renewable energy policy-making. Many of the mechanisms constitutive of China's comprehensive approach were implemented in European nations and particular US states, including renewable portfolio standards, feed-in-tariffs, carbon markets, R&D subsidies, and demonstration programmes, which were all fixtures of democratic energy governance. Taken further, whilst the specific form of industrial planning in China has predominantly operated in authoritarian contexts, the liberal democracies of Europe and North America, in the middle of the twentieth century, partook in robust state planning and management of key sectors of the economy. A hypothetical democratic China undergoing the same process of industrialisation - including the socio-ecological crisis, unsustainable growth model, and explosive energy demand - might well have developed similar institutional mechanisms for renewable energy development, potentially through coalition-building between environmental groups, industrial unions, and green technology sectors. What is argued here is not that China's authoritarian governance had no role in its renewable energy success, but that China's specific economic composition created favourable structural conditions and aligned multiple social forces behind green developmentalism, which acted as the primary driver towards the party-state's adoption of its policies.

This section has analysed how China's renewable energy policy-making underwent a fundamental qualitative transformation from reactive crisis management to comprehensive long-term strategising, deepening the green developmental state and cementing it as a permanent

cornerstone of economic policy-making. The integration of renewable targets into the Five-Year Plans, the BRI's development of global supply chains and export markets, and the incremental development of the institutional capacity for a national emissions market collectively embody this shift in policy-making. Together, they demonstrate that by the early 2010s, green developmentalism had transcended its origins as an improvised response to energy shortages, environmental crises, and export shortfalls to become the CCP's chosen pathway for navigating the contradictions of China's slowing industrialisation process. This strategic deepening was not a natural institutional evolution but reflected the structural imperatives created by China's changing economic composition: as double-digit growth ended, labour costs climbed, and low-value manufacturing advantages eroded, the party-state recognised that technological leadership in strategic green sectors represented the optimal route to resist industrial stagnation whilst simultaneously addressing the environmental legitimacy crises that threatened urban stability. The coherent policy framework that emerged thus embodied the historical convergence of late industrialisation's contradictions with the renewable sector's proven capacity to deliver high-quality employment, export revenues, and ecological modernisation, cementing the Green Divergence as an inevitable product of China's delayed but accelerated integration into global capitalism.

[7.3] Conclusion

This process analysis has traced how China's renewable energy policy-making evolved through two distinct phases that mirror the changing dynamics of its rapid industrialisation. The crisis-driven foundation phase (2003-2010) revealed how successive energy shortages,

environmental legitimacy threats, and export demand collapses compelled the party-state to construct the institutional architecture of green developmentalism through reactive, adaptive responses. The strategic deepening phase (2011-2017) demonstrated the qualitative transformation toward comprehensive long-term planning, as renewable energy ascended from a crisis management tool to the cornerstone of China's developmental strategy.

The iterative policy-making process examined - from the REL through the BRI - crystallised the structural advantages created by China's economic composition during industrialisation. Energy diversification imperatives, visible ecological crises, and addition dynamics created both the necessity and political space for ambitious renewable policies, whilst retained state capacity and manufacturing capabilities provided the tools for effective implementation. This stands in stark contrast to the post-industrial constraints that systematically undermined America's transitional efforts.

Yet this analysis raises crucial questions about the broader implications of the Green Divergence for global energy governance. If China's renewable leadership emerges from the specific contradictions of late industrialisation rather than superior institutional design, what does this suggest about the possibilities for accelerated transitions in other contexts? How do these divergent pathways reshape global power dynamics and climate governance? The next section synthesises these findings through systematic comparison, examining how the contradictory effects of (de)industrialisation within global capitalism produced not merely different national outcomes but a fundamental reconfiguration of the geopolitical terrain upon which energy transitions are contested.

Section 3: Looking Across the Pacific: Comparing the Energy Transitions

Chapter 8: Comparison and Conclusion

[8.0] Chapter Outline

This comparative chapter synthesises the empirical findings from the preceding case study analyses to demonstrate how the divergent processes of deindustrialisation in the United States and rapid industrialisation in China fundamentally determined their contrasting energy transition trajectories. Rather than treating these as independent national phenomena shaped by distinct institutional arrangements, cultural values, or policy designs, this chapter reveals the Green Divergence as the contradictory outcome of a unified global process of capitalist restructuring that spatially reorganised production, ecological burdens, and political possibilities for climate action. Through systematic comparison across the context, actor, and process dimensions analysed in Chapters 2 to 7, this chapter advances the dissertation's central argument that economic composition - specifically the centrality of manufacturing and developmental stage of national economies - constitutes the primary determinant of energy transition governance capacity between the global superpowers.

The chapter is organised around three comparative sections that progressively build the case for economic composition's primacy while addressing alternative explanations. The first section synthesises the structural analyses from Chapters 2 and 5 to reveal how America's post-industrial economy and China's industrialising economy created fundamentally incompatible political-economic environments for renewable energy development. This section demonstrates

how the spatial displacement of the metabolic rift through deindustrialisation enabled fossil capital's ideological dominance in the US by obscuring the ecological consequences of consumption, while China's concentration of global manufacturing intensified environmental crises to the point where renewable development became essential for regime legitimacy. It discusses the structural weak points in the two poles of the global economy and how both created divergent economic imperatives for energy development - in the US towards fracking and in China towards renewable manufacturing. Furthermore, it traces how divergent energy demand trajectories - stagnant in the post-industrial US, explosive in industrialising China - established substitution versus addition dynamics that determined whether renewable expansion threatened or complemented existing fossil fuel interests. Finally, it examines how deindustrialisation hollowed out American state capacity for industrial policy while China's developmental imperatives revitalised centralised planning capabilities essential for coordinated renewable deployment.

The second section synthesises the analyses from Chapters 3 and 6 to compare how (de)industrialisation systematically reshaped the constellation of social forces influencing energy policy in each context. This section demonstrates how deindustrialisation fractured the American labour-environmentalist coalition by transforming remaining fossil fuel jobs into precious bastions of unionised employment while relegating so-called green jobs to precarious service work, creating structural antagonism between working-class interests and renewable development. It contrasts this with China's industrialisation process, which aligned renewable manufacturing with working-class employment by providing industrial careers in clean technology production. The analysis extends beyond labour to examine how post-industrial

America generated an elite-dominated environmental coalition incapable of popular mobilisation, while China's industrialisation forged a broad developmental coalition encompassing workers, environmentalists, nationalists, and state planners united around green modernisation. Finally, it traces how these social configurations shaped divergent leadership approaches - Obama's market-driven incrementalism reflecting post-industrial governance limitations versus Hu and Xi's state-led developmentalism necessitated by industrialisation's ecological and economic contradictions.

The third section synthesises the process analyses from Chapters 4 and 7 to demonstrate how the structural conditions and actor configurations established through economic composition determined the concrete pathways of energy policy formation and implementation. This section contrasts the failure of comprehensive federal climate legislation in the US with China's iterative expansion of renewable energy policy, revealing how deindustrialisation created institutional fragmentation and corporate capture that prevented transformative action while China's developmental state capacity enabled responsive policy adaptation. It examines how the Waxman-Markey bill's defeat reflected not merely tactical errors but the systematic undermining of popular coalition-building capacity through deindustrialisation, while China's regulatory evolution demonstrated how industrialisation's imperatives drove continuous policy innovation. The analysis traces, through the processes of policy formation, how substitution dynamics in the US created zero-sum conflicts that paralysed federal action while addition dynamics in China enabled simultaneous fossil and renewable expansion, providing political space for ambitious green targets without immediate confrontation with incumbent interests.

The final section acknowledges competing interpretations of the Green Divergence while demonstrating the explanatory superiority of the critical political economy framework. This section examines alternative explanations - institutional design differences, cultural attitudes, natural resource endowments, firm-level specialisations, ideological differences, and the role of leadership. It argues that whilst each of these clearly played an important role in the Green Divergence, they were often reflective of the underlying economic transformations underway, and were not the primary determinant. It thus demonstrates how institutional arrangements, often cited as primary explanatory factors, were themselves products of economic composition, with America's lack of state capacity and centralised planning institutions reflecting post-industrial transformations while China's centralised planning capacity stemmed from industrialisation's coordination demands. The analysis reveals how cultural and ideological differences - American market liberalism versus Chinese state developmentalism, climate denialism versus environmental pragmatism - emerged from material conditions, particularly shaped by whether ecological consequences were spatially displaced or concentrated through (de)industrialisation.

[8.1] Comparing Contexts

The preceding analyses of the American and Chinese contexts have revealed that the Green Divergence did not emerge from isolated national trajectories but from contradictory outcomes of a unified global process: the spatial reorganisation of capitalist production through globalisation. Where deindustrialisation in the US systematically amplified fossil capital's dominance while eroding the conditions for transitional governance, China's rapid industrialisation created both the structural imperative and institutional capacity to pursue

renewable energy development as a strategic response to the ecological and economic contradictions of fossil-fuelled growth. This section synthesises the findings of Chapters 2 and 5 to demonstrate how the divergent economic compositions of the two states - the US' post-industrial economy and China's industrial developmental model - produced completely divergent political-economic landscapes for energy transition governance.

First, the spatial concentration of ecological burdens under global capitalism fundamentally reshaped the political terrain for energy transitions in both contexts. In the US, deindustrialisation's outsourcing of manufacturing to China and the Global South displaced the metabolic rift's most dire and visible consequences beyond national borders. This spatial shift enabled fossil capital to consolidate ideological dominance by obscuring the material connections between American consumption patterns and ecological degradation. As highlighted in Chapter 2, the offshoring of carbon-intensive production allowed US policymakers and fossil capitalists to frame climate change as an external threat emanating from Chinese factories rather than a systemic consequence of capitalist growth. This spatial obfuscation proved fertile ground for climate denialism, as domestic capitalists could position environmental regulations as economically suicidal sacrifices made for foreign polluters' benefit. Meanwhile, China's industrialisation process inverted this dynamic by concentrating the metabolic rift's consequences in its coastal economic heartlands. The same factories producing goods for global markets emitted pollutants that turned Shanghai's air grey and unleashed a wave of catastrophic health crises. Unlike the US' abstracted climate politics, China's environmental crisis became viscerally immediate - a daily assault on public health, economic productivity, and social life that threatened the CCP's performance-based legitimacy. This spatial compression of ecological

consequences created powerful imperatives: industrialisation generated both the pollution-demanding state response and the manufacturing capabilities enabling renewable solutions. Where America's displaced metabolic rift weakened pro-transition coalitions, China's concentrated rift aligned environmental action with the imperative of regime survival.

The structural vulnerabilities embedded in each nation's economic model further amplified their divergent trajectories. America's post-industrial economy, despite its advantages in R&D and tech services, systematically disincentivised renewable manufacturing. As discussed, the financialisation of the US economy privileged short-term returns over long-term industrial investments, leaving renewable innovation stranded in laboratories rather than scaled in factories. The offshoring of manufacturing eroded the industrial capacity and institutionalised support required to develop a renewable economy that could provide satisfactory employment to the losers of deindustrialisation and the green transition. Furthermore, this deindustrialised landscape left fossil capital as the sole remaining source of high-wage industrial employment in key regions, transforming the energy transition into a perceived threat to working-class livelihoods. China's industrialisation process generated the opposite dynamic. The export-oriented growth model's reliance on low-value manufacturing created acute vulnerabilities: dependence on foreign technology, susceptibility to competition from lower labour-cost economies, and exposure to global market fluctuations. Renewable energy emerged as the strategic solution to these vulnerabilities, offering a sector where China could leverage its industrial ecosystem to ascend the value chain. Solar panel and wind turbine production required precisely the capabilities honed through decades of electronics and machinery manufacturing, enabling China to expand existing supply chains and human capital pools rather than build new

ones. Crucially, renewable manufacturing provided high-value employment that aligned environmental and economic objectives - a stark contrast to the US' framing of the green transition, embodying an assault on the few remaining traditional jobs in Appalachian communities.

Another key point developed is that the divergent energy demand trajectories stemming from (de)industrialisation created fundamentally different political economies of renewable deployment. America's stagnant post-industrial energy demand forced renewable growth into a substitution dynamic, where every megawatt of clean energy threatened existing fossil fuel assets. This zero-sum logic intensified opposition from fossil capital, as demonstrated by the fierce opposition - from sections of the Democrats and Republicans - against the moderate Waxman-Markey bill. The substitution dynamic helped to fracture potential pro-transition coalitions, pitting renewable advocates against unions defending fossil jobs in a shrinking industrial pie. Meanwhile, China's explosive industrial energy demand created an additional dynamic that temporarily reconciled fossil and renewable interests. Instead of facing stagnation, China was fighting desperately to stave off energy shortages, expanding its energy consumption by three times over between 2000 and 2010 (IEA, 2023a). In this context, renewables served as complementary capacity rather than competitive substitutes. Renewables were a pragmatic solution to recurring blackouts rather than an existential threat to coal interests. This additive logic allowed the CCP to build renewable manufacturing dominance while delaying fossil phase-out, resolving the immediate crisis of energy security without confronting entrenched coal interests. The resulting contradiction of simultaneous renewable expansion and coal plant

construction proved strategically sustainable precisely because industrialisation's energy hunger created space for both.

Finally, the institutional capacities forged through (de)industrialisation determined each state's ability to execute coherent energy strategies. America's deindustrialisation eroded the developmental state structures that had underpinned mid-century industrial policy, leaving a fragmented governance landscape ill-equipped for systemic transition. The hollowing-out of manufacturing weakened the political coalitions supporting industrial economic planning, while financialisation shifted policy influence to corporate elites, favouring market-based solutions. The post-industrial state lacked the administrative tools and political consensus to override fossil capital's veto points. In contrast, China's industrialisation process had the opposite effect, revitalising and sustaining the CCP's industrial planning capacities. The state's role in coordinating FDI inflows, managing cooperation in joint enterprises, and directing infrastructure and utility investment provided an institutional template for renewable industrial policy. Critically, industrialisation's revitalisation of the developmental state enabled policy instruments unimaginable in the US context: provincial governments could mandate renewable procurement quotas because the grid operators were state-owned; state banks financed factories, knowing state-driven domestic demand would absorb overproduction.

These contextual comparisons reveal that the Green Divergence stems primarily from the two countries' opposing positions within capitalism's global division of labour. The US' deindustrialisation and China's industrialisation represent two faces of the same capitalist transformation in response to the crises of profitability. It was a spatial reorganisation of

production that concentrated manufacturing emissions in China and thus concentrated the imperatives to overcome the limitations of fossil capitalism within its borders. Whilst America's post-industrial economy systematically advantaged fossil capital by obscuring ecological costs, eroding state capacity, and framing transition as economic suicide. China's industrialising economy compelled renewable development by making ecological costs unignorable, revitalising state planning capacities, and aligning green growth with national ascent. The tragedy of this divergence lies in its self-reproducing logic: America's fossil lock-in deepens as China's renewable dominance grows. However, as the analysis of the Chinese addition dynamics reveals, China's path contains its own contradictions - a renewable manufacturing base built on coal-powered growth, an ecological modernisation that has postponed decarbonisation. The Green Divergence thus embodies capitalism's crisis of spatial and temporal displacement, supposedly solving contradictions in one sphere by intensifying them elsewhere. Only by confronting this systemic logic can we move beyond divergence toward genuinely sustainable transitions.

[8.2] Comparing Actors

The divergent trajectories of energy transition governance in China and the US cannot be fully understood without examining how (de)industrialisation reconfigured the balance of social forces in each context, as demonstrated in Chapters 3 and 6. Where America's post-industrial economy fractured potential pro-transition coalitions and constrained political leadership within market-oriented frameworks, China's rapid industrialisation created conditions for broad coalitional alignment around renewable development whilst necessitating transformative

state-led approaches to energy governance. This section synthesises the actor analyses from Chapters 3 and 6 to demonstrate how contrasting economic compositions systematically produced divergent actor configurations - fragmented and defensive in the US, cohesive and expansive in China - that determined each nation's capacity for comprehensive energy transition policy-making.

The most striking divergence emerges in organised labour's relationship to renewable energy development, where (de)industrialisation created diametrically opposed material interests. In the US, deindustrialisation's systematic destruction of manufacturing employment left fossil fuel jobs among the few remaining bastions of high-wage unionised work in devastated former-industrial regions. The UMWA's fierce opposition to Waxman-Markey exemplified this defensive posture, as coal mining had become economically vital to Appalachian communities stripped of alternative industrial employment. The UMWA's strategic embrace of carbon capture technology over renewable development reflected not ideological climate denial or techno-optimism but desperate attempts to preserve their members' livelihoods amid post-industrial devastation. This antagonism was deepened by the renewable sector's concentration in non-unionised service work - installation and maintenance jobs that offered neither the wages nor security of traditional industrial employment. Even labour organisations supporting Waxman-Markey, like the AFL-CIO's executive leadership, did so with limited enthusiasm, vaguely hoping for "green union jobs" with no clear pathway to materialisation.

China's industrialisation process inverted this dynamic by positioning renewable manufacturing as a major expansion opportunity for the swelling industrial working class. The same

export-oriented growth model that concentrated hundreds of millions of migrant workers in coastal cities also created the production networks, supply chains, and skill bases necessary for solar panel and wind turbine manufacturing at an unprecedented scale. Rather than experiencing renewable expansion as displacement, industrial workers found career continuity through reskilling programmes that effectively transferred manufacturing and engineering expertise into clean technology sectors. The manufacturing-intensive character of China's green economy meant that renewable development directly expanded relatively high-quality industrial employment rather than threatening it, creating structural alignment between worker interests and environmental objectives that was impossible in America's service-dominated post-industrial context. Beyond manufacturing, the growth of the green extractivist sector in China also enabled a more direct transition of Chinese fossil fuel workers into the new economy.

The transformation of the environmentalist movement itself represents a second critical divergence shaped by economic composition. America's environmental movement underwent profound recomposition through deindustrialisation, becoming increasingly concentrated in affluent coastal metropolitan areas and dependent on professional NGO networks. This geographic and class transformation severed the movement's organic connections to working-class constituencies, particularly in the deindustrialised regions where decisive Senate votes would be contested. The resulting environmentalist coalition was dominated by a corporate liberalism - exemplified by USCAP's inclusion of fossil fuel companies like BP and ConocoPhillips alongside elite environmental organisations. This elite orientation produced policy frameworks prioritising carbon trading mechanisms compatible with corporate profitability over popular economic revitalisation that might have addressed working-class

anxieties in fossil fuel-dependent regions. Fundamentally, this left them incapable of linking up with and mobilising the key working-class constituencies that were necessary to win over in order to pass ambitious climate legislation.

In contrast, China's environmental movement developed within fundamentally different structural conditions, which facilitated its eventual operation as part of a broader coalition conditionally supporting state-led ecological modernisation. The concentration of environmental degradation in China's economic heartlands - where both party elites and industrial workers experienced immediate health consequences - created shared material interests that transcended class divisions. Environmental organisations, while operating under strict state oversight, found their concerns integrated into the policy-making process and the formulation of state plans rather than being outmanoeuvred and blocked by fossil capitalists. This integration was facilitated by industrialisation's creation of visible, tangible environmental crises that affected all social strata, contrasting sharply with America's spatial displacement of ecological consequences that enabled climate denialism to flourish in deindustrialised regions.

The coalitional dynamics extend beyond environmentalists to encompass broader pro-transition alliances that reflect each economy's structural imperatives. China's industrialisation process forged what Chapter 6 identifies as the “big green tent” that integrated environmentally concerned civil society organisations, green technology manufacturers, and Chinese nationalists around shared support for renewable development. This coalition derived strength from renewable energy's capacity to simultaneously address multiple national priorities: environmental protection through pollution reduction, economic development through

high-value manufacturing, technological advancement through industrial innovation, and national security through energy independence. The alignment of these diverse interests made opposition to green transition politically costly, as any resistance would need to challenge multiple powerful constituencies simultaneously. America's post-industrial context produced no comparable coalitional coherence. Instead, deindustrialisation's effects created what Chapter 3 reveals as fundamental fractures within the potential pro-transition coalition. The AFL-CIO's support for Waxman-Markey was undermined by fossil fuel unions' opposition, the environmental movement's elite orientation alienated working-class constituencies, and corporate involvement through USCAP prioritised market mechanisms over redistributive policies that might have built popular support.

The divergent economic compositions' effects also resulted in the contrasting approaches of executive leadership, where Obama's market-centric incrementalism stood in stark opposition to the transformative developmental approaches pursued by Hu and Xi. Obama's transitional imaginary, centred on energy security through domestic fossil fuel expansion and gradual technological modernisation, reflected deindustrialisation's erosion of state capacity for industrial planning. His administration's reliance on private innovation and market mechanisms - epitomised by the embrace of fracked natural gas as a “bridge fuel” and outsourcing of climate policy design to USCAP - stemmed from both ideological commitment to neoliberal governance and structural constraints imposed by the post-industrial economy. Finally, Obama's hands-off approach to Waxman-Markey, despite possessing unprecedented political capital, reflected the post-industrial retreat from mass politics toward elite stakeholder engagement that characterised Democratic Party leadership.

Hu and Xi operated within dramatically different structural imperatives that both necessitated and enabled transformative state intervention. The “Scientific Outlook on Development” concept developed under Hu and the “Ecological Civilisation” framework advanced by Xi represented necessary adaptations to industrialisation's dual crises: deepening ecological degradation and looming economic stagnation. Both leaders leveraged state planning capacities that remained vital for managing industrialisation's tumultuous effects - energy crises, rapid urbanisation, environmental disasters, and social transformation - to develop renewable policy into a comprehensive industrial policy. Where Obama lacked both willingness and capacity for transformational intervention, Hu and Xi were compelled toward ambitious state-led approaches by industrialisation's imperative to climb the value chain, address the ecological crisis, and other contradictions threatening the entire developmental project.

These leadership differences reflected broader transformations in state capacity forged through (de)industrialisation. America's post-industrial economy had systematically weakened the institutional infrastructure necessary for popular political mobilisation while elevating technocratic expertise over mass engagement. China's industrialisation, conversely, maintained and revitalised state planning institutions through the practical necessities of managing breakneck economic transformation, creating both the capacity and imperative for comprehensive industrial policy, including renewable energy development. The result was leadership operating within entirely different possibilities: Obama constrained by market-liberal ideology and atrophied state capacity, Hu and Xi enabled by developmental imperatives and robust planning institutions.

These actor-level divergences were not contingent political outcomes but systematic products of (de)industrialisation's reconfiguration of class relations, coalitional possibilities, and state capacities. America's post-industrial transformation systematically disorganised pro-transition forces by severing labour-environmental solidarity, concentrating environmentalism in elite networks, and constraining leadership within market-oriented frameworks. The resultant political vacuum enabled fossil capital to maintain dominance through ideological hegemony and structural advantages embedded in post-industrial governance. China's industrialisation, conversely, reorganised social forces around transitional imperatives by aligning manufacturing employment with renewable expansion, integrating environmental concerns within developmental planning, and necessitating transformative state intervention to manage industrialisation's contradictions. This comparative analysis furthers the conclusion that the Green Divergence emerged primarily from the economic transformations that reconfigured the fundamental terrain of political possibility. Where deindustrialisation fragmented American environmental politics into an isolated elite project incapable of challenging fossil dominance, China's industrialisation created the social foundations, institutional arrangements, and developmental imperatives for comprehensive energy transition governance.

[8.3] Comparing Processes

The process analyses of Waxman-Markey's failure in the United States and China's iterative renewable energy policy development reveal the most striking dimension of the Green Divergence: how fundamentally different political-economic compositions generated entirely

opposite dynamics of policy-making that crystallised the broader structural and actor-level contradictions examined in previous chapters. Where America's post-industrial landscape produced elite-dominated, corporate-oriented policy processes that systematically excluded popular participation and reinforced fossil capital's hegemony, China's industrialising context enabled transformative state-led mobilisation that integrated diverse social forces into a coherent developmental framework. This comparison illuminates how the same global capitalist restructuring that hollowed out America's capacity for comprehensive climate action simultaneously created the conditions for China's emergence as the world's leading renewable energy developer.

The most fundamental contrast lies in the relationship between policy design and popular mobilisation that characterised each country's approach to energy transition governance. As demonstrated in Chapter 4's process analysis, Waxman-Markey's formulation through USCAP represented the crystallisation of deindustrialisation's transformation of American environmental politics into an elite-dominated enterprise structurally incapable of building the popular coalitions necessary to challenge fossil capital. The bill's market-centric mechanisms - cap and trade, technology subsidies, extensive offset provisions - reflected the environmental movement's post-industrial recomposition into professionalised NGOs embedded within coastal metropolitan networks that prioritised corporate partnerships over working-class mobilisation. This elite orientation was not a strategic error but a structural inevitability, emerging from the economic pressures, geographic polarisation, and class stratification that deindustrialisation had imposed upon American political coalitions. The resulting policy framework appeared elegant and well-balanced to coastal elites while remaining fundamentally alien to the economic realities

facing deindustrialised communities, creating systematic vulnerabilities that fossil capital readily exploited through targeted campaigns emphasising job losses and regulatory burden.

In stark contrast, Chapter 7's process analysis revealed how China's iterative policy-making approach continually adapted to changing material conditions and shifting social forces, which converged behind green developmentalism. The evolution from the Renewable Energy Law of 2005 through the ambitious climate targets in the 2016 Five-Year Plan demonstrated a fundamentally different relationship between environmentalist policy-making and popular interests, where renewable energy development aligned with rather than threatened working-class employment and regional economic development. This alignment was not coincidental but reflected industrialisation's creation of material conditions where green manufacturing provided high-value industrial employment while addressing the visible environmental crises concentrated in China's coastal cities. Unlike America's corporate-oriented approach that excluded labour organisations from Waxman-Markey's formulation, China's developmental model integrated worker interests through the ACFTU and state-led industrial planning that guaranteed employment creation alongside environmental improvement, eliminating the labour-environment tensions that plagued American climate politics.

The temporal dynamics of each policy-making process reveal another crucial dimension of the Green Divergence. Waxman-Markey's trajectory from introduction in May 2009 to abandonment in July 2010 reflected the compressed timeframe within which federal climate legislation had to succeed before political opposition consolidated and electoral dynamics shifted. This urgency stemmed from deindustrialisation's systematic weakening of pro-transition coalitions, which

meant that rare moments of unified Democratic control represented fleeting opportunities that could not be sustained against sustained fossil capital opposition. The bill's rapid collapse in the Senate demonstrated the structural fragility of corporate-dominated policy processes that lacked popular mobilisation capacity to pressure wavering legislators. Obama's hands-off approach compounded this temporal compression by failing to leverage his unprecedented popular support to build sustained pressure for climate action, instead defaulting to elite stakeholder negotiations that fossil interests systematically exploited.

China's iterative approach operated within fundamentally different temporal dynamics that reflected industrialisation's creation of sustained developmental momentum rather than fragile political windows. The evolution from basic renewable energy legislation in 2005 to ambitious climate targets in 2011 and 2016 demonstrated the party-state's capacity to adapt and expand policies in response to changing material conditions and growing institutional capabilities. This iterative development was enabled by the alignment of renewable energy policies with broader objectives emerging out of industrialisation, which created sustained political support rather than momentary consensus. The CCP's time horizon extended across decades rather than electoral cycles, enabling comprehensive planning that integrated environmental goals with long-term developmental strategies. This temporal stability was indicative not just of the party-state's authoritarian structure but of the material foundation of ongoing industrialisation, which generated sustained demand for state-led coordination and planning that could accommodate expanding renewable energy development alongside continued economic growth.

The relationship between central and local governance in each country's policy-making process further illustrates how different political-economic compositions shaped energy transition outcomes. Waxman-Markey's failure at the federal level left American renewable energy development fragmented across state-level initiatives that varied dramatically based on regional political economies and fossil fuel dependencies. Progressive states with flourishing service economies successfully implemented renewable portfolio standards and other transitional policies, while conservative states with fossil fuel dependencies resisted comparable measures. This fragmentation reflected deindustrialisation's creation of divergent regional trajectories that made comprehensive federal action politically impossible. The absence of effective federal coordination meant that renewable energy development proceeded unevenly, with post-industrial coastal regions advancing while fossil-dependent heartlands stagnated, reinforcing the geographic polarisation that had initially prevented federal legislation.

By contrast, China's approach integrated central planning with local implementation through hierarchical coordination that reflected the party-state's institutional architecture and its underlying developmental imperatives. Provincial governments became active participants in renewable energy development through policy entrepreneurialism that competed to develop nationally competitive green technology industries, creating systematic incentives for innovation and expansion rather than resistance. This central-local integration was enabled by the alignment of renewable energy development with local economic development objectives, particularly in coastal regions where environmental degradation threatened economic sustainability. The party-state's capacity to coordinate across governmental levels reflected not just institutional

design but the material necessity of managing rapid industrialisation's environmental and social consequences through comprehensive state intervention.

The role of crisis management in each policy-making process reveals how different political-economic compositions shaped responses to external shocks and changing conditions. Waxman-Markey's formulation occurred during the acute phase of the 2008 financial crisis, yet the bill's design reflected the environmental movement's structural incapacity to link climate action with economic recovery in ways that appealed to working-class constituencies devastated by deindustrialisation. The crisis intensified public sensitivity to economic costs while eliminating any slight prospects for energy demand growth that might have created space for renewable additions without directly threatening fossil fuel generation. Obama's simultaneous embrace of the fracking revolution as a crisis response revealed the post-industrial state's systematic bias toward market-driven solutions that preserved corporate profitability rather than transformative interventions that might have challenged existing power structures.

China's iterative policy-making demonstrated superior adaptive capacity precisely because renewable energy development emerged through crisis management and because it addressed multiple underlying objectives simultaneously. The 2009 revision of the Renewable Energy Law and associated programmes emerged as responses to the global financial crisis and declining international demand for Chinese renewable energy products, yet these adaptations reinforced rather than undermined China's long-term developmental strategy. The CCP's capacity to use external shocks as opportunities for accelerating domestic renewable energy development reflected the alignment of environmental goals with industrial policy objectives and employment

creation. This integration enabled crisis responses that strengthened rather than weakened renewable energy development, contrasting sharply with America's tendency to prioritise short-term economic relief over long-term developmental and environmental objectives.

The international dimensions of each policy-making process further illuminate how different positions within global capitalism shaped national energy governance. Waxman-Markey's design reflected America's post-industrial economy's structural dependency on market mechanisms and technological innovation to deliver climate solutions without confronting the global production networks that had displaced environmental consequences overseas. The bill's carbon trading framework assumed that pricing mechanisms could drive renewable energy development without addressing the systematic disadvantages facing domestic renewable manufacturing or the structural power of fossil capital. This approach reflected the post-industrial economy's disconnection from the material basis of production, creating climate policies that remained distant from the industrial transformation necessary for comprehensive decarbonisation.

China's renewable energy development was systematically integrated into global market positioning and export strategies that leveraged industrialisation's accumulated capabilities to dominate emergent sectors. The party-state's approach treated renewable energy not merely as environmental policy but as a comprehensive industrial strategy requiring coordinated investment in research, manufacturing, infrastructure, and market development. This integration reflected China's positioning within global production networks as the primary destination for manufacturing investment, enabling technological advancement through production scaling, transfers, and local innovation. The result was renewable energy policies that simultaneously

addressed domestic environmental crises, provided high-value employment opportunities, and positioned China as the dominant global supplier in strategic sectors, creating self-reinforcing dynamics that sustained political support across changing conditions.

The contrasting outcomes of these divergent process dynamics crystallised the broader structural and actor-level contradictions that defined the Green Divergence. Where America's post-industrial composition generated policy processes that systematically excluded popular orientation and participation while accommodating fossil capital's interests, China's industrialising trajectory enabled transformative state-led mobilisation that integrated environmental goals with developmental objectives, whilst speaking to working-class interests. Where American climate legislation collapsed under the weight of its own contradictions and fossil capitalist opposition, Chinese renewable energy policy evolved through iterative adaptation that strengthened its coherence and institutional capacity. Most fundamentally, where deindustrialisation had hollowed out America's capacity for comprehensive climate action by fragmenting pro-transition coalitions and constraining state planning capabilities, industrialisation created the material foundations for China's emergence as the world's leading renewable energy developer through the alignment of environmental necessities with developmental opportunities.

This process-level comparison reveals the Green Divergence as emerging from the contradictory effects of global capitalism's spatial reorganisation, wherein the same processes that systematically undermined America's capacity for transformative climate action simultaneously created the conditions for China's renewable energy revolution. The policy mechanisms,

coalition dynamics, and temporal frameworks that shaped energy governance in each country emerged from their positions within global production networks and the contradictory effects of (de)industrialisation on political economy. Understanding this relationship is essential for comprehending not only the historical trajectory of the Green Divergence but also the structural constraints and opportunities that continue to shape global energy transition governance in the contemporary period, where the spatial logic of capitalist development continues to generate uneven capacities for climate action across different political-economic contexts.

[8.4] Other Causes of the Green Divergence

This dissertation advances a critical political-economic framework that positions divergent economic compositions - America's deindustrialisation and China's rapid industrialisation - as the primary cause of the Green Divergence. This structural analysis complements and extends existing explanatory frameworks across institutionalist, STS, and innovation studies approaches, while demonstrating that these frameworks have undertheorised how economic structure shapes the institutional arrangements, socio-technical imaginaries, and innovation systems they analyse. This section acknowledges the substantial contributions of existing literature whilst clarifying how this dissertation's critical political-economic framework has both contrasted with and extended these approaches.

The institutionalist scholarship examined in Chapter 1, particularly Chen's (2016, 2023) comprehensive analysis of China's green developmental state and Skocpol's (2013) process analysis of Waxman-Markey's failure, provides indispensable insights into the governance

mechanisms and policy processes that have shaped the Green Divergence. Chen's meticulous documentation of how Chinese state institutions mobilised financial resources, coordinated between governmental levels, and integrated renewable energy development into a comprehensive industrial policy offers crucial empirical grounding for understanding the “how” of China's transitional success. Similarly, Skocpol's analysis of how USCAP's elite-dominated approach systematically undermined grassroots mobilisation illuminates the key points of failure concerning coalition building and legislative design that determined Waxman-Markey's defeat. These institutionalist insights remain central to this dissertation's analysis. The Chinese party-state's institutional capacity and America's corporate-dominated policy-making processes represent essential mediating mechanisms through which underlying economic structures influenced transitional outcomes. Crucially, this structural analysis does not diminish the importance of these institutional mechanisms but rather provides the missing causal foundation for understanding this institutional variation. It has sought to demonstrate that these variations can only be understood when situated within the deeper structural conditions emergent from global capitalism's development.

Where this dissertation diverges from institutionalist approaches is in its systematic attention to why these particular institutional arrangements emerged and persisted rather than alternatives. Chen's account of the green developmental state, whilst empirically rich, provides only a limited explanation for why China adopted this model when other industrialising economies have not, or why the US, despite possessing comparable state capacity during its post-war industrial expansion, proved incapable of deploying similar approaches during the Obama era. This dissertation's critical political economy framework reveals how China's ongoing industrialisation

created both the necessity and opportunity for state-led renewable development, whilst America's post-industrial transformation systematically eroded the material foundations upon which effective developmental state institutions depend. The analysis thus complements the institutionalist analyses by providing the structural account necessary to explain institutional variation across different political-economic contexts.

The significance of differing policy-making structures - particularly the contrast between America's gridlocked federal system and China's centralised authoritarian governance - represents another crucial dimension of analysis that this dissertation's framework aligns with. Gallagher and Xuan's (2019) comparative framework illuminates how American “deliberative incrementalism” and Chinese “strategic pragmatism” reflect fundamentally different approaches to climate policy-making, with China's centralised system enabling rapid policy implementation whilst America's federal structure creates multiple veto points that systematically advantage organised opposition. Roberts' (2010) analysis of the role of the US federal structure in Waxman-Markey’s defeat, particularly with the uneven representation within the Senate and the power of the filibuster, reveals how the US’ institutional design amplified the power of fossil capital as manifested through their influence over the T15 Democrats. Similarly, the literature concerning authoritarian environmentalism in China highlights how the party-state’s hierarchical structure enables consistency in policy-making direction, overcoming short-term political pressures, and rapid policy diffusion throughout the multiple layers of government (Gilley, 2012; Lo, 2015; Xiang and Lo, 2024). The collective findings of these works demonstrate that differing policy-making structures played an undeniable role in causing the Green Divergence.

This dissertation acknowledges but contextualises the role of policy-making structures within broader economic conditions. The key insight is not that institutional design is irrelevant, but that its effects are mediated by economic composition and the structural conditions it imposes on policy-making. Although China's party-state structure undoubtedly facilitated coordinated industrial policy implementation, similar authoritarian arrangements in other contexts - such as Vietnam - did not generate comparable renewable energy programmes. As argued throughout this dissertation, the key distinction lies not in authoritarianism per se, but in how China's centralised governance intersected with the specific economic contradictions of rapid industrialisation to create both the necessity for renewable energy development and the political conditions enabling its implementation. Moreover, democratic and federal policy-making structures have not systematically prevented renewable energy policy-making, as evidenced by European nations and various US states successfully implementing renewable portfolio standards, feed-in tariffs, and comprehensive industrial planning mechanisms. This dissertation thus should be understood to be built atop these analyses. It integrates their diagnoses of the role of policy-making structures in advancing or preventing the advancement of transitional policy-making, whilst arguing the primacy of economic composition in creating structural conditions and determining the alignment of social forces whose antagonisms, coalition building, and contestation were mediated through these policy-making structures.

The STS literature examined in Chapter 1, particularly the work of Sovacool (2009a, 2009b) on American socio-technical impediments to transition and Huang and Westman's (2021) analysis of China's Ecological Civilisation concept, provides crucial insights into the cultural and ideological dimensions that have shaped divergent energy imaginaries in both contexts.

Sovacool's systematic examination of how public apathy, consumerist abundance, and resistance to government intervention created socio-technical barriers to renewable adoption illuminates cultural dynamics that clearly influenced the political reception of climate policies like Waxman-Markey and partially explain the absence of popular mobilisation behind it. Similarly, Huang and Westman's analysis of how Xi's Ecological Civilisation resonated with traditional Chinese concepts reveals how cultural foundations can facilitate rather than impede environmental governance. Smith and Tidwell's (2016) ethnographic research on the "bounded imaginaries" of American energy-producing communities further illuminates how local cultural framings - prioritising production-side employment - facilitated fossil capital's narrative hegemony.

While fully recognising the explanatory value of socio-technical analysis, this dissertation demonstrates that cultural and ideological factors operate as mediating mechanisms rather than independent causal forces. Through utilising the metabolic rift framework, these phenomena have become historicised, being understood as emergent outcomes of capitalism's spatial reorganisation in the face of its own crisis tendencies. The spatial displacement of environmental consequences through deindustrialisation, examined in Chapter 2, systematically undermined the material basis for environmental consciousness in the US whilst providing fossil capital with the rhetorical weapons necessary to frame climate action as an elite-demanded sacrifice of working-class livelihoods. Conversely, China's rapid industrialisation concentrated ecological crises in its economic heartlands, creating the visceral environmental experiences that enabled Ecological Civilisation discourse to gain popular resonance rather than remaining an abstract policy slogan. The divergent socio-technical imaginaries are shown to be reflections of the

different ways in which global capitalism's spatial reorganisation created varying experiences of environmental degradation and economic security across different contexts.

The innovation studies scholarship, particularly Nahm's (2021) comprehensive analysis of global renewable energy value chains and firm-level specialisations, provides essential insights into the technological and industrial dimensions that have shaped the Green Divergence. Nahm's firm-level analysis demonstrates how globalisation distributed different capabilities across national boundaries, with Chinese firms specialising in manufacturing-intensive innovation whilst American firms concentrated on design-intensive research and development. This specialisation pattern helps explain why substantial US public investments failed to translate into domestic manufacturing capacity comparable to China's explosive growth in renewable production. Nevertheless, this dissertation's framework reveals that these innovation system differences cannot be adequately explained without reference to the underlying economic structures that systematically shaped firm strategies and state capacities in each context. Nahm's (2021) assertion that American and Chinese governments pursued “common political goals” through “fundamentally [similar] industrial policy strategies” obscures the qualitative differences in state-market relations that emerged from their divergent economic compositions. Where China's ongoing industrialisation enabled comprehensive developmental state intervention combining research, manufacturing, infrastructure development, and market creation into a unified industrial policy, America's post-industrial transformation hollowed out the institutional capacity necessary for such coordination, whilst privileging market-driven approaches that systematically channelled funding towards intellectual property creation. The innovation system

variations thus reflect the structural constraints and opportunities created by divergent positions within global capitalism's spatial organisation.

Resource endowment differences represent another factor that was, in no doubt, significant in causing the two countries' divergent energy trajectories. China's substantial coal reserves and America's emergence as a major oil and gas producer through the fracking revolution clearly influenced the political economy of energy policy-making in both contexts. The US' abundant shale resources enabled the politically expedient embrace of natural gas as a bridge fuel, whilst China's heavy reliance on energy imports created security imperatives that facilitated renewable development as a domestic alternative. However, this dissertation's analysis suggests that resource endowments gained political significance primarily through their intersection with the economic and political dynamics created by divergent developmental trajectories. America's fracking boom became politically salient not merely because of geological abundance and technical maturity but because deindustrialisation had created regional economic dependencies and state capacity limitations that made extractivist expansion appear as the optimal response to multiple intersecting crises. Similarly, China's energy security concerns motivated renewable development not simply due to the party-state seeking to limit import dependencies but because rapid industrialisation had created both the institutional capacity for comprehensive industrial planning and the economic contradictions that necessitated strategic sector development.

International relations and geopolitical factors similarly require integration within the broader political-economic framework developed throughout this dissertation. China's positioning as a late industrialiser seeking to challenge unipolarity undoubtedly influenced its strategic decision

to dominate emerging green technology sectors, whilst America's role as the incumbent global hegemon created incentives to preserve existing fossil fuel-based power structures. The Trump administration's explicit embrace of fossil fuel nationalism and withdrawal from international climate agreements clearly reflected geopolitical calculations about maintaining American energy dominance, whilst China's increasing prominence in international climate governance aligned with its aspirations for global leadership in strategic economic sectors. However, these geopolitical dynamics themselves must be situated within the material transformations analysed throughout this research: America's post-industrial transformation created structural dependencies on fossil fuel extraction that fostered fossil nationalist energy strategies, whilst China's rapid industrialisation generated both the necessity and opportunity for renewable energy leadership that aligned with its international aspirations.

Rather than treating these various factors as independent explanatory variables competing for analytical primacy, this dissertation's critical political economy framework reveals how they operated as interconnected mediating dimensions of the broader capitalist transformation that generated the Green Divergence. Institutional arrangements, policy-making processes, socio-technical imaginaries, innovation systems, resource endowments, and geopolitical strategies all found themselves shaped through their embedding within the spatial reorganisation of global capitalism that simultaneously created conditions for America's fossil fuel entrenchment and China's renewable energy revolution.

[8.5] Conclusion

This dissertation has advanced a novel explanation for the Green Divergence between China and the US by demonstrating how their contrasting economic compositions - characterised by the ongoing linked process of (de)industrialisation - systematically shaped the trajectory of their national energy transitions in fundamentally different directions. Through the application of critical political economy, metabolic rift theory, and historical-materialist policy analysis, this research revealed that what appeared as two independent national policy-making processes were actually the contradictory manifestations of a unified global process of capitalist development. The spatial reorganisation of production through manufacturing offshoring created mutually reinforcing dynamics: deindustrialisation amplified fossil capital's dominance in the US while industrialisation generated the structural imperatives driving China's building of the green developmental state. The dissertation's central contribution thus lies in demonstrating how these divergent economic compositions operated through multiple interconnected levels to shape the two countries' energy transitions. The Green Divergence thus reflects not just two varying national strategies but the spatially differentiated consequences of global capitalism's reorganisation, wherein late industrialisers gained structural advantages in emerging green technologies while post-industrial economies became trapped within existing fossil fuel infrastructure and political configurations.

The dissertation's limitations must be acknowledged alongside its contributions. The focus on the 2005-2016 period, while capturing the critical opening of the Green Divergence, necessarily abandons analysis of subsequent developments that might have altered these trajectories - with

Biden's green policy-making serving as the key example here. The emphasis on deindustrialisation and industrialisation as primary explanatory factors, while empirically well-supported, potentially underemphasises other causal mechanisms. There is also room to criticise its approach as overly economically deterministic. The theoretical framework's integration of critical political economy, metabolic rift theory, and historical-materialist policy analysis, while productive for this comparative analysis, requires further development to address the complexities of authoritarian versus democratic energy transition governance - particularly in China, where the complexities of political contestation play out drastically differently than in North America and Europe. Additionally, the research's concentration on national-level dynamics, though essential for explaining the Green Divergence, provides limited insight into subnational variations that might complicate or nuance these findings.

Despite these limitations, this dissertation advances significant contributions to energy transitions scholarship by providing the first comprehensive critical political-economic explanation of the Green Divergence, demonstrating how economic composition shapes the possibilities for energy transition governance, and deepening our understanding of the spatial dimensions of global capitalism's environmental contradictions. By showing how China's renewable energy leadership emerged from industrialisation's structural imperatives, this dissertation challenges conventional assumptions about the relationships between economic development, environmental governance, and technological innovation. The analysis suggests that effective energy transitions under capitalist conditions may require not just appropriate policies and institutions but favourable positioning within global capitalism's uneven spatial and

temporal development - a finding with profound implications for understanding both historical patterns and future possibilities for global decarbonisation.

Most fundamentally, this research reveals that the Green Divergence represents a manifestation of capitalism's contradictory relationship with ecological sustainability: the same system that drives environmental destruction through endless accumulation imperatives can, under specific structural conditions, generate powerful imperatives for renewable energy development.

However, these conditions appear to align primarily with late industrialisation rather than post-industrial maturity, suggesting that global decarbonisation may depend less on the enlightenment of wealthy nations than on the developmental strategies of emerging economies still building their industrial foundations. Understanding this dynamic is essential for grasping both the possibilities and limitations of energy transitions within the constraints of capitalist political economy, as the world confronts the accelerating urgency of climate breakdown in an era of deepening global economic integration.

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